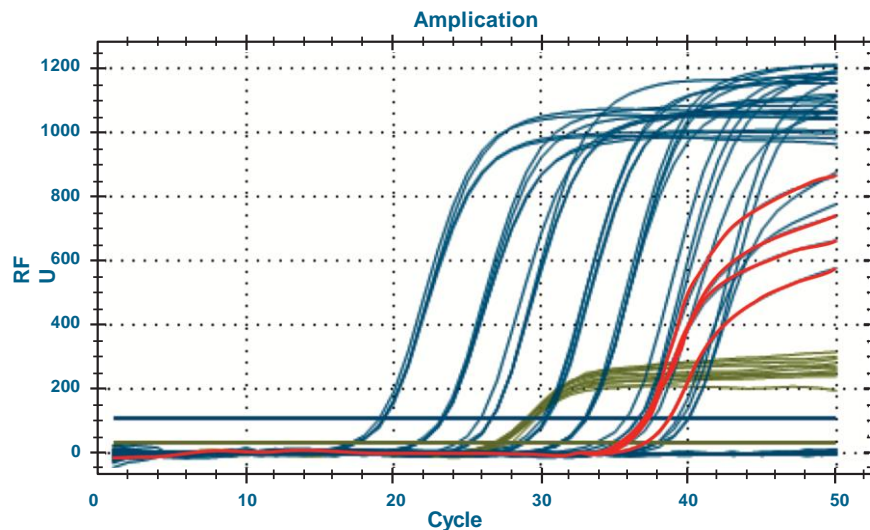


Fig.2 The results of ID-Gene™ PCR assay showing the presence of the parasite *Tetracapsuloides bryosalmonae* in water sample from Geneva river.



HOW TO START?

If you are interested in applying the ID-Gene™ AIS Survey or parasites test to identify and inventory the diversity of selected taxonomic groups or to detect particular species or parasites, please contact us and we will provide you with additional information and material necessary for samples collection and preservation.

A new DNA-based tool for rapid and cost-effective monitoring of aquatic invasive species (AIS) and parasites detection

💧 The importance of invasive species

Invasive Alien Species are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment. They represent a major threat to native plants and animals in Europe, causing damage worth billions of euros to the European economy every year.

<http://ec.europa.eu/environment/nature/invasivealien/>

The control of invasive species dispersal became particularly important due to globalisation of human activities, which facilitates species migration and contributes to substantially increase the number of non-native species. In Europe, the Water Framework Directive and the Regulation 1143/2014 on invasive alien species require that all European countries monitor their freshwater and marine ecosystems and coordinate their actions

against invasive species. There are about 1500 inland and marine AIS that have been identified by the Delivering Alien Invasive Species Inventories for Europe (DAISIE). The AIS monitoring in Europe costs about 50 million euros, however, it is widely accepted that these expenses will increase in the coming years.

🔥 The limitations of conventional AIS monitoring

The effective monitoring depends on early detection and accurate identification of invasive species. At present, visual observation remains the main source of information about the presence/absence of species in a given ecosystem. There are various conventional methods to detect invasive species, such as electric fishing, kick net sampling, depending on targeted taxonomic group. However, most of these methods are not very efficient for detecting low abundance species, such as invasive species at the early stages of invasion, or small populations of reintroduced species.

Moreover, once collected, the species have to be correctly identified, which is particularly problematic in the case of closely related, morphologically similar native and non-native species. In general, the routine use of morphological identification system cannot answer the increasing demand for biodiversity assessments, which require more rapid and standardized methods for species identification.

🔥 The advantages of eDNA-based AIS survey

The environmental DNA (eDNA) monitoring consists in analysing DNA isolated from water or sediment samples in order to detect whether particular species are present in the surveyed ecosystem. The eDNA approach is based on the detection of DNA traces of each species which remain preserved in water and sediment for a certain period of time. The eDNA surveys allow identifying species using their unique DNA sequences, DNA barcodes.

The main advantage of eDNA is the possibility to use it as an early warning about the presence of invasive species, which is of key importance for monitoring programs. Most of practical applications of eDNA in aquatic ecosystems concern the detection of invasive amphibians and fishes, some of them of very high economic importance. However, the eDNA can also be used to detect invasive macro-invertebrates, plants and microbial species.

HOW DOES IT WORK?

ID-Gene proposes two approaches to detect AIS in eDNA samples. They differ by taxonomic range of DNA barcodes and technology used to obtain molecular data. In high-throughput sequencing (HTS-based approach), a broad range of taxa is sequenced using HTS amplicon sequencing and the

sequence data are screened for the presence of targeted species.

In target eDNA tests, specific probes are designed for targeted species and applied to eDNA samples, using a quantitative PCR (qPCR).

WHAT DO WE OFFER?

The ID-Gene™ AIS Survey offers following services:

→ PCR/qPCR assays for the detection of invasive species:

- Zebra mussel (*Dreissena polymorpha*)
- Quagga mussel (*Dreissena bugensis*)
- Asian clam (*Corbicula fluminea*)
- New Zealand mudsnail (*Potamopyrgus antipodarum*)
- River nerite (*Theodoxus fluviatilis*)

→ qPCR assays for the detection of parasites:

- *Tetracapsuloides bryosalmonae* (PKD)
- *Saprolegnia parasitica* (saprolegnosis)

- *Aphanomyces astaci* (crayfish plague)
- *Batrachochytrium dendrobatidis* (chytridiomycosis)
- HTS-based eDNA test for freshwater vertebrates
- HTS-based eDNA test for freshwater insects
- HTS-based eDNA test for freshwater molluscs

The ID-Gene team can also develop eDNA test for any specific aquatic species or group of species.

Fig.1 Workflow of species detection using qPCR assays and HTS tests

