



Conference Abstract

The European eel *Anguilla anguilla* in Cyprus - Investigating the role of freshwaters for eel conservation using integrated monitoring methods

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Abstract

The European eel (*Anguilla anguilla*) is a catadromous fish species, with population trends presenting significant declines over the last four decades. These declines throughout their range have resulted in their classification as ‘critically endangered’ by the IUCN. In addition, the European Union has implemented specific legislation surrounding *A. anguilla*, requiring member states to develop eel management plans [The EC Eel Regulation (1100/2007)]. Aimed to facilitate increased recruitment, these regulations state >40% of historic eel biomass should be allowed safe passage between inland waters and the sea. Cyprus however, applied and were granted an exemption from this, on the basis that there are no rivers on the island of suitable habitat and flow regimes which naturally host *A. anguilla* (2009/310/EC).

Following this decision, recent findings have suggested that historically eels were more widespread in Cyprus than previously recognised. Indeed, a study by Zogaris et al. (2012) indicated that eels are likely the island’s most widespread native species. Cyprus’ freshwater lotic systems are dominated by intermittent rivers and streams, however the

natural state and fish populations of these systems are poorly understood. The freshwaters of the island are now heavily fragmented, and with an estimated 108 dams retaining water are host to one of the highest densities of dam reservoirs in Europe. These interruptions to longitudinal connectivity lead to degraded freshwater systems in the lowlands, but despite this the island does have perennial freshwaters, particularly in the western side of the island and at higher elevations. If *A. anguilla* are indeed present in inland Cyprus, one key deterministic factor on their survival could be access to perennial summer refugia.

Here, multiple monitoring methods were applied to build knowledge on present day eel distribution in Cyprus. By increasing knowledge regarding distribution, we can re-evaluate whether conservation initiatives are in fact justified and worthwhile. In 2020 environmental DNA metabarcoding was applied, 130 samples were taken across 26 freshwater sites to provide an up-to-date snapshot of eel distribution. In addition to this, temporal trends were considered based on an island wide fish monitoring programme spanning 2009 - 2019 which predominantly used electric fishing.

Overall the results suggest that *A. anguilla* is widespread in western lowland Cyprus; 11/26 study sites (31/130 samples) tested positive for eel using eDNA metabarcoding, while eels were captured in 61/299 surveys (355 individuals) over the 10 year fish monitoring programme. The trends in eel distribution are highly concordant across methods, although not all sites were monitored with both methods (Fig. 1). These data indicate widespread eel recruitment in lowland freshwaters, but a lack of eels at higher elevation perennial areas. Lowland perennial areas are few and far between, however results here suggest they are abundant in *A. anguilla*. While higher elevation areas had higher overall freshwater fish species richness suggesting good habitat quality, the lack of the migratory eel in upper reaches indicates that barriers including dam structures may be preventing access for such migratory fish species. Environmental DNA detected eels in intermittent outlet flows of dams, but only in 2/9 reservoirs surveyed. We provide evidence for present day widespread eel recruitment in Cyprus' inland freshwaters, however highlight the need to increase connectivity to inland perennial systems in order to enhance survival of this critically endangered species at its eastern most range.

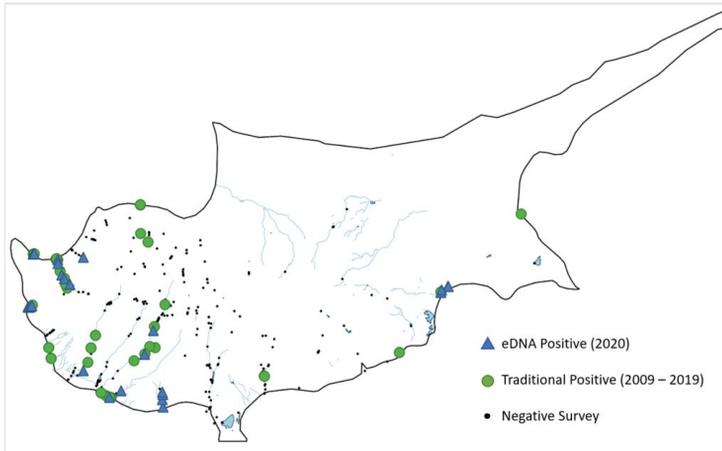


Figure 1. [doi](#)

The distribution of data points positive from the 2020 eDNA surveys, 2009 - 2019 fish monitoring programme, and all negative surveys for *A. anguilla*.

Keywords

Eel Regulations, Conservation, Freshwater, Environmental DNA, Intermittent streams

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