Research into the chances of survival of flatfish and rays: how is it done?

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How many undersized fish actually survive the process of being discarded? This question is relevant because of the European landing obligation, which obliges fishers to land undersized fish that are subject to a quota. Wageningen Marine Research, together with the fishing industry, has investigated the chances of survival of flatfish and rays in pulse fishing. How is research into the chances of survival of fish conducted?

Why research into chances of survival of undersized fish?

As of 2019, the Common Fisheries Policy will oblige the fishing industry to land all undersized specimens of fish that are subject to a quota. Under the previous policy, fishers had to discard these fish. Some of the undersized fish survive the process of discarding and can contribute to the fish stock. This is not the case if the fish has to be brought to shore; in that case, all fish are certain to perish. The discards policy therefore includes a provision that states that an exemption may be made on the landing obligation for fish species with a high chance of survival. For this reason, we need to know more about on the chances of survival of discarded fish.

International guidelines

The International Council for the Exploration of the Sea (ICES) has developed guidelines for carrying out research into chances of survival. The research carried out by Wageningen Marine Research follows these guidelines.

Collecting the fish

Scientists collect the undersized fish on-board the fishing vessels during regular commercial fishing trips. The research trips are spread over the year and across the North Sea.

By spreading the trips in time and space, the research takes into account the constantly changing conditions in which the fishing takes place and which can influence the chances of survival, such as fluctuating water temperature, the type of fishing ground, and wind strength and direction. When the catch is brought on board, the undersized fish for the study are randomly selected from the sorting belt at the beginning and at the end of the catch processing. This way, the scientists can also investigate whether different catch processing times lead to differences in chances of survival.

Assessment of the condition of the fish

The scientists examine reflexes and external characteristics of all collected fish. During the reflex tests, the reaction of the fish is assessed: does it try to burrow; does it curl up if you hold it upside down in your hand; does it try to swim away; does it turn around when released in the water with its blind side up? During the examination of its external condition, the fish is checked for visible wounds and bruises, and its mucous layer is examined.

PIT tag

Each fish is given a PIT tag with a unique code, to which all research data of the fish, the number of the haul and trawl duration are linked. The fish are then put in survival tanks in a survival unit, in which they stay while on board and afterwards in the laboratory. The survival units are continuously provided with fresh seawater. All data are entered into a database on board.

Control fish

Besides the fish that are caught, the scientists also bring control fish on board. Control fish are healthy fish that lived in the laboratory for a minimum of three weeks.

By using control fish, the scientists can verify whether mortality of the undersized fish from the catch is not caused by the conditions in the survival units.

Once on board, the control fish are given the same treatment as the undersized fish that were collected from the catches. Their reflexes are examined, their external characteristics are assessed, they are given a PIT tag and they are placed in a survival unit. Their data are also entered into the database.

Monitoring on board

On board, all fish in the survival units are checked twice a day. Oxygen levels and the temperature of the water are measured. Dead fish are removed immediately from the survival units. The dead fish are identified by their PIT tag using a reading device. The moment the fish was found dead can then be linked to the fish's data in the database.

Survival unit with plaice
Photo: Pieke Molenaar

Transport to the laboratory

At the end of the fishing trip, the survival units are hoisted off board. They are put into custom-made containers and brought to the laboratory by a temperature-controlled lorry. During transport, the water is aerated to guarantee sufficient oxygen levels.

In the laboratory

In the laboratory, the survival tanks with fish are placed in racks. The supply of seawater is reconnected immediately. Larger fish such as rays, turbot and brill are transferred into larger basins. Sand is added to the survival tanks and the basins to keep the living conditions as natural as possible. The racks and basins are located in a climate chamber where the temperature is kept at a constant level equal to the temperature of seawater.

The oxygen levels and water temperature of all survival tanks are checked daily, and any dead fish are removed and registered. The fish are fed with natural feed (rag worms and raw shrimp).

Why continued monitoring in the laboratory?

The reason for monitoring the fish in the laboratory for some time after the fishing trip is because part of the mortality only occurs at a later stage. 95% of the undersized fish are still alive immediately after catch, and most mortality occurs in the following days. Conclusions about actual chances of survival can only be drawn once mortality stabilises. For the study of flatfish and rays, the monitoring period in the laboratory is two weeks.

Series of factsheets into fish survival research

This factsheet is part of a series of factsheets in which research into the chances of survival of flatfish and rays in pulse fishing are discussed. Other factsheets discuss the results of the research into the chances of survival of flatfish and rays; effects of modifications in catching and processing procedures on chances of survival; and effects of the conditions under which fishing takes place on the survivability of flatfish and rays.

Animal Experimentation Act

The treatment of the fish in this research project was in accordance with the Dutch Animal Experimentation Act, as approved by ethical committees (Experiment 2017 D0012.002).

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More info: www.wur.eu/fishsurvival