

Genetic evidence for the appenninization of alpine streams: tracing the origin of hatchery-reared Mediterranean trout in northern Italy using molecular markers

Andrea Splendiani¹, Tommaso Righi¹, Andrea Gandolfi², Tatiana Fioravanti¹, Annarita Rossi³, Lorenzo Tancioni⁴, Gianluca Zuffi⁵, Paolo Lo Conte⁶, Michele Spairani⁷, Francesco Nonnis Marzano⁸, Laura Filonzi⁸, Alessia Ardenghi⁸, Alessandro Marieni⁹, Vincenzo Caputo Barucchi¹

¹ *Università Politecnica delle Marche - Dipartimento di Scienze della Vita e dell'Ambiente*

² *Conservation Genomics Research Unit, Research and Innovation Centre - Fondazione Edmund Mach, San Michele all'Adige (TN), Italia*

³ *Dipartimento di Biologia e Biotecnologie "C. Darwin", Sapienza-Università di Roma, Via Alfonso Borelli 50, 00161 Roma, Italia*

⁴ *Dipartimento di Biologia, Università di Roma "Tor Vergata", Roma, Italia*

⁵ *Hydrosynergy SC, San Lazzaro di Savena, Italia*

⁶ *Funzione Specializzata Tutela Fauna e Flora, Città Metropolitana di Torino, C. so Inghilterra 7, 10138 Torino, Italia*

⁷ *FLUME Srl - Fluvial Management and Ecology, Alpe Ronc 1, 11010, GIGNOD (AO), Italia*

⁸ *Department of Chemistry, Life Sciences and Environmental Sustainability, University of Parma, 43124 Parma, Italy*

⁹ *Centro Studi Biologia e Ambiente di A. M. Anzani ed A. Marieni snc C.so XXV Aprile, 87 - Erba (CO)*

Over the past decade, the so-called Mediterranean brown trout (*Salmo ghigii*) has increasingly been used in restocking activities managed by sport fishing associations. However, little is often known about these hatchery stocks' origin, genetic composition, and breeding methods. These practices are widespread throughout Italy, particularly in the northern regions. This study aimed to reconstruct the origin and genetic characteristics of domestic Mediterranean trout stocks currently used for restocking in central and northern Italy. A total of 610 trout were analysed using molecular markers: six domestic stocks of Mediterranean trout, two samples of Atlantic trout (*S. trutta*), 25 wild Mediterranean trout populations, and two wild samples of marble trout (*S. marmoratus*). The results highlighted three key findings:

i) A widespread presence of Atlantic genetic traits in domestic Mediterranean stocks, indicating past hybridization; ii) Domestic stocks are genetically mixed, primarily derived from central and southern Italian rivers (Magra, Serchio, Fibreno, Volturno), and not representative of local wild populations; iii) Genetic traces found in Lombardy—previously interpreted as evidence of a native presence—are more likely the result of recent restocking with non-native Apennine-origin trout. These findings underscore the risk that current restocking practices pose to the conservation of native trout diversity. They highlight the urgent need for strict genetic monitoring and traceability of hatchery stocks to preserve local biodiversity and prevent the unintentional spread of non-native genetic lineages.