

Faster swimming spermatozoa secure the revival of fish species

by Carina Caldeira

It's a race against time: the faster fish sperm swim, the better the chance we have of helping the species survive.

This is what Portuguese marine biologist Carina Caldeira has been working on for her PhD with the Proiser research team in Valencia, Spain. Her work focuses on one of the main issues of conservation and revival of endangered fish species - sperm quality.

Successful aquatic fertilization depends of the good quality of both eggs and sperm. There has been a lot of research on sexual reproductive cells (gametes) of fish in the last few years, although more information about sperm characteristics is necessary to improve the fertilization procedures. Spermatozoa behaviour (velocity and time of activation) and the effect of environmental parameters, such as temperature and daylight, on fish sperm quality are two important issues that can help improve chances of successful reproduction.



Simplishow video - <https://vimeo.com/271433772>

There are ways to evaluate the quality of gametes, and it is possible to make rapid and accurate measurements of motility parameters through a computer assisted sperm analysis (CASA) system. CASA technology was initially designed for mammal species and has been adapted for fish sperm analysis.

The first step was to know more about the specific features of fish sperm that can affect the sperm assessment. Fish sperm has a short motility that decreases very rapidly after activation (less than 2 minutes) and, in some cases, is adapted to lower temperature. We studied Atlantic salmon – its sperm remains active for only 20-30 seconds.

It's not much time and it meant we had to modify the CASA software and hardware components to be able to do the fish sperm analysis.

Sperm quality assessment depends largely of the hardware tools, such as counting chambers, video cameras and technology for maintaining temperatures close to what the species would experience in the wild. It is essential to adapt these tools to fish sperm features in order to start motility analysis as soon as possible and at the right temperature. A cooling plate for an optical microscope, and a tool to keep samples at constant temperature throughout sperm analysis were developed to obtain accurate data for fish sperm motility.

Fish production in captivity has been optimized by manipulating daylight and temperature in order to improve fish growth. However, this could also be associated with sexual maturation of some fish species, such as Atlantic salmon. This means that we need to know more about the effect of environmental conditions on the quality of fish sperm.

The knowledge about fish sperm quality is still very limited, and one of the first steps is to optimise the sperm assessment and minimize the differences between the results obtained by different laboratories. Only in this way will it be possible to improve knowledge about fish sperm quality. In this way fish production can be improved and the conservation and revival of endangered fish species enhanced.