

Records of New Fish Species in the River Neretva Estuary: Potential Threat to Coastal Adriatic Nursery

Nalazi novih vrsta riba na ušću rijeke Neretve: potencijalna prijetnja priobalnom jadranskom rastilištu

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Summary

Specimens of the three new fish species were recorded during 2015 and 2016 in the River Neretva Estuary. These species are: White trevally, *Pseudocaranx dentex* (Bloch and Schneider, 1801), Pilotfish, *Naucrates ductor* (Linnaeus, 1758) and White grouper, *Epinephelus aeneus* (Geoffroy Saint-Hilaire, 1817). The characteristics of caught specimens and their history of records in Adriatic Sea are described. Potential impact of new species invasion in the Neretva Estuary as a major Eastern Adriatic nursery habitat is discussed.

Sažetak

Tijekom 2015. i 2016. godine na ušću rijeke Neretve nađene su tri nove vrste riba, trnbokan plosac, Pseudocaranx dentex (Bloch i Schneider, 1801), skušac pratibrod, Naucrates ductor (Linnaeus, 1758) i bijela kirnja, Epinephelus aeneus (Geoffroy Saint-Hilaire, 1817). Opisane su karakteristike ulovljenih primjeraka i navedene bilješke koje su vođene o njihovoj prisutnosti u Jadranu. U radu se raspravlja o potencijalnom utjecaju invazije novih vrsta na ušće Neretve kao ključnog rastilišta u istočnom Jadranu.

KEY WORDS

White trevally
Pilotfish
White grouper
impact
Neretva Estuary

KLJUČNE RIJEČI

trnbokan plosac
skušac pratibrod
bijela kirnja
utjecaj
ušće Neretve

1. INTRODUCTION / Uvod

Estuaries are among the most biologically productive and valuable ecosystems world-wide, but human impacts have depleted these habitats, impact native species, degraded water quality and accelerated species invasions [12]. Consequently, loss of biodiversity is increasingly impairing ecosystem services, such as food provision through traditional fishery [25].

River Neretva Estuary in South Eastern Adriatic (Croatia) has ecological role as an important feeding, spawning and nursery ground for fish, crustacean and bivalve species [8]. Over the past decades, the estuary has undergone many natural and anthropogenic impacts evidenced with different biological changes [6, 22, 14, 9]. Among these impacts the most under estimated is presence of new invasive organisms. In the last 10-years, several new fish species such as bluefish, *Pomatomus saltatrix* or pompano, *Trachinotus ovatus* were recorded in the Neretva Estuary, which significantly impacted several grey mullet species and artisanal fishery oriented towards them [4]. Invading blue crab, *Callinectes sapidus* established population in this estuary in only six year [6] after the first record [16] and among other impacts compete for food resources with native Mediterranean green crab, *Carcinus aestuarii* [13]. Similar proofs of impact of the new fish species in this estuary are still not available. It is of paramount importance to better understand

impact of increasing number of new fish in these habitats that serve as nurseries in order to improve conservation and management of this area.

This article provides information on new fish species recorded recently in the River Neretva Estuary and discuss their properties in the light of ecological importance of transitional ecosystems.

2. MATERIAL AND METHODS / Metodologija

Specimens of new fish species in the River Neretva Estuary was captured by local artisanal and sport fishermen. After capture the specimens were frozen and transported to the laboratory where they were determined to species level according to Jardas (1996). Total length (TL) was measured to the nearest 0.1 mm and body weight (W) to the nearest 0.01 g. The stomachs contents were dissected, weighed and prey composition was determined.

3. RESULTS AND DISCUSSION / Rezultati i rasprava

The position of three fish species catch is presented in Figure 1. The White trevally, *Pseudocaranx dentex* (Bloch & Schneider, 1801) was caught with gillnets in Vlaška Lake at 10. September, 2016 (Figure 2). A specimen of the pilotfish, *Naucrates ductor*

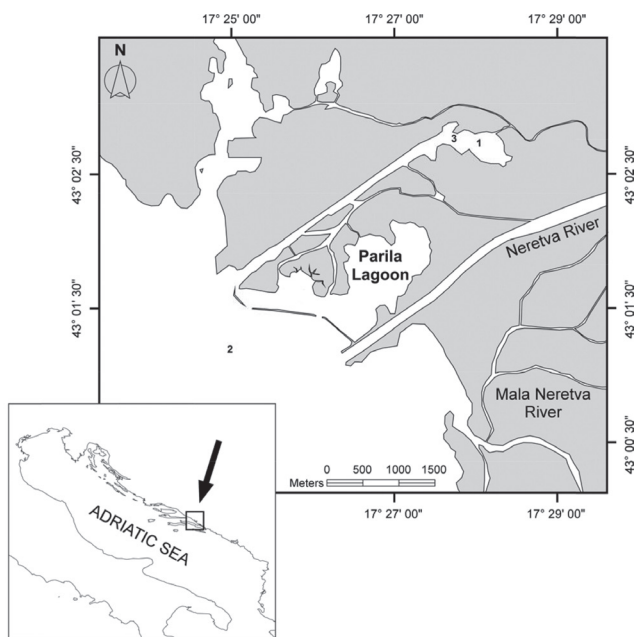


Figure 1. Map of the River Neretva Estuary with locations of fish species catch (1. White trevally, *Pseudocaranx dentex*; 2. Pilotfish, *Naucrates doctus*; 3. White grouper, *Epinephelus aeneus*)
 Slika 1. Karta ušća rijeke Neretve s označenim lokacijama ulova riba

(Linnaeus, 1758) was caught by hook at 12. December, 2016 (Figure 3). A specimen of the white grouper, *Epinephelus aeneus* (Geoffroy Saint-Hilaire, 1817) was caught in December 2015 with standing trap for eel located in the channel connected Vlaška Lake with sea (Figure 4).

White trevally was noted four times [2], including our, since its first sighting in the Adriatic Sea in 1986 [17]. Specimen was immature so the sex was not able to determine. Measured total length was 19.39 cm and weight 94.42 g. Afonso et al. (2008) estimated that the size at first maturity (L_{50}) for this species is 27.8 cm for males and 30.0 for females. Stomach analysis showed the presence of one specimen of big-scale sand smelt, *Atherina boyeri* Risso, 1810 with standard length of 4.51 cm and weight of 0.71 g. Dulčić et al. (2003) found digested fish larvae and postlarvae and specimens of Mysidacea in stomach of white trevally caught in eastern Adriatic Sea. Immature individuals of white trevally prefer sheltered habitats feeding on invertebrates and small fish [21, 1]



Figure 2 White trevally, *Pseudocaranx dentex* (Bloch & Schneider, 1801): total length 19.39, weight 94.42 g.

Slika 2. Trnbokan plosac: ukupna dužina 19.39, težina 94.42 g.

The noted specimen of the pilotfish was a male with a total length of 28.71 cm and a weight of 230.44 g. The gonad mass weighed 0.387 g. This species reaches sexual maturity at length around 25 cm [11]. Stomach analysis showed the presence of fish scale, decapod juvenile and copepods. Weight of stomach content was 0.774 g. Pipitone et al. (2000) in their study of the diet of pilotfish in central Mediterranean reported that the dominant group of the prey were crustaceans followed by molluscs, fishes, annelids and tunicates.

The specimen of white grouper was 46.70 cm in length and 2.74 kg of weight. The largest recorded total length in the Adriatic Sea was 108 cm and it is also northernmost occurrence of this species [3].

White trevally is not common species in the Adriatic Sea and it has been reported only in its southern part. It is marine and brackish, reef-associated species inhabiting depths from 10 to 200 m [11]. It belongs to family Carangidae and like the other species from this family younger, immature individual are inhabiting inshore habitats, shallow bays and river estuaries [23].

Pilotfish is an epipelagic species distributed in subtropical and tropical areas and it is common species in the Adriatic Sea especially in its southern part [11, 18]. Due to its constant presence near floating objects it is considered characteristic species of the fish assemblage associated with floating objects in the Mediterranean [24] in both juvenile and adult phases [19]. Diet is contained mainly of crustacean larvae, amphipods and gastropods [20].

White grouper is distributed throughout southern Mediterranean and along the coast of Africa from Morocco to Angola. It is rare species in the Adriatic Sea first records were in 1998 in Dubrovnik area (28 cm in total length) and in 1999 (21.5 cm in total length) [7]. It inhabits rocky, sandy and muddy bottoms in depths of 20 to 200 m. Juvenile of this species have been found in estuaries and coastal lagoons [5, 15]. This species has high economic importance and because of its rapid growth rate and potential for induced spawning in captivity it is good candidate for aquaculture [10].

Impact of these species has to be investigated in more details, but present data on food composition and literature data on feeding preferences, indicate that these species should impact important fish (i.e. big-scale sand smelt) or crustaceans (i.e. *Melichertus kerathurus*) in the River Neretva Estuary, changing



Figure 3 Pilotfish, *Naucrates ductor* (Linnaeus, 1758): total length 28.71 cm, weight 230.44 g.
Slika 3. Skušac pratibrod: ukupna duljina 28,71 cm, ukupna masa 230,44 g.

local food webs and ecology of transitional areas in general. Two species were caught deep in the estuary showing their acclimation to lower salinity which enables them to enter most important nursery area for juvenile recruitment. These indications are clear sign of significant changes of present ecosystems and local fishery associated with estuarine resources, as previously described for impact of bluefish on grey mullet species and local artisanal fishery associated with them [4].

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REFERENCES / Literatura

[1] Afonso, P.; Fontes, J.; Morato, T.; Holland, K. N.; Santos, R. S. (2008). Reproduction and spawning habitat of white trevally, *Pseudocaranx dentex*, in Azore, central north Atlantic. *Scientia Marina*, vol. 72, pp. 373-381.

[2] Dulčić, J.; Pallaoro, A.; Onofri, V.; Lučić, D.; Jardas, I. (2003). New additional records of imperial blackfish, *Schedophilus ovalis* (Cuvier, 1833), white trevally, *Pseudocaranx dentex* (Bloch & Schneider, 1801), and atlantic pomfret, *Brama brama* (Bonnaterre, 1788) in the eastern Adriatic. *Annales*, vol. 2, pp. 149-154.

[3] Dulčić, J.; Tutman, P.; Čaleta, M. (2006). Northernmost occurrence of the white grouper, *Epinephelus aeneus* (Perciformes: Serranidae), in the Mediterranean area. *Acta Ichthyologica et Piscatoria*, vol. 36, pp. 73-75. <https://doi.org/10.3750/AIP2006.36.1.10>

[4] Dulčić, J.; Glamuzina, B. (2010). Procjena ranjivosti sektora ribarstva na klimatske promjene: slučaj šireg područja ušća rijeke Neretve. Pages 31-39. in B. Glamuzina and J. Dulčić, editors. Proceedings of fish and 600 fisheries of Neretva River: status and perspectives. University of Dubrovnik and Neretva-Dubrovnik County, Dubrovnik, Croatia.

[5] Dulčić, J.; Dragičević, B. (2011). Nove ribe Jadranskog i Sredozemnog mora. Institut za oceanografiju i ribarstvo, Split, Državni zavod za zaštitu prirode, Zagreb, pp 160.

[6] Dulčić, J.; Tutman, P.; Matić Skoko, S.; Glamuzina, B. (2011). Six years from first record to population establishment: the case of the blue crab, *Callinectes sapidus* Rathbun, 1896 (Brachyura, Portunidae) in the Neretva river delta (south-eastern Adriatic Sea, Croatia). *Crustaceana*, vol. 84, pp. 1211-1220. <https://doi.org/10.1163/156854011X587478>

[7] Glamuzina, B.; Tutman, P.; Kožul, V.; Glavić, N.; Skaramuca, B. (2000). Premier signalement du mérour blanc, *Epinephelus aeneus* (Serranidae) dan le mid-est de l'Adriatique. *Cybiurn*, vol. 26(2), pp. 306-308.

[8] Glamuzina, B. (2010). Neretva River fishery-history and perspectives. Pages 20-30 in B. Glamuzina and J. Dulčić, editors. Proceedings of fish and fisheries of Neretva River: status and perspectives. University of Dubrovnik and Neretva-Dubrovnik County, Dubrovnik, Croatia.

[9] Glamuzina L., Conides, A.; Mancinelli, G.; Dobroslavić, T.; Bartulović, V.; Matić Skoko, S.; Glamuzina, B. (2017). Population Dynamics and Reproduction of Mediterranean Green Crab *Carcinus aestuarii* in Parila Lagoon (Neretva Estuary, Adriatic Sea, Croatia) as Fishery Management Tools. *Marine and*



Figure 4 White grouper, *Epinephelus aeneus* (Geoffroy Saint-Hilaire, 1817): total length 46.70 cm, weight 2.74 kg.
Slika 4. Bijela kirnja: ukupna duljina 46,70 cm, ukupna masa 2,74 kg.

Coastal Fisheries: Dynamics, Management, and Ecosystem Science, vol. 9, pp 260-270. <https://doi.org/10.1080/19425120.2017.1310155>

[10] Gorshkov, S. (2010). Long-term plan for domestication of the white grouper (*Epinephelus aeneus*). *The Israeli Journal of Aquaculture-Bamidgeh*, vol. 62(4), pp. 215-224.

[11] Jardas, I. (1996). *Jadranska Ihtiofauna*. Školska knjiga, Zagreb, pp 536.

[12] Lotze, H.K.; Lenihan, H.S.; Bourque, B.J.; Bradbury, R.H.; Cooke, R.G.; Kay, M.C.; Kidwell, S.M.; Kirby, M.X.; Peterson, C.H.; Jackson, J.B. (2006). Depletion, degradation, and recovery potential of estuaries and coastal seas. *Science*, vol. 312, pp. 1806-1809. <https://doi.org/10.1126/science.1128035>

[13] Mancinelli, G.; Glamuzina, B.; Petrić, M.; Carrozzo, L.; Glamuzina, L.; Zotti, M.; Raho, D.; Vizzini, S. (2016). The trophic position of the Atlantic blue crab *Callinectes sapidus* Rathbun 1896 in the food web of Parila Lagoon (South Eastern Adriatic, Croatia): a first assessment using stable isotopes. *Mediterranean Marine Science*, vol. 17, pp. 634-643. <https://doi.org/10.12681/mms.1724>

[14] Mancinelli, G.; Chainho, P.; Cilenti, L.; Falco, S.; Kapiris, K.; Katselis, G.; Ribeiro, F. (2017). The Atlantic Blue Crab *Callinectes sapidus* in Southern European Coastal Waters: Distribution, Impact and Prospective Invasion Management Strategies. *Marine Pollution Bulletin*, vol. 119(1), pp. 5-11. <https://doi.org/10.1016/j.marpolbul.2017.02.050>

[15] Ndiaye, W.; Diouf, K.; Samba, O.; Ndiaye, P.; Panfili, J. (2015). The Length-Weight Relationship and Condition Factor of white grouper (*Epinephelus aenus*, Geoffroy Saint Hilaire, 1817) at the south-west coast of Senegal, West Africa. *International Journal of Advanced Research*, vol. 3, pp.145-153.

[16] Onofri, V., J. Dulčić, A. Conides, S. Matić-Skoko, and B. Glamuzina. 2008. The occurrence of the blue crab, *Callinectes sapidus* Rathbun, 1896 (Decapoda, Brachyura, Portunidae) in the eastern Adriatic (Croatian coast). *Crustaceana*,

vol. 81, pp. 403-409. <https://doi.org/10.1163/156854008783797561>

- [17] Pallaoro, A.; Jardas, I. (1996). Ichthyological collection of the Institute of oceanography and fisheries in Split (Croatia). *Natura Croatica*, vol. 3, pp. 177-219.
- [18] Pipitone, C.; Campagnuolo, S.; Andaloro, F.; Potoschi, A. (2000). Diet of pilotfish, *Naucrates ductor* (Carangidae), associated with fads in Sicilian waters (Central Mediterranean). *Cybium*, vol. 24, pp. 415-418.
- [19] Reñones, O.; Massuti, E.; Deudero, S. Morales-Nin, B. (1998). Biological characteristics of pilotfish (*Naucrates ductor*) from the FADs fishery of the Island of Mallorca (Western Mediterranean). *Bulletin of Marine Science*, vol. 63(1), pp. 249-256.
- [20] Reñones, O.; Morales-Nin, B.; Deudero, S. (1999). Population size structure, age and growth of *Naucrates ductor* in the small scale FADs fishery of Mallorca Island (western Mediterranean). *Scientia Marina*, vol. 63, pp. 355-366. <https://doi.org/10.3989/scimar.1999.63n3-4355>
- [21] Rowling, K.R.; Raines, L.P. (2000). Description of the biology and an assessment of the fishery of Silver Trevally *Pseudocaranx dentex* off New South Wales. Final Report to Fisheries Research and Development Coroiration. Project No. 97/125, pp. 70.
- [22] Sarà, G.; Milanese, M.; Prusina, I.; Sarà, A.; Angel, L.D.; Glamuzina, B.; Nitzan, T.; Freeman, S.; Rinaldi, A.; Palmeri, V.; Montalto, V.; Lo Martire, M.; Gianguzza, P.; Arizza, V.; Lo Brutto, S.; De Pirro, M.; Helmuth, B.; Murray, J.; De Cantis, S.; Williams, A.G. (2014). The impact of climate change on Mediterranean intertidal communities: losses in coastal ecosystem integrity and services. *Regional Environmental Change*, vol. 14, pp. 5-17. <https://doi.org/10.1007/s10113-012-0360-z>
- [23] Smith, G.C.; Parrish, J.D. (2002). Estuaries as nurseries for the Jaks *Caranx ignobilis* and *Caranx melampygus* (Carangidae) in Hawaii. *Estuarine, Coastal and Shelf Science*, vol. 55, pp. 347-359. <https://doi.org/10.1006/ecss.2001.0909>
- [24] Vassilopoulou, V.; Siapatis, A.; Christides, G.; Bekas, P. (2004). The biology and ecology of juvenile pilotfish (*Naucrates ductor*) associated with Fish Aggregating Devices (FADs) in eastern Mediterranean waters. *Mediterranean Marine Science*, vol. 5/1, pp. 61-70. <https://doi.org/10.12681/mms.211>
- [25] Worm, B.; Barbier, E.B.; Beaumont, N.; Duffy, J.E.; Folke, C.; Halpern, B.S.; Jackson, J.B.C.; Lotze, H.K.; Micheli, F.; Palumbi, S.R.; Sala, E.; Selkoe, K.A.; Stachowicz, J.J.; Watson, R. (2006). Impacts of Biodiversity Loss on Ocean Ecosystem Services. *Science*, vol. 314, pp. 787-790. <https://doi.org/10.1126/science.1132294>