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ISTITUTO ZOOPROFILATTICO  
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## ATTI CONVEGNO

## SELECTION OF CLIMATE-RESILIENT TROUT LINES THROUGH GENOME-WIDE ASSOCIATION STUDY

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Aquaculture is one of the fast-growing food production sectors, source of high-value protein for human nutrition, increasingly playing a central role in the global economy. Climate changes affect the quantity, quality and seasonality of water resources. This involves to inevitable changes in aquatic ecosystems. Also promoting the onset of physiological stress of fish leading to susceptibility to infectious diseases representing an economic burden on aquaculture and a limitation to its growth. Aquatic systems that sustain aquaculture are undergoing significant changes as a result of global warming, and these changes are expected to worsen in the future. In particular, major challenges for trout production are represented by infectious, parasitic diseases and thermal stress.

Among infectious diseases, lactococcosis, caused by *Lactococcus garvieae*, *Lactococcus petauri* and *Lactococcus formosensis*, is a re-emergent bacterial disease that severely impacts global aquaculture, particularly under warm water conditions. Characterized by high mortality and economic losses, its management is challenged by limited efficacy of treatments and vaccines, especially under field conditions. Similarly, proliferative kidney disease (PKD), caused by *Tetracapsuloides bryosalmonae*, represents a significant threat to salmonid farming in Europe and North America, with high mortality rates in rainbow trout. Treatment or vaccine are not available. Both diseases are temperature-dependent and more prevalent in farms with surface water supply, favouring outbreaks.

Despite growing concern in Italian aquaculture, no trout commercial genetic lines resistant to lactococcosis, PKD, or thermal stress have been developed yet. Therefore, genomic selection of resilient fish lines could be used as an adaptation strategy to support aquaculture production and counteract environmental changes.

Scientific research is increasingly focused on the application of innovative technologies to support production, with Genome-Wide Association Study (GWAS) approaches gaining prominence for identifying genetic variants associated with important traits such as disease resistance and tolerance to environmental stress. The project "RESILTROUT – Resilient Aquaculture to Global Climate Change: Research Supporting Italian Rainbow Trout Production " employs a GWAS approach based on single nucleotide polymorphism analysis to identify genetic markers associated with resilience to infectious and parasitic diseases. In this project, GWAS will be conducted using a commercial medium-density SNP array on dead and survived fish in natural outbreaks. The use of such approaches not only contributes to genetic improvement of farmed species but also promotes more sustainable aquaculture practices capable of addressing the environmental and production challenges facing the sector.

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