



Popular science summary of the PhD thesis

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Title of the PhD thesis	Stock structure and connectivity of capelin (<i>Mallotus villosus</i>) in Greenland – Otolith microchemistry used to track past whereabouts of a small, pelagic fish
PhD school/Department	DTU Aqua

Science summary

This PhD project revolves around a small species of fish, the capelin (*Mallotus villosus*), which is one of the most abundant fish in the Arctic. It is also a key species in Arctic food webs, as prey to many fish, birds and mammals. In the North Atlantic, capelin are known to migrate hundreds of miles between spawning, feeding, and overwintering grounds. In Greenland, large schools of capelin suddenly appear during late spring and late summer to spawn at shallow water beaches. However, their whereabouts the rest of the year are largely unknown. There is also a gap in the knowledge of whether they belong to one coherent stock or are divided into multiple, separated populations. Such information is key to how fishery of the stock should be managed. Therefore, unlike many stocks in the North Atlantic, inshore capelin in Greenland are not fished commercially.

This study examines the stock structure and migration behavior of inshore capelin in Greenland. This is done by the use of otolith (earstone) chemistry. Otoliths grow continuously throughout a fish's life. Some elements are incorporated into the otoliths in relation to their concentrations in the surrounding water, and otoliths may therefore serve as chronological logs of environmental exposure. Chemical analysis of otolith can therefore sometimes be used to track past whereabouts of fish. This requires that chemical contrasts can be found in their habitats. Chemical conditions in the seas around Greenland vary significantly over a year due to seasonal differences in ice cover. In the winter and most of spring, land and seas are covered by ice. In summer and fall, as the ice melts, glaciers and rivers release vast amounts of freshwater and sediments into the seas, which strongly affects the water chemistry in the upper water layers.

For this study, the otoliths of 619 capelin, caught at 19 locations along Greenland's east and west coast, were examined by chemical analysis. Otolith chemistry of fish from different localities were compared, in order to determine if they had resided in different environments during their life. Some elements showed patterns that were proportionate to seasonal or geographic variations in salinity or influx of geological material. In many cases, fish caught at different localities showed contrasting concentrations, indicating that they had been exposed to different environments and therefore had remained separated. It was therefore concluded that many, isolated populations of capelin exist along Greenland's coastline. It was also proposed that these capelin most likely spend their entire life in one area, e.g., one fjord system. The results have profound implications for fishery management of the stock. In order to avoid depletion of individual fjord populations, the stock should be managed at high spatial resolution, e.g., on a fjord-to-fjord basis.