



## Development of a Catch-damage-index to assess the quality of cod at landing

Margrethe Esaiassen\*, Leif Akse, Sjurður Joensen

Nofima, Muninbakken 9-13, Breivika, PO Box 6122, N-9291 Tromsø, Norway

### ARTICLE INFO

#### Article history:

Received 4 January 2011

Received in revised form

21 May 2012

Accepted 26 May 2012

#### Keywords:

Fish

Catch

Capture

Handling

Damages

Quality

### ABSTRACT

Quality and quality management are of increasing concern and importance in all parts of the fishery chain. Fishing gears and handling onboard the vessel have multiple impacts on fish quality, and damages caused during these operations may affect the product quality considerably, resulting in downgrading of the end products. The European fish sector consider measurement of quality defects and other quality factors as important, but methods for systematic evaluation of quality defects caused during catching operations have not been published to any extent.

In this work cod caught by different fishing gears commonly used in the Norwegian coastal fisheries were examined for catch-related damages at landing. Other species like saithe and haddock may suffer the same damages, but due to being the economically most important specie in Norway, cod is chosen as model. The severities of the damages are described, and the influence of the damages on the quality of cod products is considered. Based on this, a Catch-damage-index (CDI) scheme is elaborated.

© 2012 Elsevier Ltd. All rights reserved.

### 1. Introduction

Quality and quality management are of increasing concern and importance in all parts of the fishery chain. The quality of fish products depends both on natural variations (season, location, stock, and size of the fish), the freshness, as well as damages occurring during capturing and handling.

Fishing gears have multiple impacts on fish quality, and damages caused by the fishing gear may considerably affect the product quality, resulting in downgrading of the end products. Bloodstains and gaping have profound negative effect on the quality of fish fillet, as well as the proportion of “expensive” cod fillet products as compared to “cheap” fillet products (Margeirsson, Nielsen, Jonsson, & Arason, 2006). Margeirsson, Hrafnkelsson, Jónsson, Jensson, and Arason (2010) concluded that a lower defect rate would result in a significantly higher product value. Botta, Bonnell, and Squires (1987) demonstrated that the catching method was the most important factor affecting sensory quality of fresh cod. The quality parameters significantly affected was colour, bruising/discolouration and final overall grade of Atlantic cod. The freshness (age) of the raw material influences the quality of cod fillets (Galvão, Margeirsson, Garate, Viðarsson, & Oetterer, 2010; Margeirsson, Jonsson, Arason, & Thorkelson, 2007). Ozyurt et al. (2007) showed that catching method had considerable influence

on the freshness/shelf-life of pike perch. Esaiassen et al. (2004) showed Fultons K-factor and pH was significantly different in cod caught by longline or gillnet.

Cod is commonly killed and bled onboard the vessels by cutting the isthmus. If not properly bled, the remaining blood in the blood vessels may cause blood spots, discolouration and more rapid deterioration of the fish products. Bleeding has been shown to reduce blood spots in rainbow trout and Atlantic salmon (Olsen, Sorensen, Stormo, & Elvevoll, 2006; Robb, Phillips, & Kestin, 2003; Roth, Torrissen, & Slinde, 2005). Blood residue in fish muscle has also been shown to cause lipid oxidation in i.e. seabass, smoked Atlantic salmon, trout and mackerel (Maqsood & Benjakul, 2011; Richards & Hultin, 2002; Roth, Obach, Hunter, Nortvedt, & Oyarzun, 2009). The elapsed time from killing to bleeding has been proven as the major factor affecting the exsanguination (Akse, Joensen, Tobiassen, & Hardarson, 2008; Roth et al., 2005).

Regarding gutting after catch, the effect upon quality of fish products is reported contradictory. European hake (Baixas-Nogueras, Bover-Cid, Veciana-Nogues, & Vidal-Carou, 2009) and seabass (Papadopoulos, Chouliara, Badeka, Savvaiddis, & Kontominas, 2003) are shown to become more susceptible to spoilage through gutting. On the other hand, Karl and Meyer (2007) showed that immediate evisceration after catch resulted in a longer shelf life for saithe, haddock and plaice. According to Akse, Tobiassen, and Martinsen (2010), cod could be stored without gutting for up to 20–27 h after catch without considerable quality reduction if stored in chilled seawater at 3 °C or ice-slurry at –1 °C, respectively.

\* Corresponding author. Tel.: +47 776 29039; fax: +47 776 29000.

E-mail address: [margrethe.esaiassen@nofima.no](mailto:margrethe.esaiassen@nofima.no) (M. Esaiassen).

From a survey it is shown that more than 80% of the European fish sector considered measurement of quality defects and other quality factors of importance (Jørgensen et al., 2003).

During the last decades, much effort has been put into developing methods assessing the freshness of fish. Currently one of the most wholesome and straightforward ways of describing freshness is a standardised sensory assessment method; the quality index method (QIM). QIM has been developed for several species like e.g. cod, hybrid striped bass, tub gurnard, cuttlefish, maatjes herring, common octopus and salmon (Barbosa & Vaz-Pires, 2004; Bekaert, 2006; Bonilla, Sveinsdottir, & Martinsdottir, 2007; Lyhs & Schelvis-Smit, 2005; Nielsen & Green, 2007; Sveinsdottir, Hyldig, Martinsdottir, Jørgensen, & Kristbergsson, 2003; Vaz-Pires & Seixas, 2006). Methods for evaluating catch-related damages however, have not been focused to the same extent. Schelvis-Smit and Luten (2003) introduced an idea of developing a Catch Index for measuring the quality of catch handling at sea, but to our knowledge this index is not yet published.

A tool for systematic evaluation of catch damages could be useful in several ways: For processing plants it is important to determine the value (price) of the raw material based on the estimated value of the products. A close correlation between the amounts of catch defects and proportions of high value products has been found (Margeirsson et al., 2006). For research and development purposes, a systematic and standard registration of catch-related damages may be useful for comparing quality variations caused by variations in catching gears or methods, as well as handling. The objectives of this work are to describe different damages occurring in cod and similar species like saithe and haddock caused by fishing gear and/or by handling onboard. The severity of the damages will be described, and the influence of the damages on the quality of cod products will be considered. Based on this, a Catch-damage-index (CDI) scheme will be proposed and elaborated. The CDI scheme can be used for quality inspection of the catch after landing.

## 2. Materials and methods

### 2.1. Fish material

Cod caught by different fishing gears commonly used in the Norwegian coastal fisheries were examined for catch-related damages at landing. All cod were caught by commercial fishing vessels. Sampling and registration took place from March until May at five individual processing plants located from Lofoten to Finnmark in the north of Norway.

The cod examined, a total of approximately 4500 fish, were from 25 catches from set gillnets (12 bottom-set and 13 set in mid-water), 14 from longline, 7 from handline and 6 catches from Danish Seine. For each catch, the fish were bled onboard the vessel, and gutted at the processing plant after landing.

Onboard the vessels, fish were stored in boxes or containers. The storage conditions may affect the quality of the fish. However, in this study, data were only sorted by catching methods, but different storage conditions are represented within each data set.

### 2.2. Registration of damages

After landing and gutting, fish were picked by random from each catch. From the smallest catches, all fish were evaluated. From the larger catches, a minimum of 100 fish were randomly picked after discharging each container, ensuring that the selected fish represented storage in different layers in every container. The different types of damages were registered by two assessors from the research institute. During the time span for gutting the total catch,

the assessors evaluated as many fish as possible – given the time available. Thus, due to practical reasons, relatively many fish were evaluated from the larger catches and fewer from the small ones.

The assessors registered all visible damages occurring on the fish according to a preliminary scheme outlining different categories of damages known to occur using gillnets, longline, handline or Danish Seine (Karlsen, 1997; Karlsen, Gjørseter, & Hamre, 2001). The preliminary scheme is given in Table 1. The location and the severity of the damage were also addressed. The assessors were trained evaluators of fish quality, as in freshness according to the QIM scheme, and they were experienced with production and quality grading of raw fish material, fresh fillets, stockfish, salted fish and clipfish.

### 2.3. Filleting of damaged fish

Ten fish from each category of damages were filleted using the filleting machines at two different processing plants. The quality of the fillets and the proportion of “high-value” cod fillet products (loin) as compared to “cheap” fillet products (fillet block) were considered.

### 2.4. Development of Catch-damage-index (CDI) scheme

In order to design the CDI scheme, the different damages occurring were described and registered in categories. The severity of the damages was considered according to possible economical loss due to downgrading of fillet products and/or lowering yield. Damages known to the assessors to cause downgrading of salted and dried fish were also taken into account. The damages were given scores according to the severity of the damage: 0 (flawless), 1 (moderate) or 2 (severe).

## 3. Results and discussion

The different damages occurring in cod after landing are described and registered in categories. The severity of the damages was considered according to possible economical loss due to downgrading of products and/or lowering yield. The damages were

**Table 1**

Preliminary scheme for registering catch-related damages on cod and other white fish captured by gillnet, Danish seine, longline or handline.

| Possible damages  | Description  |
|-------------------|--|
| Dead in gear      | The fish may have been dead for some time in the gear (passive fishing gear like gillnet and longline), or recently dead. Bleeding/exsanguinations of this fish is almost impossible, and this fish should be sorted out according to Norwegian regulations.       |
| Poorly bled       | Fish that is not bled, dead before bleeding, wrongly or improperly bled.   |
| Bruises           | The fish is squeezed, visible as bruises on the skin   |
| Gaffing damages   | The fish is damaged by gaff or hooks   |
| Marks from gear   | Marks on the skin caused by netting wall or main line/snoods   |
| Skin abrasion     | Loss of scale or skin abrasion due to rubbing towards fishing gear or bottom.  |
| Pressure injuries | The fish is squeezed/crushed in gear or onboard (i.e. net haulers)   |
| Biting injuries   | Damages caused by i.e. <i>Gammarus</i> sp., <i>Myxine glutinosa</i> , octopus. These injuries may vary from minor marks on the skin to entrance of the fish belly or fillet by benthic animals. Biting injuries from crabs or seal etc. normally causes disposals. |

Download English Version:

<https://daneshyari.com/en/article/6394022>

Download Persian Version:

<https://daneshyari.com/article/6394022>

[Daneshyari.com](https://daneshyari.com)