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FIRST RECORD OF NORTHERN PIKE *Esox lucius* (ACTINOPTERYGII: ESOCIFORMES: ESOCIDAE) IN THE KUTI LAKE AREA (MALA NERETVA)

Jure Jurinović[1*], Vesna Pilić[2], Kruno Bonačić[3], Mario Prečanica[3], Oliver Barić[4]

[1] *Independent researcher, Pula, Croatia*

[2] *Aquarium Pula, Verudela 33, 52100 Pula, Croatia*

[3] *University of Dubrovnik, Department for Aquaculture, Ćira Carića 4, 20000 Dubrovnik, Croatia*

[4] *Polish Academy of Sciences, Institute of Animal Reproduction and Food Research, Team of Reproduction and Development in Fish, Trylinskiego 18, 10-683 Olsztyn, Poland*

*Corresponding Author: jurinovich@gmail.com

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ABSTRACT

This paper describes the first record of northern pike *Esox lucius* (Linnaeus, 1758) in Kuti Lake (Mala Neretva, Croatia). A specimen of this species was caught in Kuti Lake in November 2024. The presence of pike has been recorded in tributaries and reservoirs of the Neretva River in Bosnia and Herzegovina, but its presence in the Neretva River system in Croatia presents an expansion of the distribution of the species. Although local fishermen and sources from grey literature in recent years indicate that this species is already present in the area where this specimen was caught, further research is needed to determine the mode of introduction and whether a stable population is present in the area.

How to Cite

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INTRODUCTION

Mediterranean rivers are home to a significant portion of Europe's freshwater fish species, many of which are endemic to the region (Kottelat and Freyhof, 2007). However, these rivers face substantial threats from human activities, including both the deliberate and accidental introduction of non-native fish species (Marr et al., 2013). The Neretva River, with its connecting water bodies such as Kuti Lake, are characterized by high biodiversity of native and endemic ichthyofauna. To date, 34 different native freshwater species have been identified in the Neretva watershed, 17 of which are endemic to the basin (Bogutskaya and Zupančič, 2003; Kovačić, 2005; Kottelat and Freyhof, 2007; Buj et al., 2010, 2014; Bogutskaya et al., 2012; Glamuzina et al., 2013; Vukić et al., 2019). However, in recent years an increasing number of non-native species have been reported for the same area (Glamuzina et al., 2013, 2017; Dulčić et al., 2017; Tutman et al., 2021; Šukalo et al., 2018). The synergic effects of various recent processes, especially the growing presence of non-native species, climate change effects and hydrological alterations, are currently not fully understood and require continuous research, but some of their effects are already apparent and could have adverse consequences for local ecosystems in the future (Dulčić et al., 2011; Tutman et al., 2021).

Three species from the family Esocidae are present in Europe: Northern pike *Esox lucius* (Linnaeus, 1758), *Esox cisalpinus* southern pike (Bianco and Delmastro, 2011), and Aquitanian pike *Esox aquitanicus* (Denys, Dettai, Persat, Hautecœur and Keith, 2014). Northern pike *E. lucius* is a cold-water species with native distribution in freshwater ecosystems of North America, Europe, and Asia. Specifically, it is found in freshwater habitats across Canada and the northern United States, in Ireland and the United Kingdom, throughout continental Europe, extending southward to Italy, around the Dead and Caspian seas, across Siberia, within the drainage basins of lakes Balkhash and Baikal, and reaching as far east as the Chukchi Peninsula (Scott and Crossman, 1973; Crossman, 1996; Senanan and Kapuscinski, 2000). It inhabits relatively shallow waters, avoids fast currents and prefers vegetated lake-like habitats and side channels. While it is considered that the mentioned parts of the world are now the native habitat for Northern pike, it is worth mentioning that during the 16th century this species was introduced to a variety of freshwater bodies across the globe (Harvey, 2009). In Croatia, pike was historically absent from the rivers of the Adriatic basin (Mrakovčić et al., 1995). However, it was recently documented in the Vrljika River (Petravić et al., 2021) and even in the marine ecosystem in the Adriatic Sea near Stobreč (Soldo, 2023). According to KlikPloče (2024), one specimen was also caught at the Neretva Delta. Recent studies have documented the presence of *Esox lucius* in the Neretva River and its tributaries in Bosnia and Herzegovina (Ridanović et al., 2021; Rozić et al., 2018). Reports suggest its presence in the Croatian section of the Neretva River, indicating a potential range expansion (Pofuk et al., 2017; CEPF, 2017). However, no official confirmation has yet been made. This paper presents the first confirmed record of *E. lucius* in Kuti Lake (Mala Neretva).

MATERIALS AND METHODS

On 28 November 2024, a specimen of northern pike *E. lucius* (Fig. 1) was caught in a modified fishing trap by a local fisherman. It was captured in Kuti Lake (42°57'20"N 17°36'34"E) (Fig. 2) at a depth of 2 m on a muddy bottom overgrown by sparse vegetation. The identification key by Scott and Crossman (1973) was used to confirm the species.

Fig 1. Specimen of northern pike *E. lucius* from Kuti Lake

The fish was weighed, morphometric measurements were taken using callipers, while gonad weight was determined using an analytical scale. The stomach was inspected macroscopically for content. Measuring was conducted at the Laboratory for Mariculture at the University of Dubrovnik.

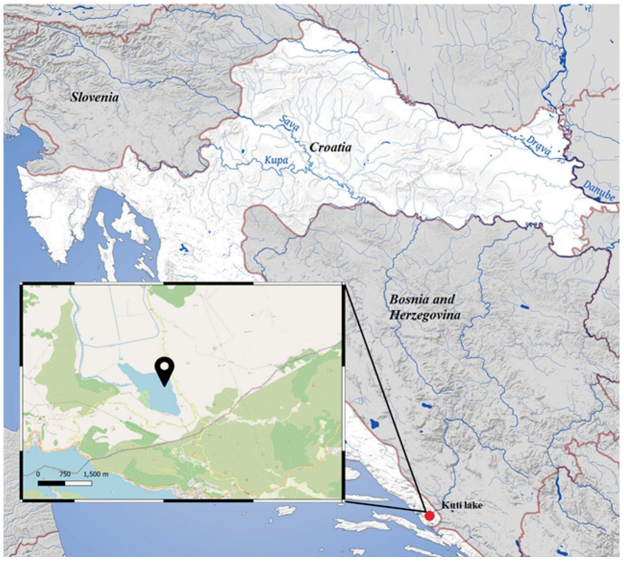

Fig 2. Catch location of *E. lucius* in Kuti Lake (Mala Neretva River, Adriatic drainage system in Croatia)

Description of the specimen

Morphometric values and meristic counts of the specimen are presented in Table 1. The specimen was male, it weighed 1.72 kg and measured 590 mm in total length, with gonads weighing 21.327 g. No food items were found in the stomach.

Table 1. Morphometric measurements and meristic count of northern pike *E. lucius* specimen from Kuti Lake, Mala Neretva

	Length (mm)	Count
Morphometric parameters		
Total length	590	
Standard length	512	
Predorsal length	384	
Preanal length	405	
Preventral length	276	
Prepectoral length	142	
Dorsal fin length	78	
Anal fin length	53	
Pectoral fin length	71	
Ventral fin length	73	
Caudal fin length	76	
Body depth (max)	97	
Body depth (min)	43	
Head length	163	
Ocular diameter	17	
Interorbital width	41	
Preorbital length	72	
Meristic parameters		
Dorsal fin rays		20
Anal fin rays		15
Pectoral fin rays		15
Ventral fin rays		11
Caudal fin rays		22

DISCUSSION

Pike is an opportunistic predator, primarily feeding on fish and invertebrates, but also consuming amphibians (Pedreschi et al., 2015). In some streams, their presence has been associated with declines in native species, such as brown trout *Salmo trutta* (Linnaeus, 1758) (Hesthagen et al., 2015). The Croatian section of the Neretva River has high biodiversity, with endemic and critically endangered species present in the area (IUCN, 2024; Tutman et al., 2017). For this reason, the introduction of pike might pose a significant threat to species like European eel *Anguilla anguilla* (Linnaeus, 1758), Neretva roach *Rutilus basak* (Heckel, 1843), Neretva rudd *Scardinius plotizza* (Heckel and Kner, 1858) and other aquatic communities. Furthermore, Kuti Lake is a shallow water body with a maximum depth of less than five meters and remains highly vegetated for most of the year. The lake's habitat complexity and underwater structures may help mitigate predation pressure and influence prey selection (Sandlund et al., 2016). Given that northern pike *Esox lucius* prefer shallow, vegetated habitats, with larger individuals displaying greater habitat versatility (Chapman and Mackay, 1984), these characteristics suggest that predation pressure on native species could be significant. While dense shoreline vegetation may offer refuge for smaller fish, further research is needed to understand how *E. lucius* interacts with the existing fish communities in this unique environment.

Spawning of pike occurs between February and March at 8–15 °C, with lethal temperatures exceeding 29.4 °C under natural conditions (Hubenova and Zaikov, 2013). Optimal growth of young-of-the-year pike occurs at 22–23 °C, reaching up to 25 °C depending on locality, though this decreases with age (Casselman and Lewis, 1996). These conditions suggest no significant environmental limitations for northern pike establishment in the Mala Neretva River as the temperature ranges from 7 °C in winter to 25–28 °C in summer, and salinity does not exceed 1 psu (practical salinity units) (Dulčić et al., 2017).

Several other non-native species with high economic potential were previously recorded in the Neretva River, such as pikeperch *Sander lucioperca* (Linnaeus, 1758) (Pavličević et al., 2016), European catfish *Silurus glanis* (Linnaeus, 1758) (Tutman et al., 2021), largemouth bass *Micropterus salmoides* (Lacépède, 1802) (Dulčić et al., 2017), and blue crab *Callinectes sapidus* (Rathbun, 1896) (Dulčić et al., 2011), and all of them quickly established stable populations. Initially, they were considered a threat to local ecosystems and caused economic losses to fishermen. However, over time some species have been recognized for their commercial potential. The most notable example is blue crab, initially considered a pest due to its damage to fishing gear, but recently gaining attention in local gastronomy, according to grey literature sources.

Additionally, pikeperch, largemouth bass and catfish are highly prized by anglers and fishing competitions were held in the region, specifically targeting largemouth bass. This shift may help reduce their negative impacts in the future, as exploitation of non-native species can be considered a key mitigation factor in the case of the mentioned species. The local fisherman who caught the pike specimen described in this paper also suggested that there is a stable population of pike in the lake and the connecting channels, mentioning catches in the previous year with specimens that exceeded 8 kg in weight. Also, the presence of seemingly enlarged gonads in the analysed specimen might represent the start of gonadal development that usually occurs during fall. However, for proper management, it is needed to assess the abundance of the species and determine whether a self-sustaining population is present in the area.

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PRVA ZABILJEŠKA ŠTUKE *Esox Lucius* (ACTINOPTERYGII: ESOCIFORMES: ESOCIDAE) NA PODRUČJU JEZERA KUTI (MALA NERETVA)

SAŽETAK

Ovaj rad opisuje prvi nalaz štuke, *Esox lucius* (Linnaeus, 1758), u jezeru Kuti (Mala Neretva, Hrvatska). Jedan primjerak ove vrste ulovljen je u jezeru Kuti u studenom 2024. godine. Prisutnost štuke je zabilježena u pritocima i umjetnim akumulacijama rijeke Neretve u Bosni i Hercegovini, međutim, pojava u sustavu Neretve u Hrvatskoj predstavlja dodatno širenje područja rasprostranjenosti. Iako lokalni ribari i izvori iz sive literature posljednjih godina upućuju na prisutnost ove vrste na području gdje je ulovljen primjerak opisan u ovom radu, potrebna su daljnja istraživanja kako bi se utvrdio način introdukcije te je li uspostavljena stabilna populacija.

Ključne riječi: strana vrsta, širenje rasprostranjenosti, slatkovodna ekologija, Neretva, introdukcija vrsta

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