Anatomy of wild and farmed fish species

Automation of fish processing has been recognized as a key factor in maintaining strong and competitive fish processing industry within the Nordic countries. 3-D imaging information of fish anatomy is an important tool in development of innovative processing methods and in adjusting new technology to anatomy of different fish species. In this project the goal is to assemble a relevant dataset as a basis for further development.

In the past, automation of manual operations has frequently been focusing on single processing steps. The overall process perspective is sometimes lacking, and there is a need to analyse whether the whole process should be reorganized, for improving factors such as yield and value of products. There is a lack of information of fish skeleton and bones for different spices which makes development of new processing methods difficult. In a previous FHF project fillets of Salmon, Haddock, Cod and Saithe were scanned, but not whole fishes. In this project, whole fish and untrimmed fillets of 9 different species have been CT scanned .

The project is financed by FHF and is a collaboration between Norway Seafoods, Marel and SINTEF ICT.

AIM OF THE PROJECT

The main goal of the project was to assemble a relevant dataset as a basis for development of processing equipment in the fish industry.

The aim was to cover a higher number of species rather than focus on individual variation. Species included in the study were Cod, Haddock, Redfish, Catfish, Tusk, Ling, Saithe, Salmon and Hake.

CT SCANNING OF WHOLE FISH AND FILLETS

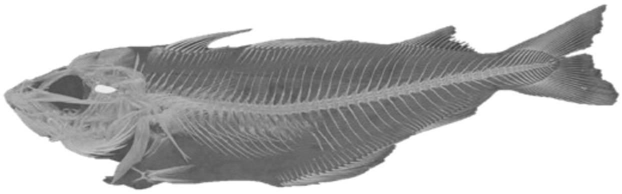
Whole fish and fillets were CT-scanned (3D) at Rikshospitalet in Oslo.

From the CT images, the bones were segmented from the fish muscle and 3D models of the bones were extracted. Size, position and location of pinbones and walking stick bones were measured from the 3D model.

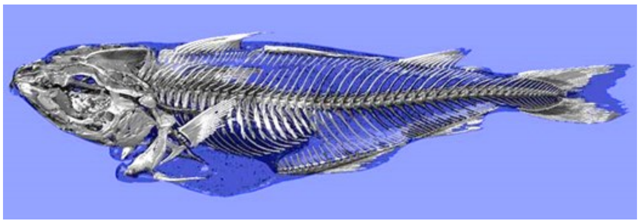
CT DATA EVALUATION

Pinbone size measured from the CT data were compared with manually measures. The analysis showed:

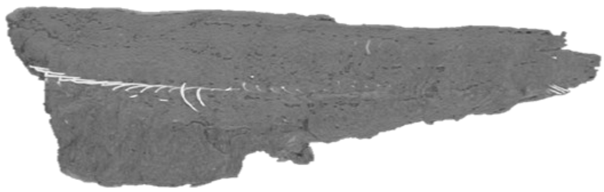
- The CT based method detected all the bones that were manually found
- The CT measures gives in average 0.2 mm thicker bones and 3 mm shorter bones than the manual measures.
- CT imaging gives sufficient accuracy for bone detection and evaluation of processing methods



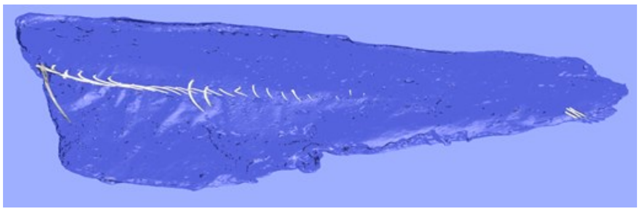
3D CT image of Haddock.



3D model of Haddock.



CT image of Tusk fillet.



3D model of Tusk fillet.

RESULTS

The result from the project are:

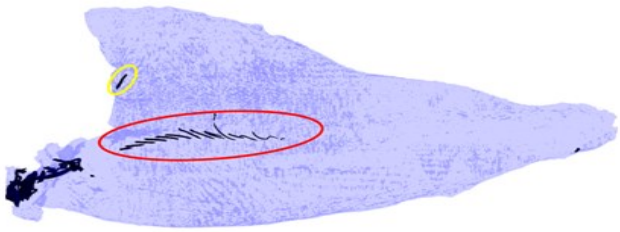
- Data and statistics of the number, size and position of all pinbones and walking stick bones in the fillets
- Loin height profiles for all fillets
- 3D models of pinbones and skeleton of every fish and fillet
- Videos of bones and skeleton for every fish and fillet
- All raw and processed data are made available for further analysis

The results are summarized in the FHF report "*Anatomy of wild and farmed fish species*" while all the results are presented in the technical report "*APRICOT2*".

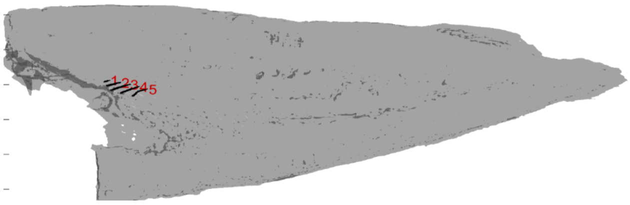
The data and the reports can be downloaded from the eroom Apricotanatomy: (https://project.sintef.no/eRoom/ikt2/Apricotanatomy). Contact Marianne Bakken or Helene Schulerud to get access to eroom.

CONCLUSION

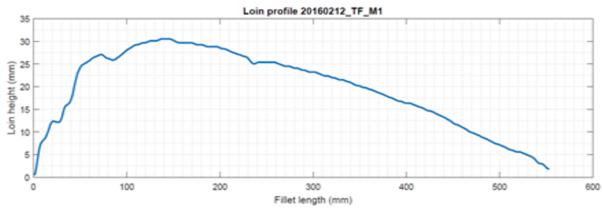
CT imaging gives sufficient accuracy for bone detection and is a useful visualization tool in development of innovative processing methods for fish processing.



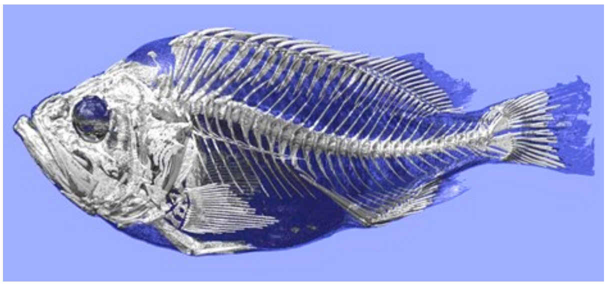
Detected pinbones in CT image of Haddock.



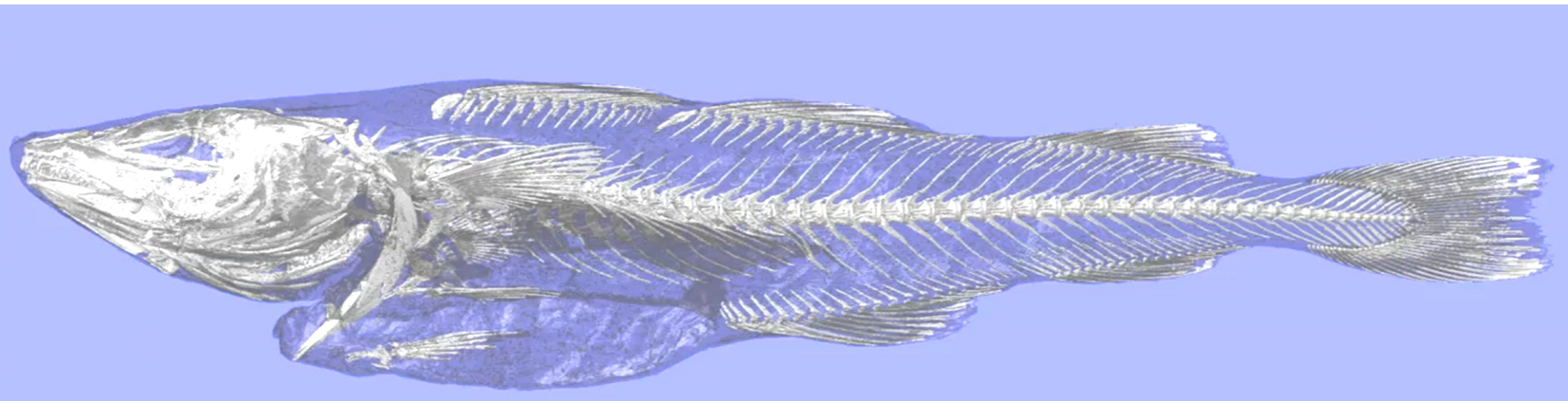
Detected pinbones in CT image of Haddock.



Detected pinbones in CT image of Haddock.



Detected pinbones in CT image of Haddock.



3D skeleton of Cod.

SINTEF

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