ARPHA Conference Abstracts 9: e204881
doi: 10.3897/aca.9.e204881

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Conference Abstract

Is the invasive raccoon threatening native crayfish? Evidence from *Austropotamobius pallipes* populations in Central Italy

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Received: 21 Jun 2026 | Published: 21 Jun 2026

Citation: Morbidelli M, Melone B, Forni S, Franco A, Bianchi G, Bonini R, Cappai N, Tricarico E (2026) Is the invasive raccoon threatening native crayfish? Evidence from *Austropotamobius pallipes* populations in Central Italy. ARPHA Conference Abstracts 9: e204881. https://doi.org/10.3897/aca.9.e204881

Abstract

Freshwater ecosystems (including riparian zones) are particularly vulnerable to invasive alien species (IAS) due to their high biodiversity (Pusey and Arthington 2003; Albert et al. 2021) and the numerous ecosystem services they provide to humans. Among freshwater taxa, decapods face the highest level of threat, as 30% of their species are classified as endangered (Sayer et al. 2025). This study assesses how the populations of the native white-clawed crayfish (*Austropotamobius pallipes* complex; hereafter *A. pallipes*) in the Foreste Casentinesi, Monte Falterona, and Campigna National Park (FCNP) (Central Italy) are affected by the invasive Northern raccoon (*Procyon lotor*), an omnivorous mammal from North and Central America first recorded in the protected area in 2013 (Cappai et al. 2016). In fact, crustaceans can represent the second most important food item and account for up to 60% of the total diet based on frequency of occurrence in raccoon scats (Boncompagni et al. 2021).

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Crayfish populations were surveyed between 2021 and 2023 at 51 stream sites (14 in Tuscany and 37 in Emilia-Romagna), each sampled once along a 100-m nocturnal transect (Morbidelli et al. 2026). Most sites (48 out of 51) had previously been surveyed between 2012 and 2016 using the same sampling protocol, allowing comparison between the early phase of the raccoon invasion and the 2021–2023 surveys. Raccoon occurrence data were obtained from camera trapping, live trapping, field signs (e.g. feeding remains) and validated reports. Crayfish sites were classified as raccoon-present (R1) when at least one raccoon record occurred within 500 m of the site during the same year as crayfish sampling; all remaining sites were classified as raccoon-absent (R0). Differences in crayfish abundance were then assessed using Catch Per Unit Effort (CPUE) and the temporal change in CPUE (ΔCPUE) between monitoring periods.

No significant differences between R0 and R1 populations were detected for the 2012–2016 period ($p > 0.05$). In contrast, during 2021–2023 crayfish abundance was significantly lower in populations where raccoons were recorded (median CPUE: R0 = 56, R1 = 3; $p < 0.001$). The temporal variation in abundance also differed significantly between groups (median ΔCPUE: R0 = -0.47, R1 = -0.95; $p < 0.001$). Generalized linear and linear models confirmed the negative association between raccoon presence and both CPUE and ΔCPUE. Furthermore, crayfish size-class distributions differed significantly between R0 and R1 populations ($\chi^2 = 10.19$, df = 4, $p = 0.037$). Environmental variables measured during sampling (stream width, water depth and water temperature) were comparable among the surveyed sites.

These findings suggest that raccoon presence may represents a key driver of the decline of *A. pallipes* populations in the study area, providing quantitative evidence of the impact of an invasive mammal predator on a freshwater species already threatened by multiple human-driven factors and protected under the EU Habitats Directive. Control activities are currently underway by the Park authority, in order to contain the raccoon population in FCNP, and crayfish monitoring is still ongoing to assess potential recovery. Overall, these results highlight the need for further research on the ecological impacts of IAS to improve management strategies and strengthen conservation efforts for native fauna in protected areas.

Keywords

IAS; raccoon; crayfish; freshwater; CPUE

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Presented at

Neobiota 2026, the 14th International Conference on Biological Invasions

Conflicts of interest

The authors have declared that no competing interests exist.

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