

The management plan of *Austropotamobius pallipes* in Trentino: priorities for conservation

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The management plan of *Austropotamobius pallipes* (Fig. 1A) in Trentino (Italy, Central Alps) provides a global approach to the conservation and restoration of native crayfish, a species whose distribution in Trentino has become patchy and greatly reduced in the last 50 years (Fig. 1D), due to the decline of their habitat, and the introduction of the alien species *Orconectes limosus* (Fig. 1B) and *Procambarus clarkii* (Fig. 1C) which carry the crayfish plague.

The management plan of *Austropotamobius pallipes* was developed in 2017 in the framework of the LIFE+TEN project, co-funded by the Provincia Autonoma di Trento - Servizio Sviluppo Sostenibile e Aree Protette. The plan addresses:

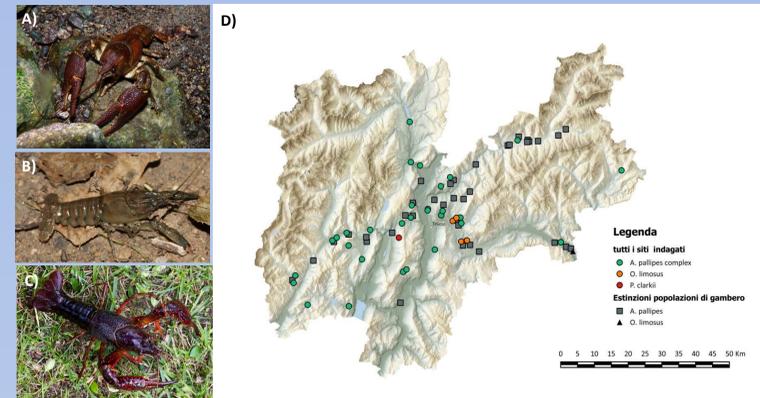


Fig. 1. Present and historical distribution of native (A) and alien (B, C) populations of crayfish in Trentino (Ciutti et al. 2013; Endrizzi et al. 2013; Formulari Natura 2000).

1) **Methods for monitoring of populations and their habitat:** sampling protocols are proposed to evaluate the status of populations and their habitat with the aims to identify potential risk and develop early strategies for conservation. Sampling protocols (Fig. 2) include:

- 🦀 site selection: stretch of 30% of the water body characterized by suitable conditions for crayfish;
- 🦀 habitat status: physical and biological (IBE) characteristics of the sampling site (once per year);
- 🦀 presence/absence: of the species in the selected sampling sites (once per year);
- 🦀 populations structure: biometric data and density of crayfish in selected sampling sites (every three years);
- 🦀 genetic characterization of populations: mitochondrial and nuclear DNA analysis.



Fig. 2. Monitoring of populations of *A. pallipes* (2012-2014). Left: collection of biometric data; right: collection of samples for biomolecular characterization.

2) **Data collection and analysis:**

- 🦀 creation of a database and website for the management of distribution data, and for the collection of records from researchers and citizens;
- 🦀 use of statistical models to analyze monitoring data.

3) **Prevention and mitigation of threats:**

- 🦀 alien species: early detection and eradication of new introductions and spread control of stabilized populations;
- 🦀 pathogens: early detection of outbreaks, especially of crayfish plague.

4) **Conservation and restoration of populations and their habitats:**

- 🦀 removal of artificial structures;
- 🦀 increase diversification and connection of aquatic habitats (Fig. 3);
- 🦀 mitigation of pollutant;
- 🦀 conservation and sustainable management of aquatic and riparian vegetation;
- 🦀 creation of multipurpose ponds and source areas;
- 🦀 construction of outdoor breeding plants in different hydrographic catchments;
- 🦀 reintroduction and restocking programs based on genetic characterization.



Fig. 3. Restoration of habitat for *A. pallipes* in the Piana Rotaliana (Trentino, LIFE +T.E.N. Action C10). Left: before restoration (2013), right: after restoration (2015).

5) **Dissemination**

- 🦀 creation of a dedicated website to provide updated information on the results of the conservation actions, and to represent a platform for citizens science and educational activities;
- 🦀 organization of training courses for anglers on crayfish species identification and methods to avoid the diffusion of crayfish plague;
- 🦀 installation of informative panels in sites characterized by the presence of alien crayfish and plague;
- 🦀 participation to public events, exhibitions, conferences, workshops (Fig. 5);
- 🦀 production of educational and scientific publications.



Fig. 5. Crayfish informative brochure and display at the exhibit «Expo Caccia, Pesca e Ambiente 2017, Riva del Garda (TN)» 25-26 March 2017.

Conclusions

A systematic long-term program is essential for native crayfish conservation in Trentino. The development of a common strategy at the national level or, possibly, among members of the Alpine Region, would be desirable for a complete understanding of genetic data and populations trends, thus allowing a better management of this species at a larger scale.