



## Tatiana Ageeva



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A doctoral student in Norway, I come originally from Archangelsk in the northwest of Russia. The city is located along the banks of the Northern Dvina River near its entrance into the White Sea. Archangelsk has a great history as a river port, which used to have an important role in the trade between the Pomors (Russian settlers on the White Sea coasts) and the Norwegians. For more than 150 years the Russian settlers used to sail through the Northern Dvina River and the White Sea to Northern Norway to get fish (particularly dry saithe) and other products in exchange of grain products. The trade was so popular that it led to the emergence of Russian-Norwegian language “Moja på tvoja”. This great relationship ended in the 1917 Russian revolution, but there are still many important forms of co-operation between Norway and Russia today. In fact, one of these international links gave me the opportunity to come to Norway and to get to know Norwegian culture

In 2001, I graduated from the Arkhangelsk Fishing Industry College as a Technician/Technologist within a programme entitled “Technology of fish and fish products”. This proved to be the starting point of my career: soon after the final exam I was sent to Finnmark (a county in the northernmost part of Norway) to get a certificate in the fishing industry. The fish company where I worked produced different products from gadoid fish such as cod, saithe, and haddock. During my time in the company, I was trained in all operations of the production process starting from filleting, cutting, quality control, and ending with packing, freezing, and transport.

After five exciting years in the whitefish industry in Båtsfjord, Norway, I applied for admission to The Norwegian College of Fishery Science (NCFS) in Tromsø. As a student of Fisheries and Aquaculture Science, I enhanced my practical experience from the industry with more academic knowledge. I learned a lot about the marine resources and the development of the marine sector (fisheries, aquaculture, and biotechnology) in Norway. In 2014, I graduated as a Master of Seafood Science with the thesis “Comparative *in vitro* digestion of fish and meat”. Two weeks after the graduation one of my examiners offered me a job as a PhD student at Nofima in Tromsø, which I gladly accepted.

Nofima is a one of the largest food research institutes in Europe. The institute has around 360 employees conducting research within the fields of fisheries, aquaculture, and food research. I work with live stored Atlantic cod (*Gadus morhua* L.); the cod is one of the most important commercial fish species in Norway. “Live stored cod” refers to the wild cod which has been caught, selected out immediately after capture,



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and then transported to shore and transferred into the sea cages. In these cages, the fish can be kept alive for up to 12 weeks after capture, and the Norwegian regulations allow the cod to be held without feed for the first four weeks. The concept of storing the cod live after catch has a history of about 40 years. The first experiences with live storage of cod in Norway come from the 1980s in Alta and the Lofoten Islands.

The cod fisheries in Norway are seasonal, making it possible to catch the cod mainly during the first five months of the year. For the rest of the year, there is a limited supply of fresh raw material. The pattern of supply and landing of fresh cod contributes to low prices and poor profit margins for both fishers and the processing industry, particularly in the high season. In addition, the periods with large supply volumes of cod lead to large amounts needed to be processed in a short time, which may lead to reduced quality of the fresh cod products. Live storage of cod gives the opportunity to solve these obstacles, with new possibilities for market-oriented and sustainable value chains for wild cod where consumers are provided with premium value and satisfaction, while the grocery retailers get long shelf-life products, very high and uniform product quality, and timely delivery.

My work lies at the intersection of physiology and product quality. It is a part of a project called CATCH: Market-oriented and sustainable value chains for cod products based on live storage ([levendetorsk.no](http://levendetorsk.no)). My research goal is to increase the understanding of how the raw material quality of live stored cod can be optimized, with a special focus on muscle quality related to harvesting season and handling procedures. Wild cod displays natural seasonal variations in muscle characteristics related to fish size, seasonal feeding patterns, and spawning activity. As such, fillet attributes, including pH, contents of protein, water and fat, water-holding capacity (the muscle's ability to retain its original juiciness), and textural properties will also show seasonal changes throughout the year and therefore affect the fillet quality. Little is known about how the live storage of cod can affect the quality of fillet.

My first study considers how the fillet quality may be affected by the nutritional status of the fish and the time span between slaughter and filleting. In this experiment, spawning wild Atlantic cod were stored live without feeding for almost three months. The fish were sampled 4, 8, and 12 weeks after capture and filleted at different times after slaughter. Their muscle properties were analysed instrumentally, chemically, and by sensory properties. Our findings indicate that the spawning cod

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can tolerate being without feed for up to eight weeks, but this can vary depending on the initial nutritional condition and size of the energy reserves (particularly liver) of individual fish. The major weight reduction and muscle quality deterioration was observed during the last month of the study, and it appears that feed deprivation affects females significant more than males. Additionally, the fillet quality was affected by the time span between slaughter and filleting. The results indicate that the fillets produced shortly after slaughter can get an unusual shape. In particular, they may shrink and become broad-shaped. However, this challenge can be solved by different packaging methods.

The knowledge gained from my research contributes to improved productions processes of fresh cod fillets and can be used by the whitefish industry. This makes me feel that my job is important and gives me more motivation every time I think about it.