

Increased utilization and valorization of marine rest raw materials

Hydrolysis and product specifications

SMARTCHAIN explores upscaling the production of high value marine ingredients from fish skins in collaboration with the industry partner Seagarden

Rest raw materials

Rest raw materials are the parts of the fish which are not primarily intended for human consumption.

Increased utilization of resources, and valorization of end products, is key to achieving circularity in the seafood sector. We must aim to use fish and their rest raw materials for the highest possible step of the value chain, thus maximizing the value of these resources. Marine ingredients are high-quality components, which are shown to possess beneficial health effects, and can be good alternatives to land-based equivalents.

Rest raw materials and processing

The seafood industry produces a great amount of rest raw material every year, and many actors along the value chain are working hard to increase the utilization and add value to these resources. Rest raw materials are the parts of the fish, which are not primarily intended for human consumption, and includes for instance the head, backbone, trimmings, blood, skin and scales, and viscera. However, these resources can be of high quality and may still be suitable for human consumption if processed accordingly. The different types of rest raw material have different biochemical composition, both based on parts of the fish, and also depending on the fish species itself.

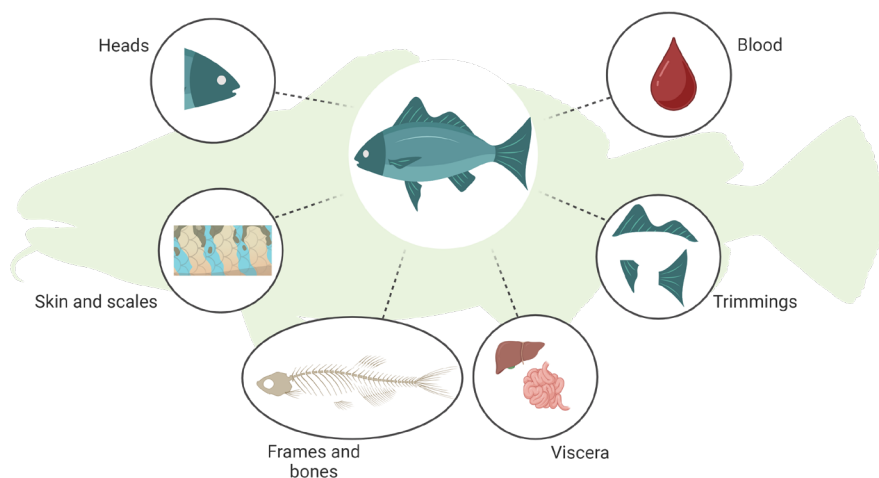


Figure 1 Typical rest raw materials from fish.

There are many ways to process the raw material, depending both on the type of raw material and what it can and will be used for. As mentioned, the biochemical

Marine ingredients

Marine ingredients are in high demand, have a positive health effect and should be used for as high-value products as possible.

composition varies among different fractions of rest raw material and impacts how and for what they are utilized, for optimal use of the different parts. Fishmeal and fish oil are often produced from raw material which is not used for human consumption, such as rest raw material, some small species, or by-catch. Enzymatic hydrolysis is a process more expensive than production of meal and oil, however, the process is gentler towards the raw material, and since the raw material used is typically human-grade and the nutrients are well preserved in the process, the ingredients produced from enzymatic hydrolysis can be used for food and supplements for human consumption. Marine ingredients are in high demand and should be used for as high-value products as possible.

Collagen and gelatin

Proteins are the most important nutritional building blocks of the body, and essential to get enough of through a varied diet. Marine proteins are not only showing several health benefits, but if we are to meet the demand for food and protein which will follow the increasing world population in the years to come, marine resources will play an important role. Collagen and gelatin are terms that you have possibly heard in your everyday life, and which are ingredients of high demand and value.

Collagen is a specific type of protein which can be found in the body of both humans and animals, particularly in bones and cartilage, skin, hair and tendons. In humans, collagen keeps the skin firm. As you get older, the body produces less collagen, and wrinkles are formed. Therefore, collagen is popular as a supplement. In tissues, collagen is made up of long, coiled protein structures. When these are uncoiled, which happens when heat is applied, the long protein chains form what is called gelatin. Gelatin has gelling properties, and is therefore widely used in cooking, for instance in gummy candies, and desserts such as jelly. By adding specific enzymes to gelatin, the long chains are split into smaller peptides, called hydrolyzed collagen peptides. These can have bioactive properties and can be used for high-value application such as supplements and cosmetics, or for medical purposes like wound healing. To extract these proteins from rest raw material such as bone or skin, it is both the gentlest and gives the most yield to do this using heat, and thus extract it as gelatin.

Collagen and gelatin

Collagen is a specific type of protein found in bodily tissues, which can be extracted as gelatin or hydrolyzed collagen peptides and used for various applications in food, supplements and pharma.

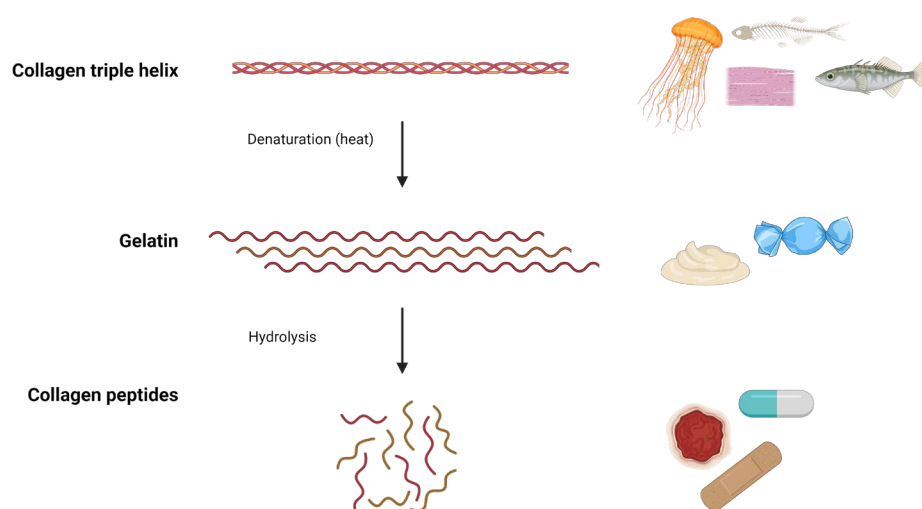


Figure 2 Extraction of collagen from tissues to gelatin or hydrolyzed collagen peptides, which can be used for various applications in food, supplements and pharma.

Marine collagen

Today, the gelatin and collagen products on the market are primarily from pigs and cattle. For both religious and dietary reasons there are many people who cannot consume these products. Marine gelatin and collagen are very relevant as alternatives to similar ingredients from land-based animals.

Choosing marine ingredients

In addition to being valuable ingredients, contributing to value-creation from increased utilization of rest raw material, there are also other reasons for choosing marine ingredients. Gelatin for instance, is as mentioned an ingredient in many food and supplement products, such as gummy candy, desserts, puddings and capsules for dietary supplements. Today, the gelatin and collagen products on the market are primarily from pigs and cattle. For both religious and dietary reasons there are many people who cannot consume these products. Marine gelatin and collagen are therefore very relevant as alternatives to these ingredients. In addition, marine ingredients tend to have a lower climate footprint than similar ingredients from land-based animals.

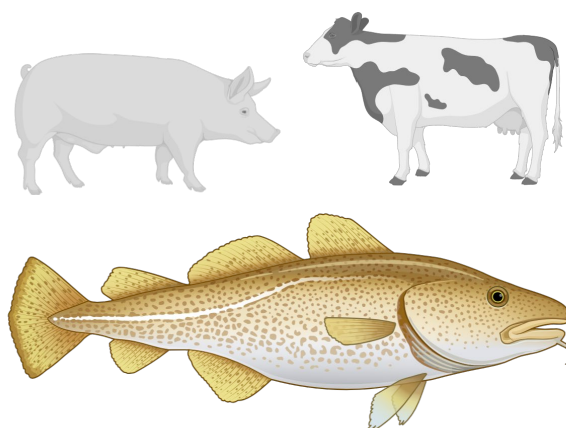


Figure 3 Marine gelatin and collagen can be valuable alternatives to similar ingredients from land-based animals, which are currently dominating in the products on the market.

Key sources for further information

To discuss the research presented in this brief, please email Pernille Kristiane Skavang pernille.skavang@sintef.no, SINTEF Ocean Norway.

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