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The fish biomass calculation project has been successfully concluded, providing important results for the sector

The project "*Designing technologies to calculate total fish biomass levels in offshore aquaculture facilities*" has been successfully concluded and provides important results for the aquaculture sector.
The work was developed jointly by APROMAR (Business Association of Marine Aquaculture Producers), the Andalusian Aquaculture Technology Centre (CTAQUA) and the Research Institute for Integrated Management of Coastal Areas (UPV), and the results were disseminated in December during a seminar in El Puerto de Santa Maria (Cadiz, Spain).

The precise estimation of the biomass stocked in offshore farms is an essential aspect for efficient management of aquaculture facilities. An accurate knowledge of the stocked biomass will allow efficient feeding practice, protection and harvesting of farmed fish, as well as correct economic evaluation. The project was focused on offering technologies to prevent economic damage from incorrect measurements.

After completing both phases of the project, the team concluded that **hydroacoustic systems** can be used as non-invasive systems to measure biomass levels of sea bream and sea bass. Experts observed that variations in

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the estimations of fish size and density coincide with changes caused by daily operations undertaken in fish farms.

In addition, **estimations of fish density** are largely affected by the time of day in which the measurements are taken. The best correlation between the intensity of the acoustic signal and the real density of fish was taken from the data collected at night; when the fish are relatively at rest, they are more dispersed and the acoustic measurements are more stable.

The results of **echo integration techniques** indicate that acoustic measurements of fish density can be used to document changes in the abundance of fish in marine cages.

Although this project did not include the observation of changes in the size of fish in marine cages over a period of time due to budget reasons, experiences in Norway indicate that **daily measurements of the variations in fish size can be obtained.**

Furthermore, thanks to the field work completed, it was observed that **correct measurements can be taken from the surface**. Current bibliography suggested that measurements should always be taken from the sea bed. This is an interesting point because surface equipment is easier to install and operate.

The **significance and effectiveness of this project's results** confirm the need to continue researching along these lines. With this objective in mind, the project team compiled a series of recommendations, including the need complete a systematic and in-depth study to monitor the cages during a longer

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period of time, from growing to harvesting, in order to generate adapted prototypes.

Also, **sources of energy** must be found that can be adapted to the conditions of offshore fish farming in cages, including energy efficient equipment that uses renewable energy sources.

Last, specialists in hydroacoustic technology indicate that there are other **advantages** to these systems, including lower production costs, early escape detection and other benefits linked to environmental sustainability and animal welfare. The applicability of these benefits, however, must be verified in the field.

The project was undertaken in Spain during two years, as established in the schedule. The budget was a total of 214,000 euros, of which 175,000 euros was provided by the General Secretary of the Sea from the Ministry of Environment and Rural and Marine Affairs of Spain, as part of the Technological Development, Fisheries and Aquaculture programme for 2011.

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