



## ADVANCES IN THE ANALYSIS OF RIVERINE ACOUSTIC CAMERA DATA

Franco-Finnish Workshop

Research topic: **Physics**

Place: **INRAE (Rennes)**

Institutions involved: **INRAE, LUKE**

Dates: **15/03/2022 to 17/03/2022**

Program: **Maupertuis Programme**

### PRESENTATION

Acoustic camera technology is a new way to collect relevant and precious data on fish population even in turbid waters, without any modification in their behaviour or risking their health state. However, as all innovative methods, analysis tools have to be developed and/or adapted to their users' requirements. Automatic fish detection and identification are the main challenges of the scientific community using acoustic cameras, and multiple studies are in progress around the world to reach these objectives, led notably by [INRAE](#) and [LUKE](#) labs. To strengthen research collaboration between France and Finland in the field of ecology, this application implemented a workshop to share and to transfer the advances in the analysis of the riverine acoustic camera data. Beyond the demonstration of state of the art, this workshop aimed to gather for the first time the scientific community using these innovative tools to monitor fish population in rivers.

### ACTIVITIES AND OUTCOMES

The workshop was chaired by French and Finnish PI and took place during 3 days in Rennes, bringing together 30 to 50 worldwide specialists. Eighty participants registered from 13 countries in Europe and North America, and belonging to 42 different affiliations. The audience, larger than expected, underlined the high expectations of the scientific community around this thematic. Four internationally renowned keynote speakers were invited, two from the US and two from Europe, and they gave talks of high interest for all the participants. During the two first days, the keynote speakers and 16 participants gave talks about how they use the acoustic cameras, the problems they are facing, and the automatic and semi-automatic methods they have built with the aim of reducing time spent for data (recorded video data set) provided by each research team and representing a wide range of monitoring conditions. The Thursday afternoon focused on a round-table discussions dealing with the key interests of this workshop and how to pursue and valorise the discussions beyond the workshop.

The audience and the keynote speakers largely encouraged the committee to pursue the process initiated by this workshop. Indeed, the discussions between the participants led to common conclusions: the different methods developed around the northern hemisphere try to reach the same overall aim (to automate the acoustic camera data analysis) by various methodologies and tools, but

which all are adapted to their study specific objectives (like the species they are studying or the recording conditions they encounter). Although only four manufactured acoustic cameras are used in the frame of those studies (and for the most, only two models), the video data recorded have a high diversity arising from different resolutions, windows lengths and environmental conditions. However, even if using the methods developed in another conditions may request an adaptation of their settings, they may be useful for the whole community of acoustic camera users, even partially. Furthermore, many participants of the workshop affirmed their desire to make available their tools to other acoustic camera users and to share their feedbacks.

Several further perspectives were mentioned to continue our discussions and our exchanges. The opportunity to formalize a true expert working group, linked to existing ICES groups ([WGFAST](#) for instance) around the thematic of acoustic camera data analysis may be a relevant way to concretize their collaboration and eventually to unite their methods to improve their efficiency and genericity. The datasets recorded by the recorded by the participants in various locations were large, diverse of their nature and were analysed by local expert operators. The idea of sharing on an open-data website some sample videos with ground-truth identified specimens of fish was also discussed. Objectives in this collaboration may be multiple: to train new operators, to give them an idea of the data resolution, to evaluate some operator effects on fish measurements or species identification, to train machine learning models, etc. Sharing their feedbacks, their recommendations, the experiments that have been realized or the limits that have been identified led them to thinking about publishing a user guide, edited by various participants to this workshop. [Jani Helminen](#), Finnish scientist and co-organizer of this workshop, has already initiated this work in one of the chapters of his PhD manuscript. As they succeeded to gather together world-wide most of the experts of using acoustic cameras in fish studies and analysing acoustic image data encourage them to merge their experiences in an enlarged document that may benefit to present or future users of acoustic cameras.