

SKRETTING
a Nutreco company



THE SKRETTING WAY

A practical guide to answer FAQs on aquaculture

OUR PURPOSE

Feeding the Future



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THE SKRETTING WAY

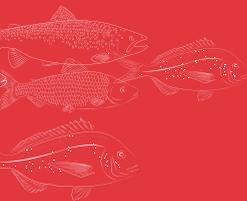
A practical guide to answer FAQs on aquaculture

In 2017, Skretting began a **process of dialogue and engagement** with its clients, with the aim of communicating and illustrating its actions in the field of **sustainability**.

This process revealed a need to improve **communication** initiatives of the various parties in the supply chain (feed producers, farmers, processors, distributors) and to coordinate them. The aquaculture industry is made up of a unique wealth of knowledge, experience, values and culture. Yet it is also unknown to many and all too often it becomes the subject of mistaken beliefs and hysteria, factors fuelled by the difficulty associated with finding accurate information.

For this reason, we decided to produce this **Communication Kit**, which is designed to do justice to our aquaculture products and bridge the information gap between producers and consumers.

Ultimately, our goal is to ensure that sustainable, competitive aquaculture doesn't fall foul to any fishy business.



The **Communication Kit** is set out as a series of questions and answers.

Each response is accompanied by a detailed information breakdown. The questions are grouped into five broad areas:

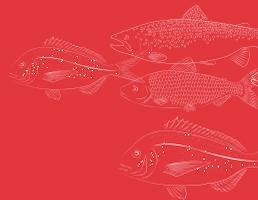
 **HUMAN NUTRITION**

 **FOOD SAFETY**

 **SUSTAINABILITY**

 **ANIMAL WELFARE**

 **INNOVATION - TOWARDS 2030**

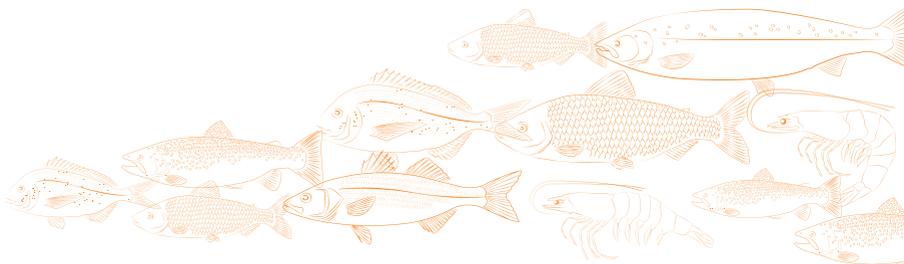




HUMAN NUTRITION

High in **OMEGA-3**, protein, vitamins and minerals, fish is the perfect component of a **HEALTHY DIET**.

By maintaining a healthy, balanced diet and regularly varying the types of fish we consume, we are able to obtain maximum benefit from this **PRECIOUS FOOD SOURCE**.



Fish - and seafood in general - has always been considered a fundamental component of a healthy, balanced diet, a belief that has been widely and consistently corroborated by scientific research.

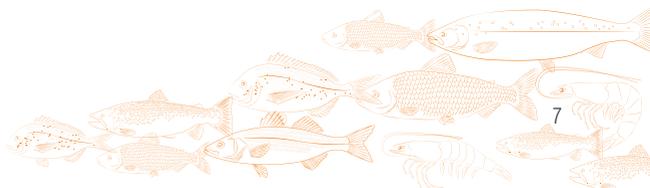
The consumption of fish is necessary because it allows the human body to absorb substances that it is not able to produce autonomously - but that are extremely important for human health. The most important of these substances are **Omega-3** fatty acids, particularly long-chain acids such as EPA and DHA, which - when present in our diets - are absorbed by the human body and **help to boost our immune system**.

Not all species of fish are equal, however. Some contain higher quantities of Omega-3 EPA and DHA than others, and an awareness of these differences allows consumers to make more informed choices.

Within the context of a balanced diet, the positive effects of fish consumption are the same regardless of whether that fish is wild or comes from aquaculture.

What is Omega-3 and why is it important?

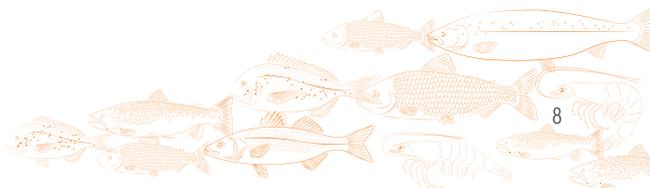
Omega-3 fatty acids are **essential fatty acids** that are a crucial part of our diets. Their **health benefits** have been scientifically proven, particularly Omega-3 EPA and DHA, which are the only active ones in organisms and that play a role in **protecting our health**. The biggest known source of these fatty acids is fish.



The entire scientific community agrees on the importance of Omega-3 fatty acids. These polyunsaturated acids are not produced by the human body - and it is for this reason that they are classed as “essential fatty acids” that must be consumed through diet. There are various types of Omega-3 fatty acids which differ in terms of their form and chemical dimension. The three most common types are EPA, DHA and ALA.

- **Eicosapentaenoic acid (EPA)**: main function is to produce eicosanoids, which help to reduce inflammation and counter the symptoms of depression.
- **Docosahexaenoic acid (DHA)**: an extremely important fatty acid to the normal development and functioning of the brain, accounting for 8% of its total weight.
- **Alpha-linolenic acid (ALA)**: can be converted into EPA and DHA, although the process is not very efficient; the main function of ALA is to provide energy to the body.

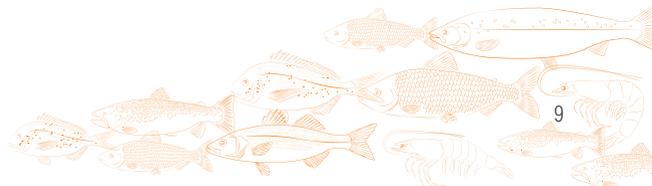
Omega-3 fatty acids are a crucial component of the membrane of human cells and serve to protect the health of the heart, support mental health and help to control body weight.



Why is it important to consume Omega-3 fatty acids but limit Omega-6?

It's important to strike the **right balance** between Omega-3, Omega-6 and Omega-9 fatty acids in the diet.

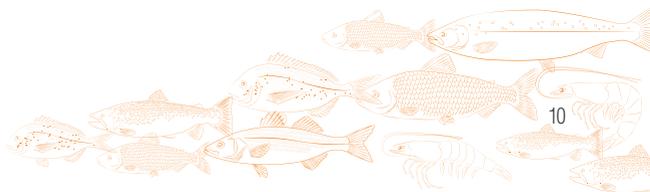
This balance of fatty acids helps to prevent a range of chronic illnesses.



Omega-3, Omega-6 and Omega-9 are all unsaturated fats, given that their molecular structure includes one or more double bonds. The different structure equates to varying levels of usefulness for the human body. Scientists believe that striking the right balance between these is one of the most important factors in any diet.

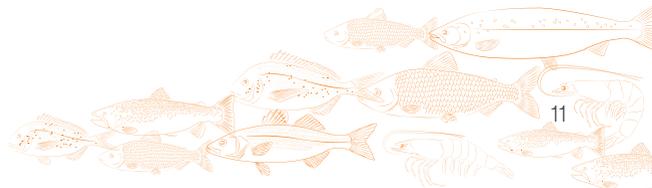
Human bodies evolved based on a diet featuring a ratio of around 1 between Omega-6 and Omega-3, yet modern Western diets now feature ratios of between 15 and 17. In order to keep this ratio low, it's important that we **consume Omega-3 fatty acids that derive mainly from the consumption of fish, because this is where the most useful forms for humans are found.**

Yet this poses a few questions. What type of fish is better for us: farmed or wild? As for farmed fish, does the feed given to the fish impact the Omega-6/Omega-3 ratio? Quite simply, the answer is yes: wild fish has a ratio very close to 1, while in farmed fish - particularly where modern feed contains vegetables - the ratio can get up to 1.5. In both cases, however, eating fish would contribute to bringing down the average ratio of 15 in Western diets.



What foods contain Omega-3 fatty acids?

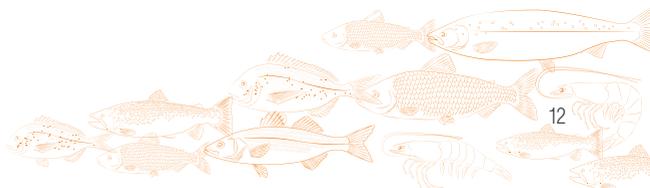
Various types of foods contain Omega-3 fatty acids (including linseed and walnuts), but **fish is one of the few foodstuffs the contain large quantities of beneficial, long-chain Omega-3** (EPA and DHA).



Omega-3 fatty acids - and in particular alpha-linolenic acid (ALA) - are found in seeds such as linseed, chia seeds and rapeseed, as well as in nuts such as walnuts. Soy beans and hempseeds also contain Omega-3s, but in smaller quantities. Fish oils and oily fish (sardines, mackerel, salmon and herring) are the biggest sources of long-chain Omega-3 fatty acids, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

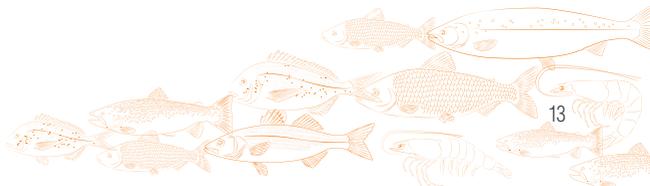
Though ALA is the most common Omega-3 fatty acid in our diet, it must be converted into EPA and DHA in order to become active and therefore usable by our bodies. Unfortunately, this process is highly inefficient in human beings. Only around 5% of ALA is successfully converted into EPA and only 0.5% becomes DHA.

The quantity of ALA normally absorbed into our diet through seeds and needs is not sufficient in terms of providing our bodies with the DHA and EPA Omega-3 fatty acids they need. An effective way of increasing intake is to eat fish at least twice a week.



Is it true that in order to consume Omega-3 fatty acids, it's better to eat wild fish only?

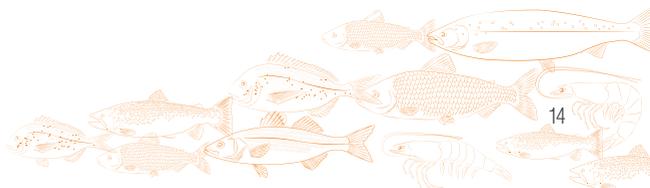
No, it has been widely demonstrated that eating **200g of oily or semi-oily fish per week** – regardless of whether it is **wild or farmed** – provides the body's entire EPA and DHA requirement (i.e. 250mg/day or 1.75g/week as recommended by the EFSA).



Many of the **nutritional qualities of farmed fish depend on the composition of their feed**. In general, it has been observed that where vegetable oils are used in feed instead of fish oils, the risk of contamination in the fish is reduced. However, this also results in a reduction in the quantities of previous Omega-3 fatty acids in their flesh.

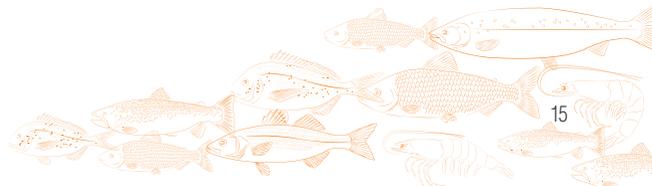
Having said that, this is not something we should be worried about - for a number of reasons. The first of these is that the difference in levels of Omega-3 fatty acids is quite insignificant, as shown by various scientific studies. Comparisons between wild and farmed salmon show that that farmed salmon has a lower quantity of DHA - but no significant difference in terms of EPA. Analysis of food composition tables (IEO-BDA) shows that farmed fish is fatter than wild fish in general, and is therefore more likely to have higher levels of Omega-3.

The conclusion to be drawn from all of this is that **while there are some differences, these are not significant enough to have a bearing on recommended purchasing choices**. As in all cases, the more varied these choices are, the better contribution they will make to a healthy, balanced diet.



Do Omega-3 levels vary between species?

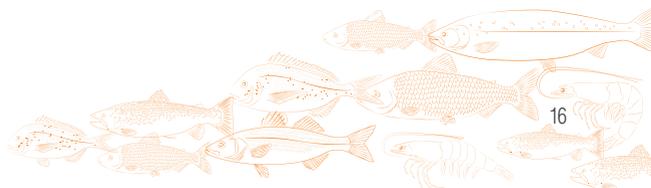
Yes, long-chain Omega-3 levels depend mainly on the total fat content of the species. Fish such as **salmon, sardines, trout, farmed sea bass and farmed sea bream** have high quantities of Omega-3, while lean fish such as cod have low levels.



The fat content in fish is, without doubt, the most interesting factor from a nutritional perspective. This fat content varies significantly, not just between different species, but also within the same species based on season, diet, water temperature and other factors.

Generally speaking, fish which feed on the seabed have a low fat content, while pelagic fish tend to store their fat in their head and muscles. The fat content in fish allows us to make the distinction between lean fish such as cod, sole, anchovies and brill and semi-oily and oily fish such as farmed sea bream and sea bass, snapper, trout, tuna, mullet, sardines, mackerel and salmon.

Farmed fish tend to have a higher accumulation of fats in their flesh.



Why is fish good for our health?

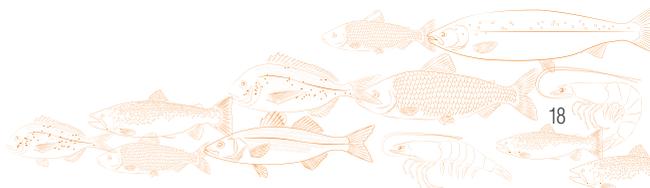
Fish is a great **source** of high-quality protein, **precious vitamins** such as D and B12 and **otherwise rare minerals** such as iodine and selenium. Fish is also the best source of the **long-chain Omega-3 fatty acids EPA and DHA**, which perform several protective roles for the body.



Fish is an extremely important part of a healthy diet. With seafood, it is the main source of the long-chain Omega-3 fatty acids EPA and DHA.

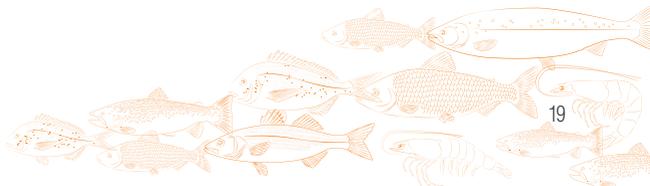
Fish also provides other nutrients such as protein, vitamin D, B vitamins, particularly B6 and B12, riboflavin and folates, as well as minerals such as iodine, selenium and fluorine. EPA and DHA are crucial to the optimal brain and retina performance, help to protect the heart and the circulatory system and contribute to reducing age-related cognitive decline.

They are also useful in the prevention of **treatment of acne** and in the **prevention of depression**, including post-natal depression.



Does farmed fish taste different when fed on vegetable-based feed?

There are various factors that impact the flavour of fish, **but what they eat and their growth environment** are probably the most significant. The use of vegetable-based raw ingredients in feed has no significant impact on the flavour - and makes aquaculture more sustainable.



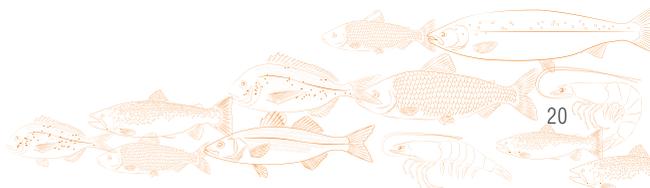
The flavour of fish depends on the presence of various amino acids and other mixtures of complex molecules: these dictate the five fundamental components of flavour, i.e. sweet, salty, bitter, acidic and umami.

Regarding the difference between farmed fish - fed on various types of feed - and wild fish, industry studies offer a range of results which make it impossible to confirm one clear theory.

The flavour and consistency of fish can vary greatly as a result of the phase of life of the fish and the environment in which it lives, i.e. the geographical zone in which the farm is located or the actual structure in which the fish are farmed.

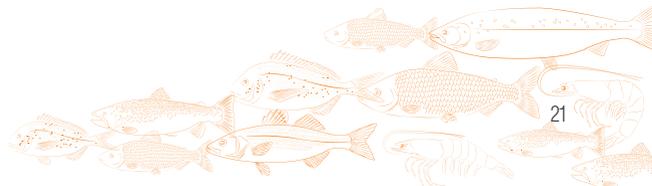
Every species has its own optimal age and weight for consumption, but to satisfy market demand for small portions, some farmed fish are sold before they develop their full flavour. It is clear, however, that one of the most important factors is the freshness of the fish, which depends mainly on storage and distribution methods.

On the subject of flavour, it's worth remembering that this often depends on how a fish is cooked and seasoned, but the old rule that to each his own is also one to keep in mind!



Which cooking method best preserves the nutritional properties of fish?

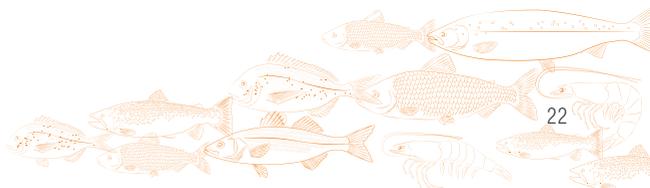
The content of protein, vitamins and minerals in fish is largely unchanged as a result of cooking, but Omega-3 levels may be reduced as a result of high temperatures. In order to preserve Omega-3 fatty acids, it's better to use **cooking methods with feature low temperatures and short cooking times.**



While cooking doesn't affect a fish's levels of protein, minerals and vitamins, it's another story entirely when it comes to previous Omega-3 fatty acids.

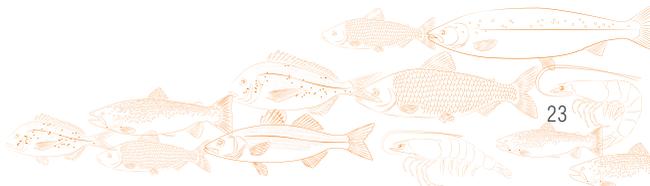
Cooking at low temperatures and for short periods of time is the best way to preserve long-chain Omega-3 fatty acids. For example, fried fish loses substantial quantities of EPA and DHA, but if you're really set on frying, olive oil is the best choice because these two most beneficial fatty acids are found in higher quantities in fish fried in olive oil than fish fried in other oils.

The best cooking methods are **steaming, poaching, salt baking, oven-baking en papillote and grilling**, but barbecuing over an open flame is one to avoid. The **microwave** is a good bet too, as is the modern technique of **sous-vide**.



What role does aquaculture play in ensuring access to food?

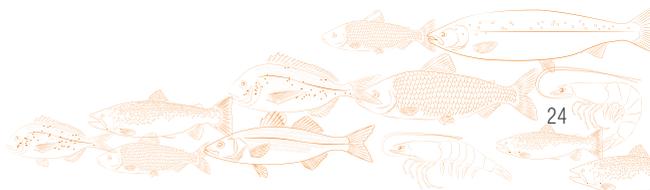
Fish is an important food in the human diet and **aquaculture products contribute significantly to enriching the diet of the world's population**, particularly in the poorer parts of the world. This contribution will grow even more in the future.



The consumption of fish is a very important component of the human diet and ensures a supply of **valuable nutrients**. At a time of drastically declining fish stocks and general overexploitation of marine ecosystems, **aquaculture plays, and will play in the future, a key role in ensuring access to food** and improving the diets of millions of people around the world. It is estimated that by 2030, nearly 60 per cent of all global fish consumption will come from aquaculture.

While this contribution is particularly evident for rural and poorer areas of the world, the importance of aquaculture in ensuring that fish is never missing from the table is also increasingly evident in any country.

We experienced this during the COVID-19 pandemic starting in March 2020: with borders closed and logistical difficulties, local aquaculture products helped to meet the demand of domestic markets, and also led consumers to rediscover some typical local species.





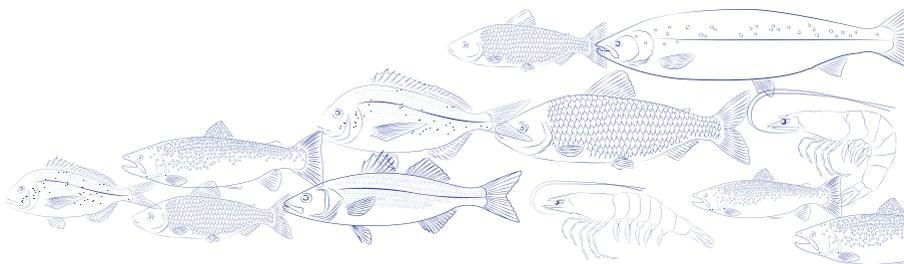
FOOD SAFETY

Strict **FOOD SAFETY CONTROLS** across the supply chain are what distinguish aquaculture products from the wild fish.

This guarantees the consumer optimal **QUALITY** and **SAFETY** levels.

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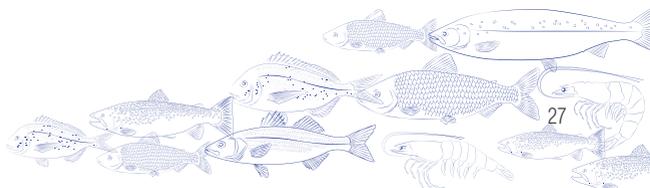
Being assured of eating healthy, safe food is a priority for consumers in both supermarkets and restaurants. This is particularly true for fish. National and international legislations impose stringent controls on aquaculture products in order to guarantee their safety, thus ensuring standards that are higher than those of wild fish.

The **diet** of the fish is also important: feed has a big impact on the quality of the fish, so it's important that they do not come into contact with substances that are harmful for human health. To that end, feed is subject to stringent checks to guarantee the safety of all ingredients.

Antibiotics are only used in the event of illness and are closely monitored by veterinarians in order to ensure that no trace of them ends up on our plates.

Is fish farmed in Europe safer than fish farmed in other countries?

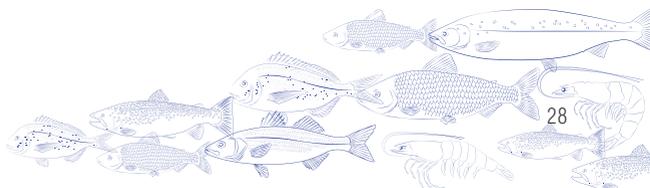
Within the European Union, the principle of ‘**farm-to-table**’ safety applies: farmed fish is controlled at all stages of the supply chain, from the egg to consumption. This provides **great guarantees** not only on the finished product, but also on **raw materials and farming techniques**. In some countries outside the EU, on the other hand, there is no traceability requirement, so checks are only carried out on the product to be placed on the market.



Rather than greater safety, one should speak of **greater traceability**. The difference, in fact, lies in the extent of controls, which in Europe cover the entire supply chain, while in other countries only the finished product.

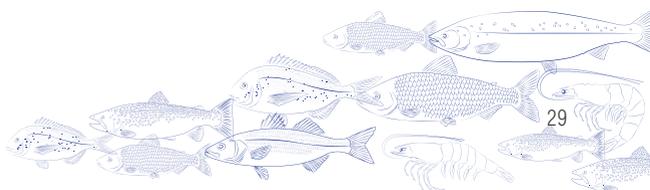
Within the European Union, the principle of safety 'from the field to the table' is in force: according to this approach, farmed fish is traced at every stage of the chain, and the use of any substance must comply with the rules laid down by the Union. These include both a ban on the use of certain substances (such as growth-promoting hormones) and the parameters according to which those for therapeutic purposes (such as antibiotics) must be used. **All fish from Member States, therefore, must meet the same requirements in terms of safety and traceability.**

In some non-EU countries, on the other hand, national legislation does not impose traceability requirements, giving precedence to analytical checks on the product to be placed on the market, rather than to supervision of the individual stages of the chain. In order to be able to import into Europe, however, non-European companies must comply with market requirements in terms of safety.



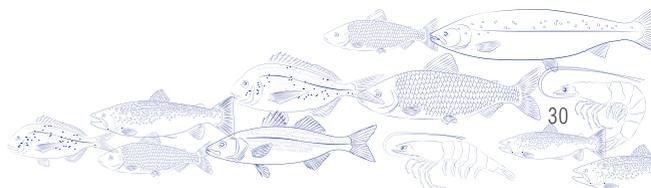
What does it mean when you say that farmed fish is more controlled than wild fish?

While in the case of wild fish, only the area and method of catching is known, **farmed fish is subject to strict controls** from birth to consumption.



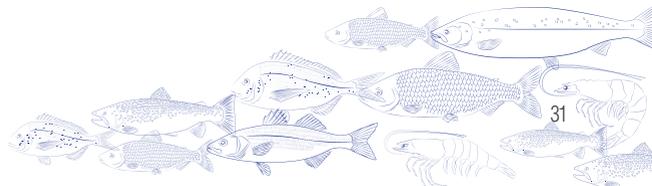
One of the advantages of aquaculture is the ability to exercise total control over a product. Farmed fish is subject to constant checks, from birth to consumption, allowing farmers to intervene at any time to ensure optimal quality standards.

Traceability is a further advantage of aquaculture: operators use various systems of documentation and labelling in order to trace production at every stage of the process.



Is farmed or wild fish fresher?

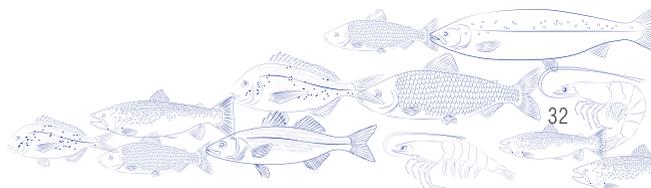
Farmed fish comes from **supply chains** that tend to be **shorter** than those of wild fish. Generally, this means that the time between the moment the fish is removed from the water and delivery to the supermarket is shorter than in the case of wild fish.



Let's make one thing clear: both wild and farmed fish are subject to **strict controls** and both are safe when they reach consumers.

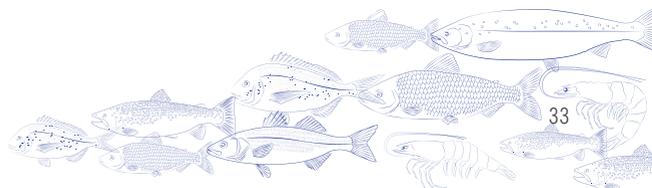
However, the supply chain for farmed fish is usually short, which **equates to an advantage in terms of freshness**. The period between the moment the fish is removed from the water and delivery to the supermarket is generally shorter than in the case of wild fish.

This is further helped by the fact that the supply chain for farmed fish is more standardised, something that makes it possible to optimise timings and the cold chain and ensure a high-quality product.



Are the animal by-products used in feed dangerous to human health?

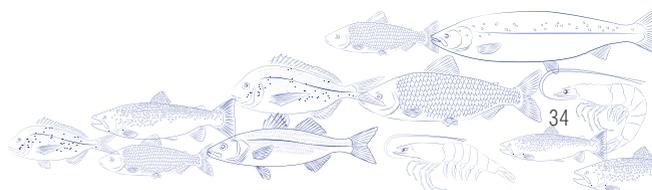
No. The safety of animal by-products has been proven by numerous scientific studies. First and foremost, these raw materials make it possible to reduce the amount of fishmeal and oil used by reusing by-products which would otherwise go to waste. This **contributes to the environmental sustainability of the food industry.**



Various by-products from the slaughter of animals destined for human consumption can be used in fish feed.

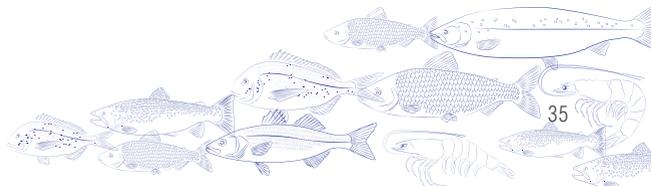
These raw materials are therefore completely safe, because they come from animals that have previously been subject to veterinary checks which exclude all possible dangers to human health. Animal by-products are high in protein, fat and minerals and therefore are of precious nutritional value to carnivorous species.

The use of these raw materials in aquaculture delivers huge benefits from an environmental perspective, because it allows us to use resources that would otherwise go to waste in order to produce more food, in accordance with the principles of the circular economy.



Is it true that the pigment used in salmon and trout feeds is harmful to human health?

No. The salmon and trout pink colour is obtained using a **carotenoid** (i.e. a pro-vitamin) which has no negative impact on human health. In fact, it is used as a food supplement on account of its **antioxidant** properties.

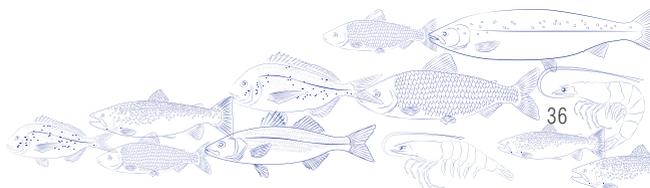


A carotenoid called **astaxanthin** is used to give a more intense pink colour to salmonids. Astaxanthin is a naturally occurring substance in algae and crustaceans.

Once absorbed by fish, astaxanthin can have a variety of different effects: it can be transformed into vitamin A, which is important for the growth and health of the fish, be stored in the flesh or skin, which is what gives it the distinctive pink colour, or have an antioxidant effect.

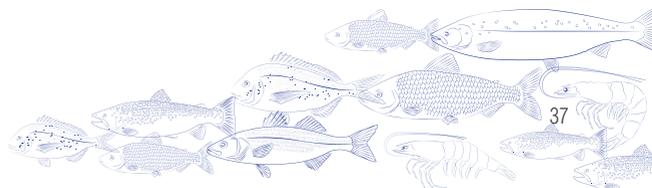
Astaxanthin is also used in chicken farming, to give an intense yellow colour to egg yolks.

The addition of this substance to feed **has no negative impacts on human health**. On the contrary, it is widely known for its **antioxidant properties** - to the extent that it is also sold as a nutritional supplement.



Does the diet of the fish impact on food safety?

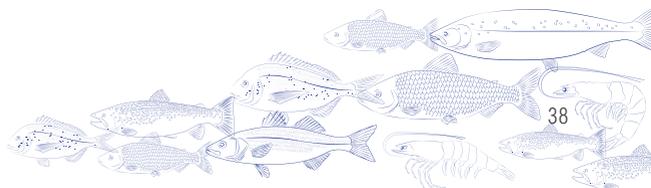
Yes, because what the fish eat may contain contaminants which could be dangerous to humans. **The farmed fish supply chain is closely controlled** and national and international law impose strict limitations in terms of the presence of contaminants in feed, something that obviously cannot be verified in the case of wild fish.



Some consumers believe that wild fish is safer and better quality because it's more "natural". In reality, we know nothing about wild fish aside from the fishing area, which doesn't correspond to a specific country, but to a geographical macro-area. For example, area FAO 37 includes the entire Mediterranean and Black Sea.

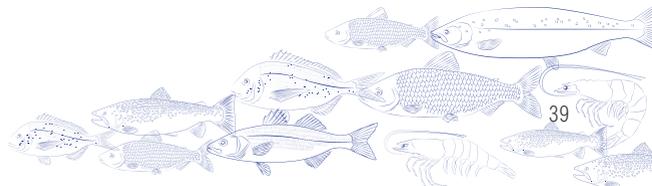
In contrast, **farmed fish is monitored and controlled** in accordance with feeding and farming environment standards through its lifecycle.

This is one of the biggest safety advantages of aquaculture. It is possible to identify the individual raw ingredients used to produce feed, which is then subject to strict controls to ensure its quality, safety and absence of dangerous contaminants for humans.



Is it true that wild fish is safer because it isn't treated with antibiotics?

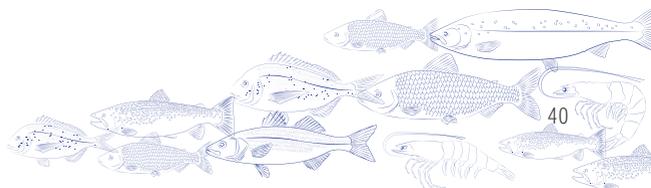
No. Even though it isn't given antibiotics, wild fish can still come into contact with substances that are harmful for human health, so greater safety cannot be guaranteed. Moreover, therapeutic action in aquaculture is **only taken when strictly necessary, and in accordance with specific regulations.**



The fact that wild fish isn't treated with antibiotics doesn't mean that it's healthier. Fish can still come into contact with several environmental contaminants in the wild that can potentially be harmful to human health. Farmed fish, by contrast, is subject to constant veterinary checks to guarantee specific food safety standards.

Therapeutic treatment is also only done when truly necessary - and again, strict checks are in place to monitor this. There is a mandatory period of time between ingestion of medicine and the release of the fish to market (this is called the withdrawal period), to ensure that all traces of the antibiotics or other substances that may potentially be harmful to humans have been eliminated from the fish.

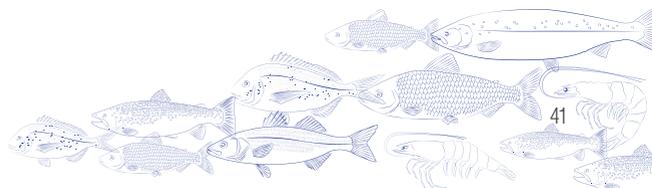
No trace of any treatments finds its way onto our plates.



Is it true that farmed fish are given antibiotics and hormones to make them grow more quickly?

No. No growth-promoting hormones are used in aquaculture as they have no effect on fish so their use would be futile.

Antibiotics are only used for therapeutic purposes, in accordance with specific rules established by law.

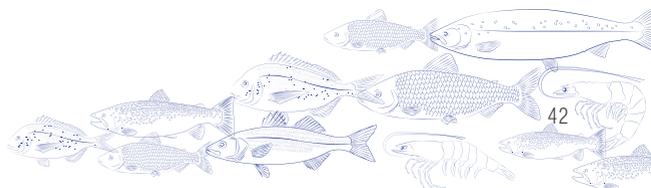


The use of veterinary medicines - particularly antibiotics - in aquaculture is subject to specific laws and regulations. The core principle is to use them as little as possible and only when necessary.

Medicines can only be used in the event of disease and following medical prescription - and never as a prevention measure. In order to reduce risk to people as much as possible, antibiotics must be administered under strict medical controls. The **withdrawal period** must also be adhered to - this refers to a set period of time between the moment of treatment and slaughter, to ensure that the medicine is no longer present in the fish on consumption.

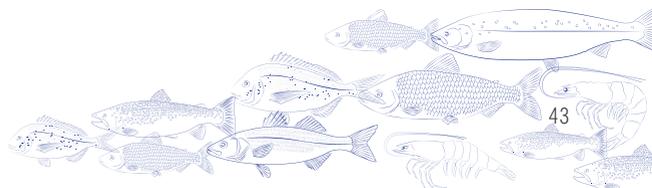
Recently, the use of functional feed and vaccination is becoming more and more widespread, thus reducing the need to use antibiotics.

Finally, the use of hormones or antibiotics with the aim of accelerating or boosting fish growth would be **futile in aquaculture**, because - unlike in the case of mammals - these substances have no such effects on fish.



Does feed contain chemicals such as preservatives that are dangerous to human health?

No. Feed is subject to checks to ensure that it does not represent a threat to human health. Any preservatives present **comply with laws and regulations** governing their use.

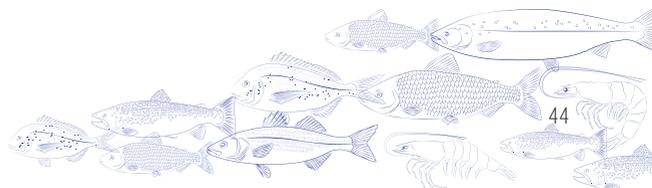


The animal feed industry is subjected to extremely strict limitations in order to ensure that feed is not dangerous for animal or human health or the environment.

Feed is closely controlled in terms of raw materials, production conditions and other additives (including preservatives), which may be used to make the fish safer from a hygiene/health perspective and improve other characteristics.

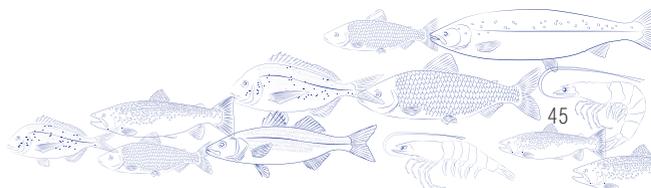
Preservatives used in feed are the same used in the majority of products destined for human consumption. Therefore, like all additives used in food, these are subject to a long series of safety assessments before being sold.

These assessments usually fall within the competence of national or federal agencies to ensure an independent and science-based approach such as the European Food Safety Authority EFSA in Europe or the Food and Drug Administration FDA in the United States.



What effects do microplastics in the sea have on the fish we eat?

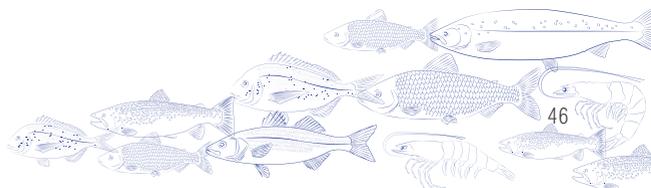
Fish may ingest microplastics. These are **generally deposited in the intestinal tract and gills**, but do not appear to accumulate in the flesh - i.e. the edible part - of farmed species. **The risk to humans is therefore minimal - and is further reduced in the case of aquaculture** because of the ability to closely control what the fish eat.



Microplastics are particles with dimensions below 5 millimetres. These are **may be ingested by fish** and traces have been found in the gills and intestinal tracts of some wild fish.

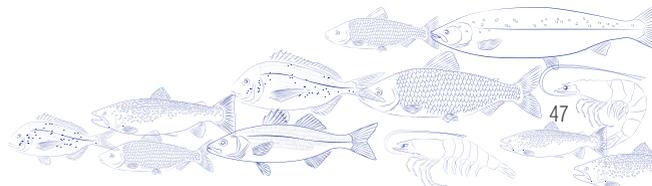
The danger of microplastics lies generally in the fact that any contaminants present could be transmitted to the organisms that eat the fish. **The risk to human health is very low**, however, because microplastics tend to be deposited in non-edible parts of the fish.

The risk is even lower in farmed fish, because the diet of farmed fish is closely controlled. Raw ingredients with high safety levels can be chosen for feed, for instance.



Can the presence of certifications guide the choice of aquaculture products?

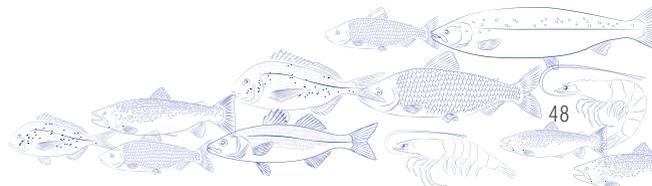
Yes. Obtaining a certification is, in itself, an indication that a company has adopted a **rigorous and structured approach** to managing its activities, and in the aquaculture sector, too, it signals a focus on providing transparent guarantees to the consumer. Aquaculture allows all production factors to be well controlled, and therefore **processes and products can be certified** for different aspects, from food quality and safety to environmental sustainability and social responsibility.



More and more companies are deciding to use voluntary certification schemes to communicate the value of their brand and products.

In general, voluntary certifications can be either process or product-related. The former aim to ensure that the company's **production processes** are managed in compliance with precise requirements (such as quality, safety, environmental sustainability and social responsibility). Companies that obtain process certifications usually undertake to continuously monitor and improve their processes. The latter, on the other hand, focus on the **finished product** and can range from the protection of animal welfare to the origin of raw materials and quality.

Regardless of the specific contents, it is possible to say that, **on average, the presence of one or more certifications indicates a well-structured and orderly approach to managing one's activities.** To acquire and maintain a certification, in fact, companies often have to adopt strict management and monitoring criteria for their production processes and supply chain.

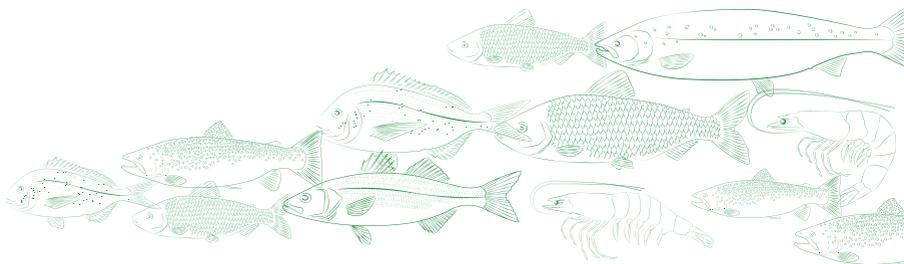




SUSTAINABILITY

With 60% of global fish stocks already being fished at maximum sustainability capacity, **AQUACULTURE PLAYS A FUNDAMENTAL ROLE** in satisfying international fish stocks.

The challenge facing the industry is to continue to grow while at the same time **REDUCING** its **IMPACT ON THE ENVIRONMENT.**



In recent years, fish consumption has been constantly increasing, resulting in added pressure on marine ecosystems in the world.

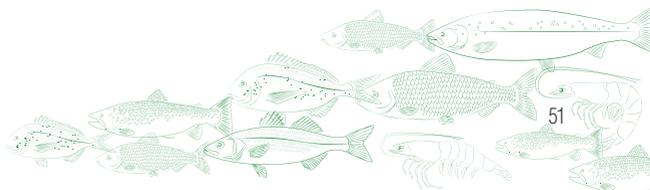
In this context, aquaculture represents the **only possible response** for the appetite of an increasing number of people for fish. To make aquaculture **sustainable in the long term**, it must be managed in a responsible manner, with action taken to address issues and problems which change based on production context and region.

Over the past few years, aquaculture has made improvements in areas that were traditionally seen as problems for the industry, such as the composition of **feed** for carnivorous species, where it was necessary to strike the right balance between fishmeal and oil and other, more sustainable ingredients. One way of striking this balance is to use **by-products** from food supply chains, which can be processed and turned into new food for the global population.

Aquaculture facilities are designed and managed in such as way to reduce negative exposure with the environment as much as possible, thus protecting local ecosystems.

Is it true that aquaculture damages the seas?

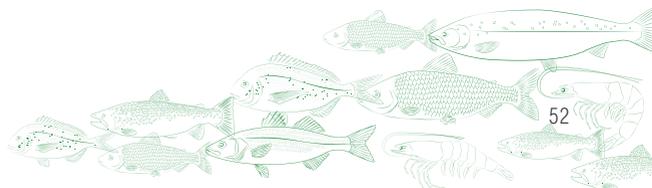
No. Aquaculture is a **potential solution** to the problem of satisfying the constantly increasing global demand for fish without depleting wild fish stocks.



Aquaculture is a **potential solution to the problem of overfishing**, which affects the majority of species living in our seas and oceans.

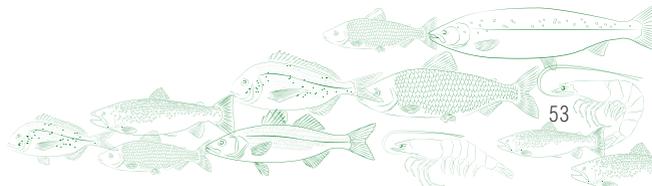
For a long time, one of the main problems in aquaculture has been the feed used in the farming of carnivorous species. The main ingredients in these fish feeds are proteins and fats administered through fishmeal and oil deriving from industrial fishing. In other words: in order to farm fish, you need fish. This is monitored through the **FIFO (Fish in - Fish out)** ratio between the amount of fish caught for the production of feed and the amount of farmed fish.

Nowadays, thanks to progress in research and technology, it is possible to consistently reduce the use of fishmeal and oil by replacing them with alternatives with no negative effects for biodiversity: from vegetable-based raw materials to by-products from slaughter and - more recently - the innovative use of algae and insects.



Is there such a thing as sustainable aquaculture?

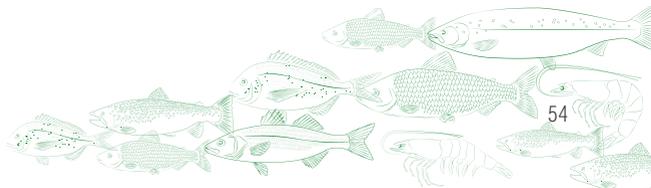
Yes, aquaculture can be practised responsibly while keeping the effects on the environment under control. In addition to **reducing the impact on water quality**, a further challenge for species farmed in Europe relates to the composition of feeds, which must **limit the use of fishmeal and fish oils** in order to be environmentally sustainable.



If managed responsibly, **aquaculture can safeguard marine and freshwater ecosystems** while making a vital contribution to the nutrition of the growing human population. Achieving this goal requires integrated action on several fronts, and on different issues depending on the context and location of production.

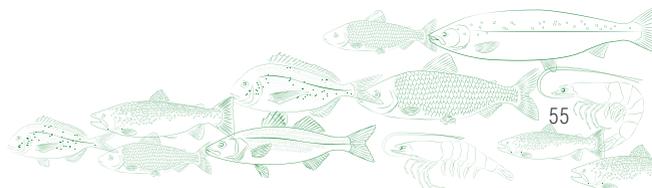
In Europe, where the majority of farmed species are carnivorous, great attention is paid to the composition of the feed, for which a balance must be found between the use of raw materials of marine origin (fishmeal and oils from capture fisheries) and alternative ingredients. Aquaculture facilities are also designed to **minimise negative interactions with the environment**. Through more efficient feed and careful farm management, the impact on local water quality can be minimised.

The case is different in some particular areas in Africa, South America and Asia, where the reared species are mostly herbivorous. Here, the main problems concern the introduction of alien species into areas where they were not originally present, with the consequent risk of reduced biodiversity, pollution and loss of areas of particular biological importance.



Are new feeds made from vegetable-based products or by-products from land animals unnatural?

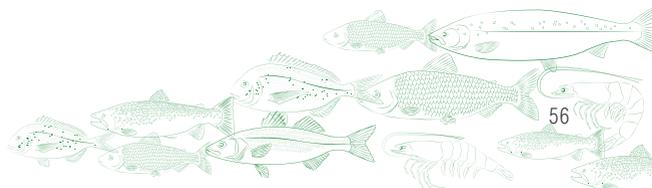
No. All feed is designed to provide the fish with all the nutrients they need and in the **right quantities**. The source of the nutrients does not have any great bearing, nor does it pose a danger to the health of the fish or the consumer.



Good feed is designed to provide the fish with all the nutrients they need to grow well and be healthy. These nutrients can come from different ingredients without this impacting on quality.

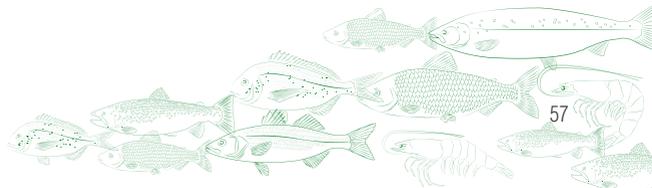
For clarity's sake, it's important to make a **distinction between ingredients and nutrients**. Imagine you went to the doctor with a cold and were advised to take vitamin C for two weeks. In order to take the prescribed quantity of vitamin C, you'd have two options: eat a kilo of lemons every day or take one small tablet every morning. Whichever option you chose, the end result would be the same. You'd be getting it from a different source, but the amount of vitamin C would be unchanged.

The same principle applies to feed: the type of ingredient used to obtain the nutrients has no effect on the quality of the feed itself.



How can you apply circular economy principles to aquaculture?

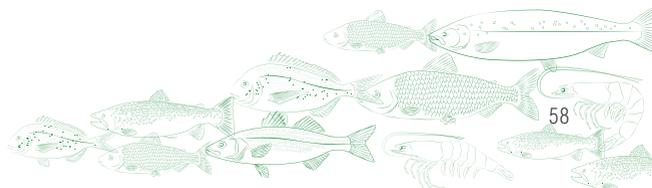
In aquaculture, the circular economy **breathes new life into products created by the food supply chain** that cannot be used directly in the production of food for human consumption.



Establishing a circular economy in aquaculture is about finding new uses for by-products and waste from supply chains involved in the product of food for human consumption. These substances can be processed in order to create new food for the world's population.

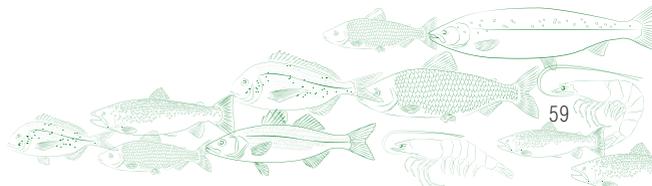
In practice, this can be done by using:

- **Trimming**s: by-products from fish processing can be used to produce healthy, nutritious food. Today, around 35% of fishmeal used in aquaculture comes from trimmings.
- **Processed Animal Proteins**: by-products from the slaughter of animals destined for human consumptions can be turned into meal with excellent nutritional value.
- **Insect meal**: though insect meal doesn't strictly fall under the circular principle, given that it is not a by-product, the use of insects in aquaculture is gaining traction and could become a key ingredient in feed in the space of just a few years.



Is farmed fish a typical local product?

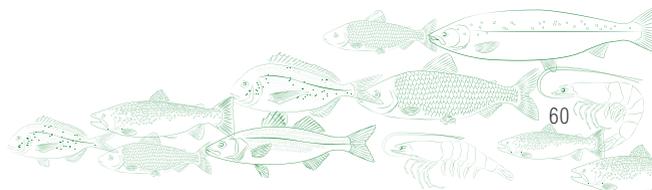
Yes, aquaculture is distinguished by the diversity of the products on offer, which reflect the different characteristics of the environment in which the fish are bred. Over time, in fact, **each region has perfected the breeding of species** best suited to the conditions of its territory, **creating local food excellence.**



There is therefore a very strong link between aquaculture products and the territory from which they originate, often witnessed by a **long local tradition**. And it is precisely the territory hosting the farms that receives the greatest benefits from this activity, both from an employment and economic point of view, and from an environmental one.

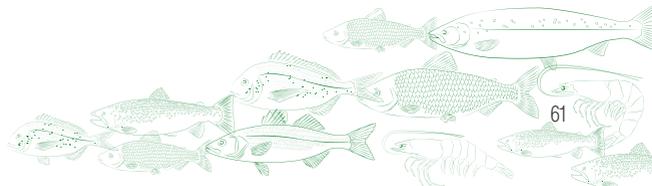
In many places, the sector's activities have made it possible to **recover and give new life to areas in a state of abandonment** and degradation. Moreover, in many areas where agricultural monoculture has reduced biodiversity, aquaculture sites **represent safeguards** for many aquatic species that would otherwise not find a favourable habitat.

One of the challenges for aquaculture is precisely that of strengthening and enhancing the association between territory and product, so as to create, as is the case for many other agri-food products, **regional food excellences that are recognised and appreciated** by consumers.



Does aquaculture have a negative impact on aquatic ecosystems?

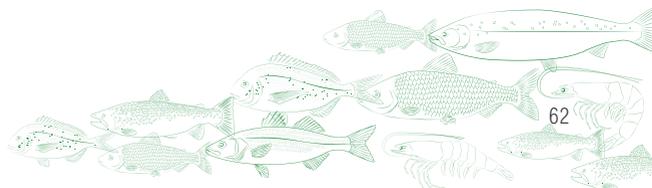
No. Nowadays, the use of the latest types of feed, the systems in place to support decision making and the advanced technology available in the fields of water recycling and purification mean that aquaculture contributes to the **development of local areas** without harming **water quality**.



One of the main criticisms levelled at aquaculture is the claim that it contaminates local water resources, in that by-products from aquaculture sites (feed, nutrients, excretion) might come into contact with the external environment and thus upset the balance of a local ecosystem. However, such observations are now out of date. In recent years, aquaculture has taken huge strides forward in terms of **minimising environmental impacts**.

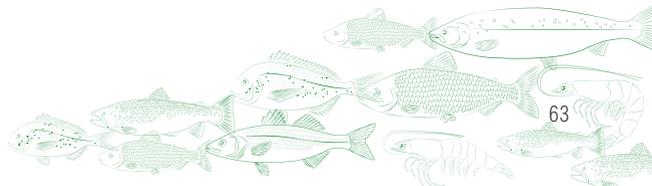
Having a healthy environment is advantageous for aquaculture, given that the quality of the fish is directly linked to the quality of the water in which it is farmed.

New feeds are easily digestible and formulated in order to avoid nutrient waste. Meanwhile, new systems designed to **support decision-making** help farmers to establish how much feed needs to be given to the fish, thus preventing waste. There is also modern technology available when it comes to treating outbound water, such as **settling tanks**, which reduce the amount of pollution in water. Filter systems, meanwhile, make it possible to reuse the large majority of the water.



Does fish farming damage wild fish populations?

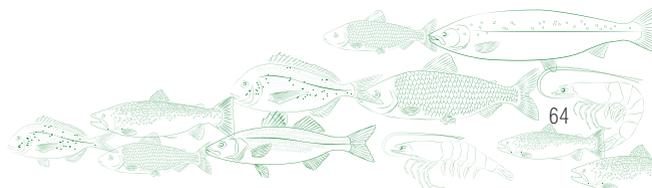
Interactions between farms and surrounding environments depend on the farming technology used. Contact is always closely controlled and managed in order to avoid negatively affecting biodiversity or impacting the health of wild populations. Despite the **limited risk, farmers are responsible for carrying out constant, stringent checks**, to avoid accidental escapes, which would represent an economic loss for them.



Farms attract various species of wild fish, generating a potential risk in terms of the transmission of diseases. To reduce such a risk, constant veterinarian checks are carried out on farms to keep the fish in good health and ensure that no contamination from the outside environment has taken place. Checks are carried out in greater number in risk areas. For example, in fish hatcheries, which are home to the youngest, most delicate fish, inbound water is filtered and sterilised.

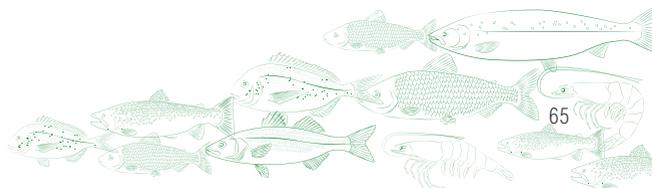
The possibility of fish escaping from farms and mixing with wild animals, thus impacting biodiversity or interfering with their reproductive capacities, is another potential risk. The difficulties associated with genetically characterising fish populations make this topic very controversial, while control measures are implemented at farm level to avoid escapes.

It's also worth pointing out that, from the other side of the debate, **aquaculture has had some beneficial effects on biodiversity, helping to protect species** such as sturgeon and marble trout, which previously looked destined for extinction.



Is aquaculture an activity with a major impact on climate change?

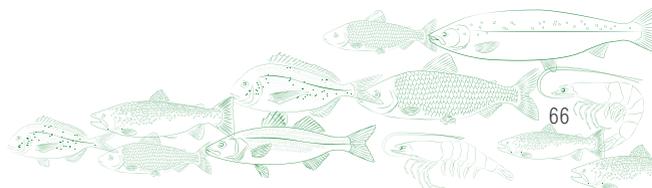
No, aquaculture has a smaller carbon footprint than other farming activities, and even in this sector, there are now various solutions **to minimise this impact and even cancel it out**, leading to ‘carbon neutrality’.



Recent years have seen a marked increase in public attention to the issues of climate change and carbon footprint, i.e. the amount of greenhouse gas emissions produced by different production activities.

Commitment to reducing these emissions has been a theme in various sectors of the agri-food industry for years. Several virtuous companies have now chosen to reduce their carbon footprint to zero, thus achieving 'carbon neutrality'.

In the aquaculture sector, emissions are lower than in other farming sectors. Various innovative solutions have been introduced to further reduce the carbon footprint of farmed fish.





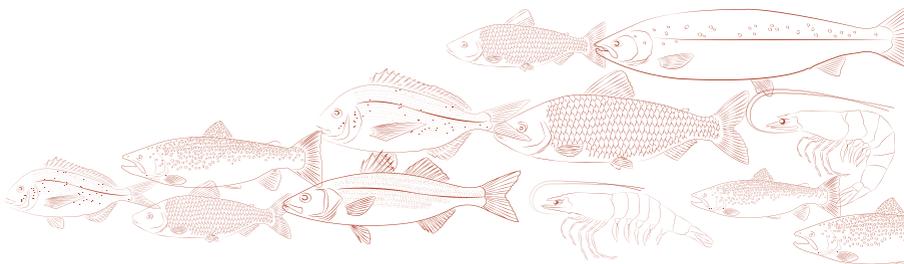
ANIMAL WELFARE

Animal welfare in aquaculture is ensured through an approach to farm management designed to minimise stress factors for fish so that they can grow properly and **BE HEALTHY**.

THE SKRETTING WAY

A practical guide to answer FAQs on aquaculture





The welfare of farmed animals is a topic of increasing relevance.

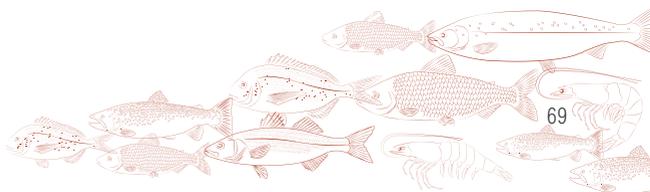
In the case of aquaculture, fish welfare depends on a huge number of interconnected factors. As a result, farmers adopt a body of measures designed to ensure **fish are able to grow properly and be healthy**.

Fish are fed on feed that offers them **all the nutrients** they need and are kept in facilities that ensure optimal environmental conditions. They are also subject to constant health checks. Even the slaughter stage is carefully planned in order to **minimise stress**.

As well as ensuring a better quality of life for the fish, all of this helps to create a **better product in terms of quality**.

Is it true that farmed fish suffer and get sick?

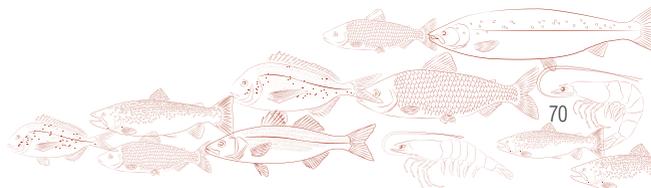
No. Farms that are managed responsibly and in compliance with existing regulations ensure appropriate levels of animal welfare. **Suffering in animals also has negative effects on the quality of the end product,** so it is in the interests of the farmer to avoid this.



The issue of farmed animal welfare - i.e. a good state of physical and mental health - has become extremely relevant in terms of both land animals and fish in recent years.

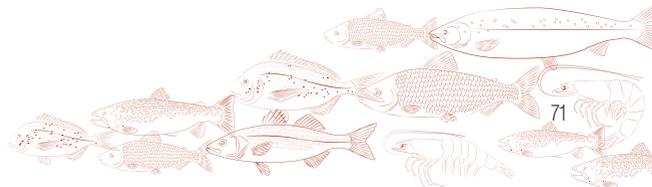
There is nobody that cares more about the health and welfare of the fish than the **farmer**, as veterinary treatment would equate to additional costs in comparison with standard farming. Moreover, stress and bad living conditions not only lead to unnecessary suffering but also have a negative influence on product quality.

Good farm **management**, the use of **functional feed**, **vaccination and regular health checks** mean that the risk of contracting diseases can often be lower than in the wild.



Why do farmed fish grow so quickly?

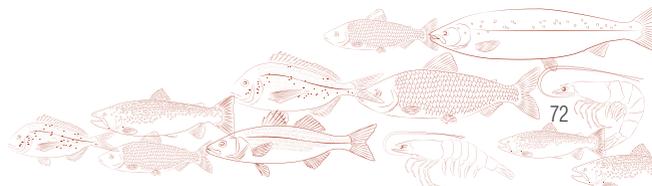
In aquaculture, **all production factors are optimised**, which makes it possible to speed up the growing process in comparison with the wild. This also allows aquaculture to satisfy the food demands of a growing population.



The diet of the fish is closely managed in terms of frequency and quantity, with a focus on striking the right balance between the need to obtain good growth rates and the optimal use of resources. By providing the fish with all the nutrients they need at regular intervals and guaranteeing an optimal farm environment, it is possible to speed up the growing process in comparison with the wild.

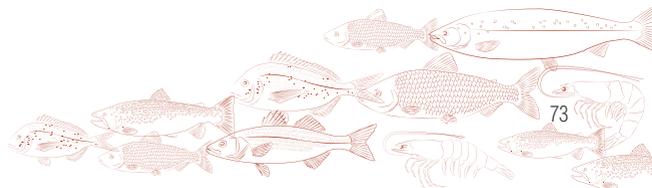
This means that, in the same period of time, aquaculture can produce more fish than could be caught through traditional fishing, thus satisfying the growing demand without harming biodiversity.

That said, feed distribution is always done in such a way to ensure optimal fish health. There is nobody that benefits more from efficiently managing this side of things than the farmer. Giving more feed than necessary would be a waste of resources and money, given that feed represents one of the biggest costs involved in the production process. It should also be remembered that selection has - in time - allowed us to obtain stocks whose characteristics are more suited to farming.



Are farms unhealthy environments or fish?

No. Farms must comply with a series of extremely strict requirements designed to ensure **hygiene and health safety** and optimal characteristics in every aspect: from water characteristics to the way waste is dealt with.

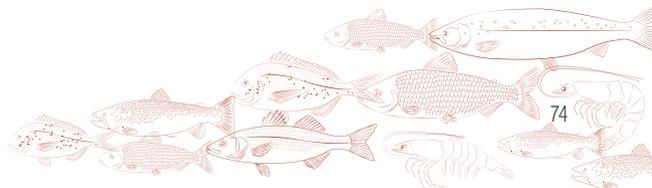


The quality of the farm environment plays a vital role in the quality of the end product.

Constant checks are carried out in fish farms by authorities and the farmers themselves. The chemical, physical and biological characteristics of the water are assessed to ensure these are suitable for fish farming, while the method by which waste water is managed is also evaluated.

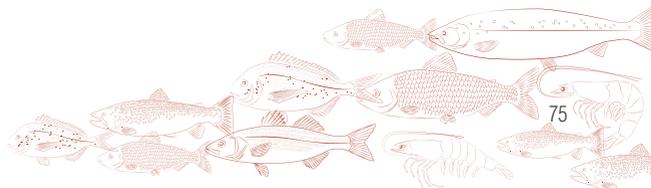
Furthermore, **specific animal welfare protocols are often in place to ensure low-density farming** and the adoption of procedures that minimise potentially stressful situations for the fish.

All of these steps help to minimise the environmental impact of aquaculture and improve the welfare of farmed fish.



Is it true that low fishmeal/fishoil feed is harmful for fish?

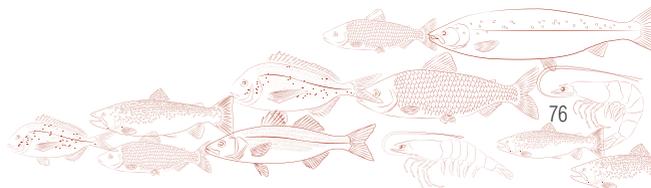
No. New feed formulations are specifically designed to **give the fish all the nutrients they need in order for them to grow properly and be healthy.** At the same time, these feeds reduce the use of limited resources such as fishmeal and oil.



The low fishmeal/fishoil formulations for carnivorous species are the result of over 20 years of scientific studies and research into the area. **Their efficacy and safety has been widely proven.**

Moreover, the welfare of farmed fish depends on a whole host of interconnected factors. Nutrition is certainly one of these, but there are many others besides - linked mainly to farm management - which have a significant bearing on welfare.

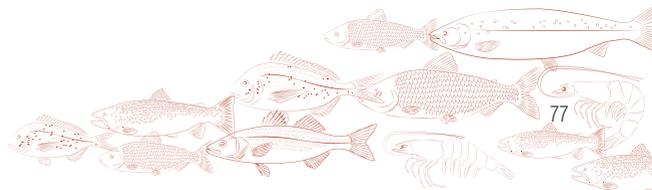
From a business perspective, formulating feed that was harmful to fish would be counter-productive. It is in the interests of the feed producer to do a good job and keep their clients satisfied and loyal by **providing quality products that fit their needs.**



Are farmed fish slaughtered ethically?

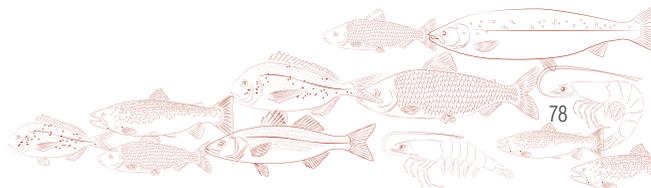
Yes. Slaughter is approached in such a way as to **minimise stress factors**.

This is important not only in terms of ethics, but also as regards quality, in that suffering can have a negative effect on the product.



As in all farming, slaughter is carried out with the aim of **minimising unnecessary suffering and stress**. This is done both for ethical reasons and based on economic concerns: stress leads to an accumulation of lactic acid in fish, which has a negative effect on product quality.

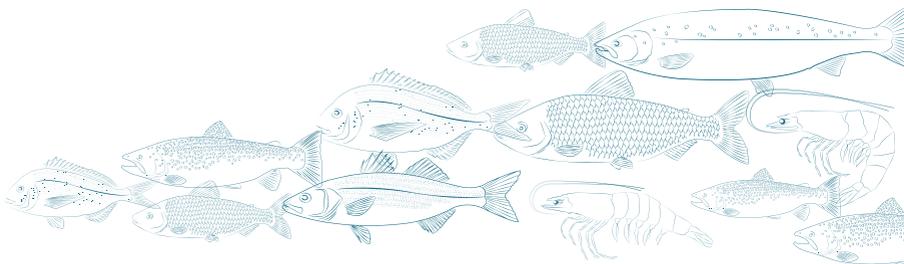
Therefore, there is nobody who cares more about managing this stage in a responsible manner than the **farmers, who take all necessary precautions in order to avoid stress for the fish**. The level of organisation typical of fish farming means that it is easier to manage this critical stage than in traditional fishing.





INNOVATION TOWARDS 2030

In the coming years, the biggest challenge facing aquaculture will be the need to develop an integrated approach encompassing the **ENTIRE SUPPLY CHAIN**, to **ENSURE THE VARIOUS PLAYERS** work together to make farming more efficient.



The gradual **development in our expertise** as a sector represents the basis upon which we can introduce new farming techniques and improve existing ones, in time allowing us to reach greater levels of sustainability in aquaculture.

The latest technology makes it possible to gather and process a whole series of information on the biological condition of the fish and a farm in general, with a view to facilitating decisions in areas such as feed provision, for example. In this way, tech helps farmers to reduce product waste, which represents a potential negative impact on the environment.

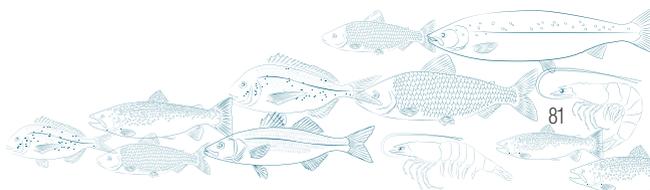
Another significant element that can benefit from developments in tech is the **health of farmed fish**.

The development of technology designed to support the health of the fish, such as oral vaccination and the use of functional feed, is a way of reducing the need to resort to treatment.

Thanks to progress in tech, aquaculture is confirming its position as a fundamental (and sustainable) sector in global food production.

Can efficient management of feed help to improve the sustainability of the aquaculture industry?

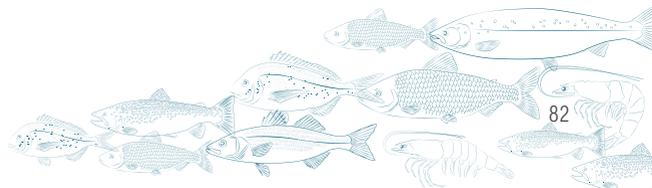
Yes. Thanks to modern systems designed to support decision-making relating to the diet of the fish, the farmer is able to **optimise** the amount of feed used, improving efficiency and **reducing both waste** and environmental impacts.



The use of systems designed to support decision-making relating to the feeding of the fish has significant advantages in both economic and environmental terms.

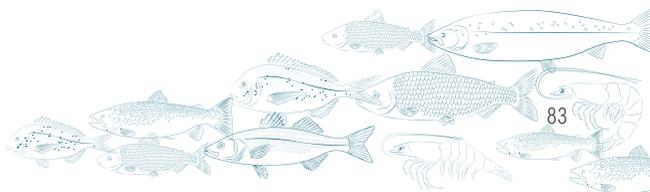
By analysing the biological and environmental parameters of farming structures, these systems provide farmers with information on the correct quantity of feed to use and the right time to feed the fish. This results in efficient rationing, which in turn maximises yield and minimises waste.

Today, farmers are able to **optimise the way they use feed**, which represents one of the biggest costs in fish farming, while at the same time obtaining a 10-20% reduction in carbon dioxide emissions when compared with traditional running methods.



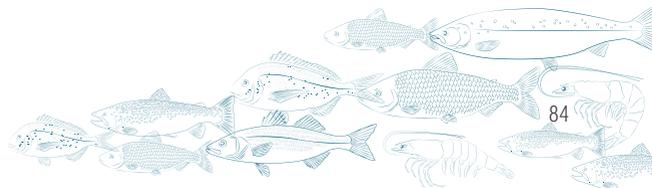
What characteristics will the feed of the future have?

The feed of the future will be more **sustainable** because it will be based on **innovative technologies and raw materials**, with **fewer impacts** and **more efficient use on farms**.



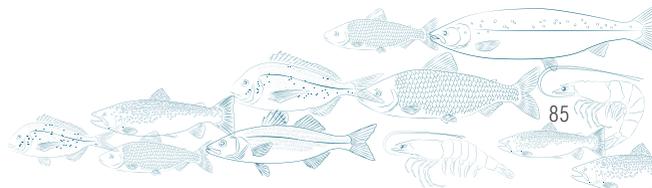
Gradual advances in science and technology will make it possible to develop increasingly **sustainable solutions for feed** used in aquaculture, both in terms of **combating climate change** and in terms of **optimal and responsible use of resources**.

The environmental footprint of animal feed depends primarily on the raw materials it is made of. In order to reduce it more and more, the feed industry is already working to **optimise the composition of feedstuffs**, making the most of **innovative raw materials** (e.g. the increasingly widespread use of insect meal and algae derivatives) and **from the circular economy**, while at the same time setting **responsible purchasing** criteria that take into account possible criticalities throughout the production chain. In particular, soya and its derivatives, as well as **palm** products, and **raw materials of marine origin** are among the ingredients for which the definition of clear criteria for responsible sourcing is particularly important.



How can innovation help to improve the lives of the fish?

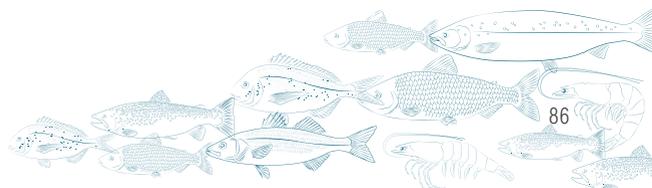
Innovative ideas include the development of **technology designed to further reduce the use of medicine, precision feeding and new farming systems**, which allow for greater control and reduced environmental impact.



In the coming years, the biggest challenge will be the need to **develop an integrated approach encompassing the entire supply chain**, to ensure the various players work together to make farming more efficient.

Biotechnologies and digital technologies will form the basis for **reducing disease** (and therefore the need to resort to treatment) and **cutting environmental impacts** by making it possible to control farms in a more accurate way while making more efficient use of resources, based on a circular economy approach.

Artificial intelligence, closed-cycle farming systems or open-water systems, precision feeding, new raw materials, functional feed and oral vaccination are just a few of the areas of innovation which will begin to make themselves felt in the industry in the coming years.



OUR PURPOSE

Feeding the Future

