

Mesoscopic wave physics in dense fish aggregates

Benoit Tallon¹, Philippe Roux², Guillaume Matte³, Jean Guillard⁴, Berit Heltne¹, Sergey E. Skipetrov⁵

¹ Aquabio AS, Norway

² ISTerre, U. of Grenoble Alpes, France

³ iXblue, Sonar division, France

⁴ CARTELE, U. Savoie Mont Blanc, France

⁵ LPMMC, U. of Grenoble Alpes, France

benoit@aquabio.no

Traditional acoustic characterization methods (such as echo-integration or echo-counting) are compromised in aquaculture context. These limitations are due to multiple scattering phenomena that occurs when acoustic waves travel through strongly disordered media. In this case a single detected echo does not correspond to an isolated target but might be the result of several contributions. In fish farms, multiple scattering limits counting, imaging, and monitoring methods.

In this project, we employ mesoscopic physics methods to develop a new way of process data acquired with an iXblue Seapix array with a reversible Mills cross configuration. In aquaculture, this alliance between physicists and sonar experts leads to the development of new monitoring methods that overcome limitations due to high fish density. By taking advantage of multiple scattering phenomena, we provide acoustics measurement of fish density and weight distribution. The methods presented here also have a strong potential regarding feeding monitoring and structure imaging (cage and anchoring) through dense fish shoals.