Taxonomy Based Solutions: the case of Italian mayflies (Insecta: Ephemeroptera)

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About biodiversity, a key aim would be to understand which and how many species are present on Earth. The Catalogue of Life (COL) currently records about 2.2 million described species, but estimates of the total number vary widely, ranging from 4 to 100 million. Within this framework of great taxonomic uncertainty, the scientific community is called upon to implement measures for monitoring, conserving and restoring biodiversity in response to anthropogenic damages. Defining concrete ecological objectives requires a clear understanding of the reference ecosystem, and an upgrade and correct taxonomy represents an indispensable compass for establishing this baseline. More importantly, without continuous taxonomic research, there is a risk that species may be lost, in the current era of the sixth mass extinction, before they are even discovered.

According to the COL portal, about 1 million of the described species belong to the class Insecta. Estimates suggest that the total number of species could be five times higher. In Italian freshwater ecosystems, taxonomic knowledge of the order Ephemeroptera is still incomplete, even though these insects represent a fundamental bioindicator tool and Italy is a hotspot of biodiversity and endemisms. Ongoing molecular analysis of the COI gene and morphological investigations support the presence of new taxonomic entities (i.e., species) in Italy, that lack correspondence with sequences in existing databases (i.e., GenBank and BOLD), and do not match descriptions in the literature. Analyses conducted so far using an integrative taxonomy approach on *Epeorus*, *Caenis*, and *Centroptilum*, among the less species-rich genera, indicate the presence of approximately 15 new species, which we are currently preparing to describe.

In conclusion, we believe that basic and taxonomic research must continue to ensure the reliability of solutions and technologies derived from biodiversity, but above all, to recognise the intrinsic value of biodiversity.