

Lumpfish caviar – from vessel to consumer



Cover photographs:

Background: Fishing grounds for lumpfish are usually close to the shore, Icelandic coast. Courtesy of Jon Johannesson.
Inset: Packing jars of lumpfish caviar for distribution, factory in Iceland. Courtesy of Helgi Helgason.

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Preparation of this document

This document describes the production of “caviar” from lumpfish roe – a small sector of the fish processing industry. It provides a detailed account of the full production process from catching the lumpfish to the final product which is usually coloured, pasteurized roe in hermetically-sealed glass jars. One aim and emphasis of the publication was to include ample photographic material with a view to incorporate this information on the Internet. The work was carried out by Mr Jon Johannesson, a visiting scientist with the Fishery Industries Division for four months in 2002–2003, on leave from the Icelandic Fisheries Laboratories, Iceland.

Abstract

Fish roe products have historically been seen as expensive and highly-desirable luxury food items. The most expensive is true caviar, which uses eggs from sturgeons caught in the Caspian Sea. In recent years, products from other fish species were developed to imitate original caviar. Using processes appropriate for each kind of fish, it is possible to make a similar – but nevertheless an imitation – product. Eggs from many fish species can be used. Together with roe, other products can be used to emulate caviar, based on the use of gelling agents to produce egg-like spheres from algae or soja for example.

The main purpose of this publication is to present a comprehensive overview of the production of lumpfish caviar as a model for fish caviar production. The source, lumpfish (*Cyclopterus lumpus*), is from the North Atlantic and can be used as a case study to develop similar products from other fish species, as was done with capelin caviar when it was created by lumpfish caviar producers in the 1990s. The document describes fishing methods, initial preservation by salting and storage of the salted eggs, as well as details on the caviar production process itself, where highly-salted eggs are de-salted and blended with other ingredients to obtain the final product, lumpfish caviar. Product safety is considered, and the rules and regulations that apply to the main markets are discussed. Production and marketing statistics demonstrate the extent of the global lumpfish caviar business. The publication draws heavily on source material from Iceland, a major producer and processor, and includes many illustrations.

Johannesson, J.

Lumpfish caviar – from vessel to consumer.

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1. Fish roe products and relevant resources for the industry

The sustainable utilization of natural resources is of major importance in the world today. Although fishing has become restricted in most fishing waters around the globe, the highest possible yield from the catch is always sought. The fishing industry is expected to develop products from edible parts of the fish whenever possible. When fish is caught during spawning season, roe can comprise a considerable percentage of the female bodyweight. The roe is an excellent raw material for the production of diverse delicacies that can be sold at good prices in many markets.

Products from fish roe can be divided into two groups: those that use the roe sac in whole form, which is then smoked, salted or dried; and those obtained by separating the eggs from each other and the roe sac by a process called screening. Screening entails removing the eggs from the roe sacs, cleaning them and preserving them with salt, and sometimes also with chemical preservatives and pasteurization. Fish caviar belongs to this group. Whole-roe-sac products, salted, dried or preserved in other ways, are not classed as either caviar or imitation caviar. There are caviar eggs of various sizes on the market, ranging from capelin eggs of approximately one millimetre in diameter, to salmon eggs of several millimetres.

The prices for these products are much lower than true caviar which uses eggs from sturgeon caught in the Caspian Sea, but viable industries are based on various fish species worldwide, and the possibility exists that underutilized stocks could still be found.

Imitation caviar from lumpfish eggs is sold in considerable quantities. Annual production is about 4 million kilos and consumers are ready to pay around US\$ 60 million for the end product in the supermarket. The industry is based on the lumpfish stock that lives in the north of the Atlantic Ocean and is caught by small boats close to the shore during spawning season. The technology developed to produce the lumpfish caviar can also be used to make capelin caviar, and probably other types of caviar from many fish species.

DEFINITIONS OF CAVIAR

Caviar is defined as a product made only from sturgeon eggs. Products from other fish species have to be labelled “imitation caviar” or include the name of the fish before the word caviar in most markets, such as “lumpfish caviar” and “capelin caviar” (Sternin and Doré, 1993: 61–62). It is therefore possible to produce imitation caviar from all fish species that are caught in the spawning season. In Table 1, some fish species are listed that have been or could be used for producing imitation caviar, but it is emphasized that the name “caviar” without some qualifying epithet can only be used for the original product made from sturgeon eggs.

The United States of America Custom Service (US Customs & Border Protection, 2004) defines caviar as:

Caviar is the eggs or roe of sturgeon preserved with salt. It is prepared by removing the egg masses from freshly caught fish and passing them carefully through a fine-mesh screen to separate the eggs and remove extraneous bits of tissue and fat. At the same time, 4–6 percent salt is added to preserve the eggs and bring out the flavour. Most caviar is produced in Russia and Iran from fish taken from the Caspian Sea, the Black Sea, and the Sea of Azov.

Imitation caviar is defined by United States Custom Service as:

Roe that comes from a fish other than the sturgeon is not true caviar, and it is classifiable as a caviar substitute. For example, the eggs of lumpfish, whitefish and salmon may be prepared or preserved as caviar substitutes. Although the term “caviar” may appear on the commercial invoice, and the importer’s price list may show the merchandise under a caviar heading, for Customs classification purposes, this roe is not caviar, but rather, a caviar substitute. Attention must be given to the name of the fish that is specified on the invoice.

The explanatory notes describe caviar substitutes as:

Products consumed as caviar but prepared from the eggs of fish other than sturgeon (e.g. salmon, carp, pike, tuna, mullet, cod, lumpfish), which have been washed, cleaned of adherent organs, salted and sometimes pressed or dried. Such fish eggs may also be seasoned and colored.

According to these definitions, products based on shrimp and snail eggs are not caviar as only fish eggs are caviar, but such products are on the market. To confuse the situation even more, imitation products made from algae and soybeans are sold as fish caviar substitutes. In the main European markets, imitation caviar made from lumpfish roe is sold under various names: in France, the product is sold as *oeufes de lomp*; in Italy it is *uova di lombo* or *succedano del caviale*; and in Germany it is *deutscher Caviar aus Seehasenrogen*.

Many products made from fish roe are not caviar because the eggs are not removed from the roe sacs or because the roe constitutes only a small fraction of the product. Botargo is one such product. It is made from the roe sacs of grey mullet (*Mugil cephalus*) or bluefin tuna (*Thunnus thynnus*) in Italy (Carrettoni, 1993: 17). A similar product is made in Greece from grey mullet (Urch, 1995). Another type is taramasalata, a paste-like product originally from Greece but now produced and consumed in Western Europe (Klinkhardt, 2002c). Many Japanese roe products, from herring roe for example, are also not caviar (Klinkhardt, 2002b).

Fish roe is consumed all over Europe in limited quantities in the form of caviar substitutes as food decorations, but not as a nutritional food item. The small quantities eaten have no measurable effects on an individual’s nutrition. While the lipid fraction of fish eggs was found to be of high nutritional value, consumers with cardiovascular diseases were advised to avoid those products because of high salt and cholesterol content (Cengarle, Carta and Pinna, 2000).

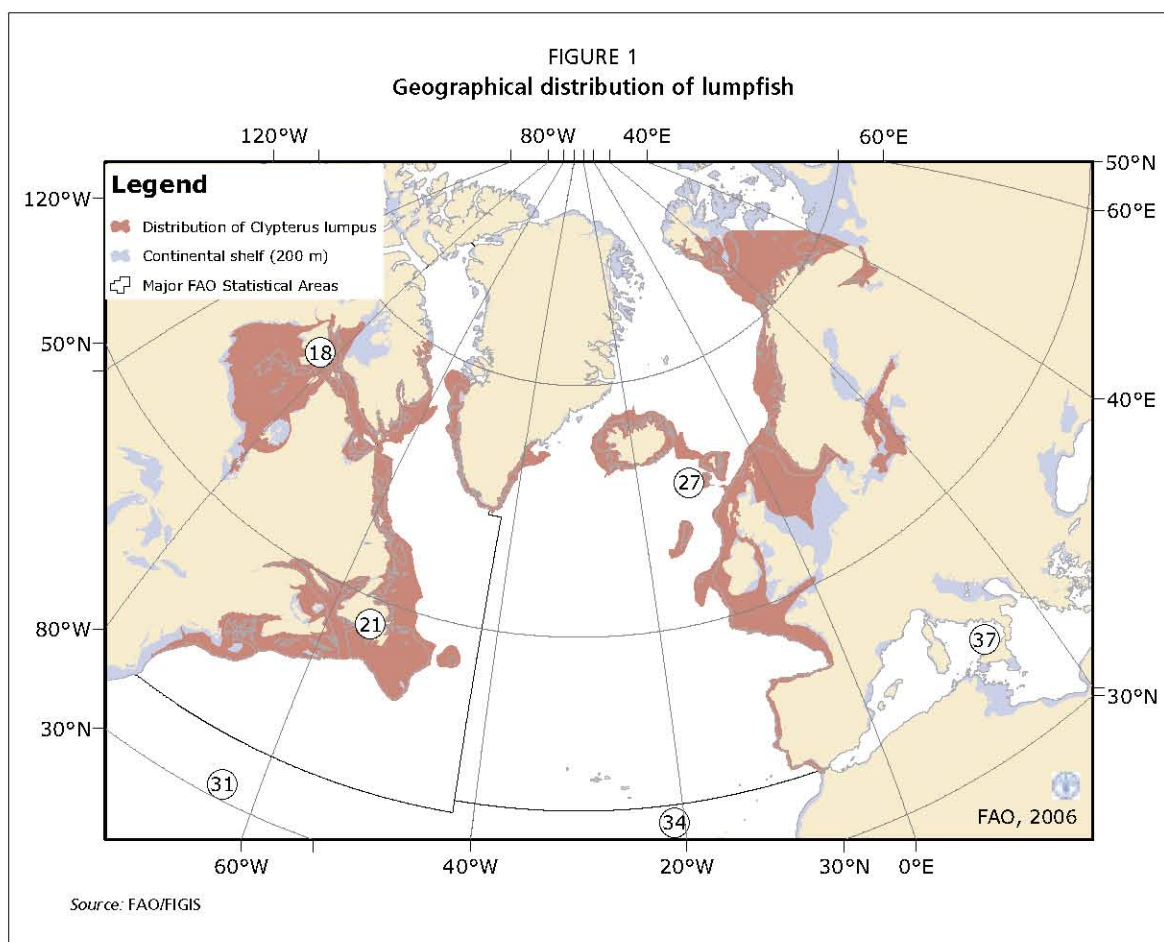
LUMPFISH CAVIAR

Lumpfish caviar is made from the roe of the female lumpfish (*Cyclopterus lumpus*). Lumpfish is found in the North Atlantic Ocean, from the Gulf of Maine north to the

TABLE 1
Fish species that have been or could be used for production of imitation caviar

Common name	Scientific name	Common name	Scientific name
Alaska pollock	<i>Theragra chalcogramma</i>	Lumpfish	<i>Cyclopterus lumpus</i>
Alewife	<i>Alosa pseudoharengus</i>	Mackerel	<i>Scomber scombrus</i>
Atlantic cod	<i>Gadus morhua</i>	Mullets	Mugilidae
Atlantic herring	<i>Clupea harengus</i>	Orange roughy	<i>Hoplostethus atlanticus</i>
Atlantic salmon	<i>Salmo salar</i>	Pacific cod	<i>Gadus macrocephalus</i>
Bream	<i>Abramis brama</i>	Ling cod	<i>Molva molva</i>
Capelin	<i>Mallotus villosus</i>	Pacific herring	<i>Clupea harengus pallasii</i>
Carp	<i>Cyprinus carpio</i>	Perch	<i>Perca fluviatilis</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Pike	<i>Esox lucius</i>
Chum salmon	<i>Oncorhynchus keta</i>	Pink salmon	<i>Oncorhynchus gorbuscha</i>
Coho salmon	<i>Oncorhynchus kisutch</i>	Roach	<i>Leuciscus rutilus</i>
Flying fish	Exocoetidae	Sockeye salmon	<i>Oncorhynchus nerka</i>
Gobies	Gobiidae	Trout	<i>Salmo trutta</i>
Grenadiers	Macrouridae	Tunas	Many species
Halibut	<i>Hippoglossus hippoglossus</i>	Whitefish	<i>Coregonus clupeaformis</i>

Sources: Sternin and Doré, 1993: 72; Hafrannastofnun, no date.



Davis Strait; around the coast of southern Greenland; around Iceland and the British Isles; as far south as the Gulf of Biscay; in the Baltic Sea; and along the coast of Norway and into the White Sea (Figure 1).

At the age of 5–6 years, the lumpfish is sexually mature. The female is bigger than the male, reaching a length of 34–40 cm, while the male is 25–30 cm in length. The biggest female lumpfish recorded from Icelandic waters was 62 cm, weighed 9.6 kg and bore almost 4 kg of roe. Lumpfish enter the shallow waters close to the shore to spawn, but are found in the open ocean before and after spawning (adapted from Jonsson, 1992: 455–458; Thorsteinsson, 1996).

Lumpfish caviar was originally an imitation of caviar because the eggs are of similar size to those of sturgeon and they were coloured black to imitate the sturgeon roe. Lumpfish caviar has now become a product in its own right, and between 3 000 and 4 000 tonnes of lumpfish caviar are sold annually, mostly dyed black, but also red. Colourant-free (natural) lumpfish caviar has had little success on the market, although fresh lumpfish eggs are sold in Denmark by fishmongers direct to consumers during the fishing season.

Lumpfish has many names in the languages of the many countries where the fish is caught and in the markets for lumpfish caviar. Some are listed in Table 2.

In Europe, lumpfish caviar is mainly sold in 50 g and 100 g glass jars at retail, and 2 oz and 3.5 oz in the United States of America. Bigger packages intended for catering services exist. Lumpfish caviar is preserved with a combination of salt, chemical

TABLE 2

Some common names for lumpfish

Danish	almindelig stenbider, kvabso
English	lump, lumpfish, lumpsucker
French	cycloptère, lompe
German	Seehase
Greenland	angalluk, arnarluk, nipisa
Icelandic	hrognkelsi, grasleppa, raudmagi
Italian	ciclottero
Norwegian	rognkall, rognkjeks
Portuguese	peixe-lapa
Spanish	lumpo jibado
Swedish	kvabbsö, sjurygg, stenbit

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Lumpfish
(*Cyclopterus lumpus*)

preservatives, pasteurization and chilled storage. In the United States of America it is often stored at room temperature, but in that case the product has a very high salt content, with a shelf life of 12 to 18 months.

Owing to the seasonal nature of lumpfish fishing, the industry has almost from the beginning been divided into two sectors: the roe industry, concerned with the catching and the preserving of the eggs by salting, and the caviar processing industry, where lumpfish caviar is produced using the heavily salted eggs as a raw material. In the industry's earliest days in Germany, lumpfish caviar was produced in a one-step process using local raw material (Sternin, 1992: 130).

THE ROE INDUSTRY

The roe industry – the fishing and salting of eggs – is situated near fishing grounds and is in operation from early spring until late summer. Small fishing boats are used for fishing lumpfish, and the fishers salt the eggs themselves or sell them to a local salting plant. The price of the salted eggs is negotiated annually before the catch starts, and depends very much on how much is left in stock from the last season. However, the price can change significantly as the season progresses and it becomes clear whether it is a good or bad year.

THE LUMPFISH CAVIAR INDUSTRY

The lumpfish caviar industry produces caviar from the heavily-salted eggs. Plants are often situated near markets. During the 1980s and 1990s Icelandic exports of salted eggs decreased but exports of processed lumpfish caviar increased. This balance is now reversing. An Icelandic plant has moved to Germany in order to be able to import Canadian eggs into the European Union (EU) without paying duty and to be better located to serve the European market (Helgason, 2002). On the same principle, plants in Denmark but owned by Swedish companies have been moved back to Sweden after the country entered the EU.

The lumpfish caviar industry has two main segments. There are companies producing under their own label, with a strong brand name and able to produce when it suits them. Other companies produce under contract to sellers and apply the seller's own label, so they can only produce after a contract has been signed. Usually contracts are renewed annually.

It is not only the catch that is seasonal but also the market. Most of the lumpfish caviar is consumed during Christmas and the New Year in the major markets in France and Germany. During summer and autumn the lumpfish caviar producers negotiate with their buyers, mainly supermarket chains in France and Germany, and production does not start until a contract is signed. The peak catching season is in March and April, but it lasts until August in the four main fishing countries (Canada, Denmark, Iceland

and Norway), so more than half a year will pass with very little consumption of the product until the Christmas and New Year period.

Lumpfish caviar can be substituted by capelin caviar when there is a shortage of lumpfish eggs. Capelin eggs are much smaller in size than lumpfish eggs, and cheaper. A mixed product of the two types of eggs has been sold in supermarkets in Europe. Caviar substitute suitable for vegetarians is even made from algae or soya, and products are also made from reconstituted herring eggs (Klinkhardt 2002a). It is possible to differentiate between lumpfish and capelin caviar by their chemical composition and the average egg size (Renon *et al.*, 1997), and also by protein and DNA analysis (Rehbein, 1997).