

STAKEHOLDER WORKSHOP ON THE VALUE OF GENETIC AND GENOMIC TOOLS FOR IDENTIFYING SPECIES IN MIXED LANDINGS, FISH PRODUCTS AND BY-PRODUCTS (WKGENOTOOLS)

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i Executive summary

Fisheries management, but also the implementation of rules along the supply chain, rely largely on the identification of fish species and their geographical origin, including in processed products. Examples of cases where such identification is required include the management of mixed fisheries, the identification of stocks and stock boundaries and responding to requirements to reduce discarding.

A stakeholder workshop on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products ([WKGenoTools](#)), co-organized by the European Commission Joint Research Centre (JRC) and the Institute of Marine Research (IMR), Norway, brought together policy-makers and scientists to clarify further the most pressing needs in the field and how to best enable successful technology and knowledge transfer.

Following the workshop presentations and discussion among workshop participants, two case studies were selected to be presented in the 2020 report of the ICES Working Group on Application of Genetics in Fisheries and Aquaculture ([WGAGFA](#)): one about the DNA-based identification of species at sea and during landing, the other about DNA-based methodology to identify and quantify species present in fish silage.

The first case study addresses the problem to identify directly, on board or at port, fish species that are not easily identifiable by visual inspection. Several portable solutions, which can facilitate species barcoding on board fishing vessels or at port, have been developed in recent years.

The second case study is motivated by the possibility, under the EU Landing Obligation, to use fish that is not commercially viable to land as whole fish to produce fish silage directly on board. However, the fish used for silage should still be counted against allocated quota. Control measures based on visual inspection of content are not possible once the fish have been digested by acid in the silage tanks and also the sampling of a single individual is not always feasible. DNA-based methods present one promising solution to identify and quantify species present in fish silage.

ii Expert group information

Expert group name	Stakeholder Workshop on the Value of Genetic and Genomic Tools for identifying species in mixed landings, fish products and by-products (WKGenoTools)*
Expert group cycle	Annual
Year cycle started	2020
Reporting year in cycle	1/1
Chair(s)	Jann Th Martinsohn, European Commission Claudia Junge, Norway
Meeting venue(s) and dates	05-06 February 2020, Brussels, Belgium (10 participants)

* Workshop funded by European Commission Joint Research Centre (JRC) and co-organized by the Institute of Marine Research (IMR), Norway

1 Introduction

Fisheries management, but also the implementation of rules along the supply chain, rely largely on the identification of fish species and also of the geographical origin, including processed products. Examples include the management of mixed fisheries, the identification of stocks and stock boundaries and the reduction of discards.

To support the advancement of mixed fisheries management, the stock identification and particularly also the reduction of discards, opportunities offered through the recent progress in genetic and genomic technological and analytical applications should be tapped into.

An initial assessment, carried out by the Working Group on the Application of Genetics in Fisheries and Aquaculture (WGAGFA) of the International Council for the Exploration of the Sea (ICES) in May 2018 and May 2019, and a first feedback by stakeholders, confirmed that state-of-the-art genetic and genomic approaches can help to support a number of challenges related to fisheries management as well as monitoring, control and enforcement.

A stakeholder workshop, funded by the European Commission Joint Research Centre (JRC), on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products ([WKGenoTools](#)) was co-organized by the JRC and the Norwegian Institute for Marine Research (IMR). WKGenoTools convened, under the remit of ICES, policy-makers and internationally renowned experts to clarify further which issues relevant to fisheries management can and should be tackled by genetic approaches and, at the same time, also to render limits of such approaches evident in order to best enable a successful technology and knowledge transfer.

2 The Workshop

The first day an intense discussion focused on support needs of the EU Landing Obligation (the Discard Ban), the legislation that intends to abolish the practice of throwing fish that is caught back into the sea.

John Hederman (DG MARE) introduced to the legal framework, explained control challenges and presented typical examples of infringement. The Landing Obligation described in the reformed Common Fisheries Policy requires fishers to land all catches of specified species so that they count against their quota and are fully documented and accounted for. John Hederman emphasized that the Landing Obligation is not a straightforward discard ban and that controlling the Landing Obligation is complicated by several exemptions such as predator damaged fish, prohibited species, high survivability and *de minimis*. Member States cannot ensure effective control and enforcement of the Landing Obligation at sea by using conventional controls such as inspections at sea/landing and aerial surveillance. He emphasized also that any evidence of infringement must be robust enough to withstand scrutiny by the defence during court cases. He concluded his presentation mentioning the Remote Electronic Monitoring (REM) used in fisheries management. REM equipped with video technology (CCTV) and sensors has been widely recognized as the best way to effectively control the Landing Obligation at sea and is increasingly used for control purposes in fisheries management around the world.

Einar Eg Nielsen (DTU Aqua) presented the status-of-the-art in the genetic and genomic methodologies that can be potentially used for identifying species in mixed landings, fish products and by-products. He presented two approaches for mixed species samples:

- The next generation sequencing and “meta-barcoding”, that is a semi-quantitative approach;
- The quantitative PCR “qPCR” with species-specific primers.

Einar Eg Nielsen then introduced the environmental DNA (eDNA) methodology and the recent advancements in the technology allowing to monitor eDNA *in situ*. He finally presented some interesting results on fish silage DNA analyses carried out in the context of the DiscardLess project (Horizon 2020 - the Framework Programme for Research and Innovation 2014-2020).

Torild Johansen (IMR Norway), on behalf of Åse Ingvill Berge, presented the experiences in Norwegian fisheries on the use of genetic tools for control or other purposes. Genetic tools are not applied regularly in Norwegian fisheries control, but more regularly in fisheries management. The following are examples where samples have been taken on board or in factories, and analysed at the Norwegian Institute of Marine Research:

- Coastal cod and Northeast arctic cod to protect Coastal cod spawning grounds;
- Shrimp catches: Coastal cod and Golden redfish juveniles in the catches (the Directorate will close area for fishing);
- Identify if a catch consists of Greater argentine (*Argentina silus*) or Lesser argentine (*Argentina sphyraena*).

At the end of the workshop first day, from the discussion among the workshop participants, some scenarios, such as false labelling of fish, were identified as being resolvable by DNA-technology. Also new approaches such as eDNA might help to create valuable evidence, perhaps also the identification of species composition of catches or processed products and the amount of fish caught.

During the second day, Cristina Ribeiro and Aronne Spezzani (DG MARE) presented a case study commissioned by DG MARE that explored the usage of genetics for control and enforcement in the North Atlantic Fisheries Organization (NAFO) that is one of the Regional Fisheries Management Organizations (RFMO). Objective of the case study was to develop a protocol and a manual to guide the collection and the chain of custody process of the samples to ensure the integrity and reliability of the results. The EU has commissioned this case study via the framework contract (EASME/EMFF/2016/008 "Scientific advice for fisheries beyond EU waters), namely under the specific contract No. 15: "Study to produce an International Manual of Procedures to be used in the NAFO Regulatory Area to guide the collection of samples from fisheries products for genetic analysis". DG MARE submitted the study outcomes, a literature review report and a manual ("Fish Products Sampling for DNA Testing") developed as a guideline for best practices with respect to genetic sampling and analysis, to the WKGenools workshop participants. DG MARE will submit both the report and the manual to the International Council for the Exploration of the Sea (ICES) for review.

Following the workshop presentations and discussion among workshop participants, two case studies were selected to be presented in the 2020 report of the ICES Working Group on Application of Genetics in Fisheries and Aquaculture (WGAGFA) for the Terms of Reference C ("Assess and report on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products"): one about DNA-based methodologies to identify and quantify species present in fish silage, the other about the DNA-based identification of species at sea and during landing.

The first case study addresses the problem to identify directly on board or at port fish species that are not easily identifiable by a visual inspection. Several portable solutions, which can facilitate the species barcoding on board of the fishing vessels or at port, have been developed in recent years.

The second case study is motivated by the possibility, under the EU Landing Obligation, to use fish that is not commercially viable to land as whole fish to produce fish silage directly on board. However, the fish used for silage should still be counted against the allocated quota. Control measures based on visual inspection of content are not possible once the fish have been digested by acid in the silage tanks and also the sampling of a single individual is not always feasible. DNA-based methodologies present one promising solution to identify and quantify species present in fish silage.

Annex 1: List of participants

Name	Institute	Country (of institute)	E-mail
Jurgen Batsleer	Wageningen University	Netherlands	jurgen.batsleer@wur.nl
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Annex 2: WKGenoTools Workshop Agenda



Agenda

SWSGenoTools

STAKEHOLDER WORKSHOP on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products

Brussels - 05-06 February 2020



SWSGenoTools

STAKEHOLDER WORKSHOP on the value of genetic and genomic tools for identifying species in mixed landings, fish products and by-products

(ICES Acronym: WKGENOTOOLS)

Brussels 05-06 February 2020

European Commission DG Joint Research Centre

JRC Headquarters - BRU-CDMA 06/144 - Rue de Champs de Mars - 1049 Brussels – Belgium

This Stakeholder Workshop is funded by the European Commission Joint Research Centre Exploratory Research Activity, and held under the remit of the ICES Working Group on Application of Genetics in Fisheries and Aquaculture.

Wednesday 05 February 2020

11:30-12:00 **Arrival at Premises**

12:00-13:00 **Lunch Buffet // Informal Introduction**

13:00-13:15 **Housekeeping and Tour de Table – Short Introduction of Participants**

13:15-13:45 **Introduction to scope and aims of meeting**

13:45-14:15 **Fisheries Control and Enforcement/The Landing Obligation: Needs and challenges – a Commission Perspective**

John Hederman EC DG MARE

14:15-14:30 **Norway: experiences from a management authority perspective**

Åse BERGE (TBD) Norwegian Directorate of Fisheries

14:30-15:00 **Coffee Break**

15:00-15:30 **Genetics and genomics: Challenges and opportunities**

Einar Eg Nielsen DTU Aqua Denmark

15:30-17:00 **Short summary and open discussion**

Plenary

19:00-21:00 **Dinner at Le Marmiton**

Thursday 06 February 2020

09:00-09:30 **Summary Day 1** - outline open discussion points

09:30-10:00 **Usage of genetics for control and enforcement: A case study**

Cristina Ribeiro EC DG MARE

10:00-10:45 **Steered discussion: Taking up issues and priorities raised during Day 1 and 2**
Plenary

10:45-11:00 **Coffee Break**

11:00-12:00 **Steered discussion: Taking up issues and priorities raised during Day 1 and 2**
Plenary

12:00-13:00 **Wrap-up session / Conclusions and prospect/ End meeting**

13:00-14:00 **Lunch-to-go and departure**