## Exploration of use of camera systems and vision algorithms to sort and document fish on-board of pelagic trawlers

Ref 2015/03 (18/5/2015)

### Introduction

The introduction of the discard ban January 1st 2015 requires a major improvement in sorting procedures on board of the vessels in combination with a need for better documentation of the catches. The discard ban is applicable to pelagic fisheries in European waters. This means that the PFA trawlers will need to bring their unwanted bycatches to the harbour. Even though the percentage bycatch is relatively low in pelagic fisheries, the overall amount of bycatch can be substantial because they operate large-scale fishing operations. A single haul can amount to 300 tonnes of fish, which is around 1.5 million fish.

Marc de Visser, an MSC student at Wageningen University, already performed a system analysis and a design study to improve on-board sorting and documenting. The design concept marked as 'Revolutionary' ranked highest by the stakeholders in the fishery industry (Figure 1). This design concept uses RGB line scan cameras to determine species and several characteristics of both the wanted catch and unwanted bycatch. However, to determine the applicability of RGB cameras on board of pelagic trawlers, an experimental research study is still required.

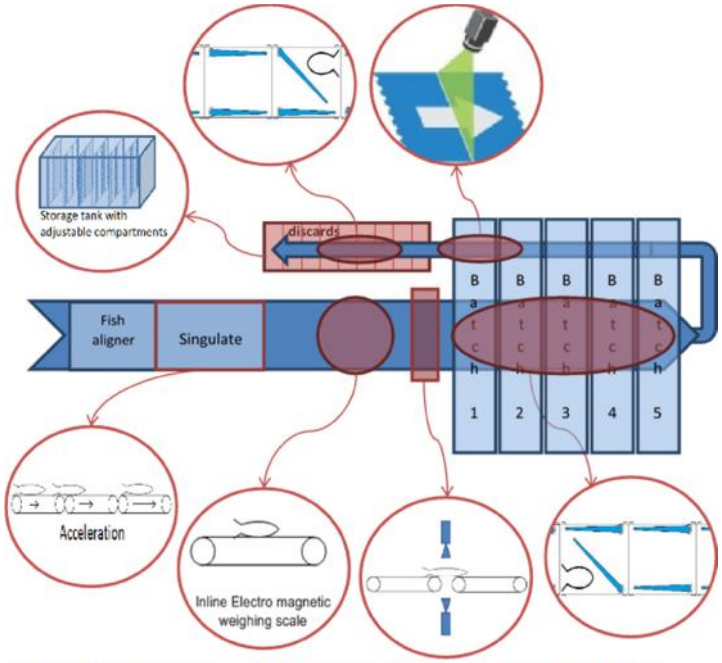


Figure 1 Schematic overview of the on-board processing area of pelagic fish of the innovative design concept. Fish enters the processing line at the left. Every block displays a process. Red circles are specific features of the design concept (De Visser, 2015).

### Research questions

What performance can (RGB line scan) camera systems deliver in sorting and documenting fish on-board of pelagic trawlers?

- Can an RGB line scan camera determine fish species and external quality accurately?
- What are the external features that can be measured objectively and that are correlated to the overall quality as is being used now on board?
- What other fish features can be measured by means of an RGB line scan camera?
- What image processing algorithms delivers the best performance and are fast enough to be integrated within this approach?
- Design and test an experimental setup where camera and software performance is measured. Is the required performance and the required output for documentation of fish product quality delivered as needed in the revolutionary design concept.
- If new image processing software is required this may optionally be developed with consequences for the scope of the thesis subject.

**Type of student work:** MSc thesis

**Required background:** vision technology

**Period: 5-**6 months. Starting as soon as possible.

**Contact persons:** Bert van 't Ooster (FTE, bert.vantooster@wur.nl), Rick van de Zedde (FBR), Martin Pastoors (mpastoors@pelagicfish.eu, +31 631901027

**Organization:** The Pelagic Freezer-trawler Association represents the interests of 9 European pelagic freezer-trawler companies. PFA members are responsible, family-run companies, mostly going back to the late 19th century, who benefit from several generations of fishing experience, and operate a combined fleet of 19 vessels. They are vertically integrated companies involved in the catching, processing, distribution and export of pelagic fish. The association currently has members in France, Germany, Lithuania, the Netherlands and the UK.

***Background information: description of the "Revolutionary" sorting and documentation design***

*To meet the maximal capacity of trawlers (estimated at 134,000 fish/hour), 8 parallel lanes will be needed with three times an acceleration in conveyor belt speed per lane (1 m/s to 1.5 m/s, 1.5 m/s to 2 m/s and 2 to 2.5 m/s). In this design concept, accurate sorting on weight has been made possible. The weight of each individual fish is measured with an inline weighing scale, based on the SmartLine grader of Marel. This weighing unit is able to measure weight at a rate of 15,000 fish/hour. The weighing unit is able to measure the continuous stream of individually separated fish. Two line scan cameras per lane are used to determine the species and the external quality of the fish. One camera scans the top of the fish, the other camera the bottom side. This is possible due to a small gap between two separated conveyor belts. An image is created from both sides of the fish, which makes sorting by external quality more accurate. Based on the perceived images and the individually measured weight, the target location of the fish is determined. The conveyor belt is located perpendicular over all storage tanks.A flipper system is activated to dispose the fish in the right compartment. All discards are singulated at the end of conveyor belt by means of a narrowing channel. This belt transports the fish to the discard tanks where discards are automatically sorted by species. All measured properties in the entire chain are documented.*

*De Visser, M. 2015. Re-design of on board processing of pelagic fish and by-catch, opportunities for automation. In Farm Technology Group, p. 141 pp. Wageningen University.*