

Occurrence of the nonindigenous tubeworm *Ficopomatus enigmaticus* (Fauvel, 1923) (Polychaeta: Serpulidae) on the Albanian coast of the Adriatic Sea

Spase SHUMKA^{1*}, Lefter KASHTA², Arefi CAKE³

¹Agricultural University of Tirana, Tirana, Albania

²Faculty of Natural Sciences, Tirana University, Tirana, Albania

³Faculty of Natural Sciences, University "A. Xhuvani", Elbasan, Albania

Received: 11.03.2013 • Accepted: 05.02.2014 • Published Online: 20.05.2014 • Printed: 19.06.2014

Abstract: The serpulid *Ficopomatus enigmaticus* is listed among the nonindigenous species of the Mediterranean Sea, and its first occurrence in Albanian Adriatic waters is noted here. This record is the first for the southeast of the Adriatic. A description of ecological features and potential impacts on native biodiversity are given. The necessity for cooperation between countries for an integrated ecosystem approach is addressed.

Key words: Adriatic Sea, *Ficopomatus enigmaticus*, Mediterranean, nonindigenous species, Polychaeta

Ficopomatus enigmaticus (Fauvel, 1923), originally named *Mercierella enigmatica*, is a serpulid polychaete worm that builds and inhabits white calcareous tubes that vary from 1.85 to 2 mm in mouth diameter and 20 to 40 mm in length. They form gregarious congregations of large intertwining reef-like aggregates that may exceed 7 m in diameter. The tubes are flared at the openings and have collar-like rings along their length. Their color is white in the early stages, but brown stains occur when they are older. The worms are usually 20–25 mm in length, but may reach 40 mm. The tubes are often covered with green algae. They have a crown of 12–20 gray, green, or brown radioles, pinnulate branchiae that they extrude from the tube opening to filter-feed (ten Hove et al., 1978; Cohen et al., 1995; Costello et al., 2001; Luppi and Bass, 2002; Dauvin et al., 2013).

The aim of this paper is to formally record the first presence of *Ficopomatus enigmaticus* in the southeastern Adriatic Sea, with a discussion of potential risks to the ecosystem and the economy of the region.

Colonies were identified in the Seaman River Delta (40°51'25"N, 19°20'04"E) on 12 September 2011 and 5 September 2012 (Figure 1). Relevant photos and several measurements of calcareous tubes for both diameter and loglines were taken. Several specimens were collected and preserved.

According to ten Hove et al. (1978), *Ficopomatus enigmaticus* is a worldwide alien invasive of unknown

origin, although increasingly it seems likely to be a native of Australia. Typically, it forms small colonial hummocks of tube aggregations in estuarine waters, and is also able to do so on otherwise soft shores. In Italy, it was recorded at several sites, particularly in the northwest of the Adriatic Sea, in the Po Delta (Bianchi, 1981).

The species was first observed in northern France in 1921, and later at the London docks in 1922 (Eno et al., 1997). It was reported from Spain in 1931 and was subsequently observed in Denmark in 1939, in Wales and at some sites in the Mediterranean in 1953, in the Netherlands in 1968, in the Black Sea in 1971, and in Germany in 1975 (ten Hove and Weerdenburg, 1978; Vaas, 1978; Dauvin et al., 2003). It has also spread to the United States (including Hawaii), South Africa, New Zealand, and Japan (Forrest et al., 1979), and Argentina (Rioja, 1943). Bonaca (2001) listed *F. enigmaticus* among nonindigenous species for the North Adriatic area.

In our measurements (Figure 2), the tubes have a mouth diameter of 1.85–2 mm and are 25–40 mm in length.

The Semani River is the most turbid in the Mediterranean Sea. The sediment deposits in the sea area are around the mouth of the river. This process is very dynamic and makes the Semani's mouth very active. The Semani River has often changed its delta in the Adriatic Sea. Over previous centuries, these changes have happened within a width of about 25 km (Pano

* Correspondence: sprespa@yahoo.co.uk

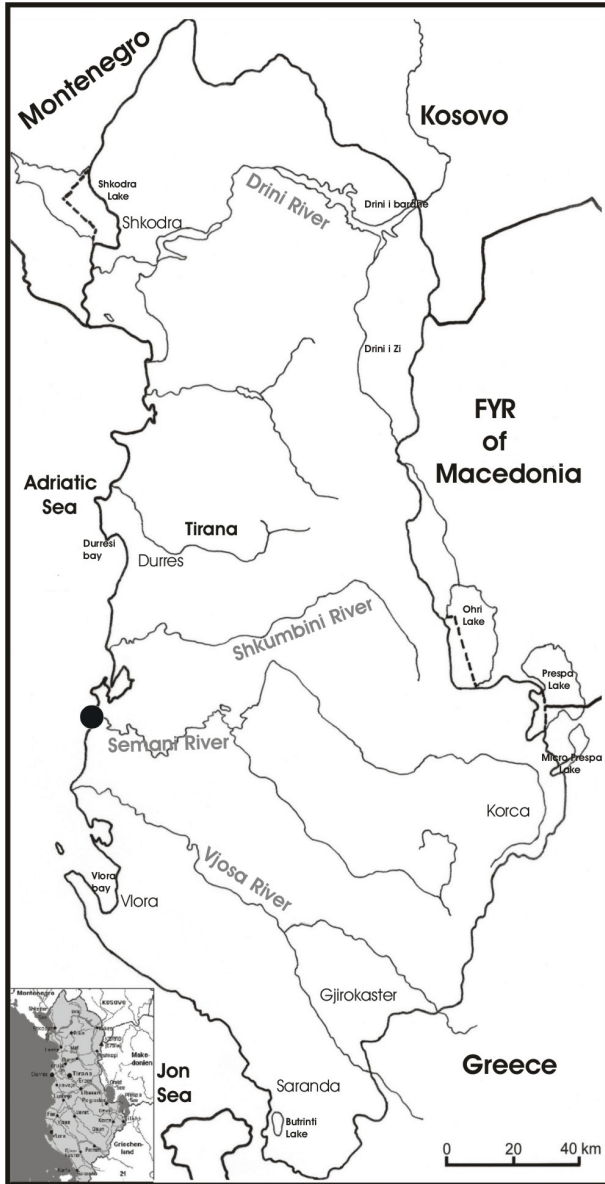


Figure 1. Map of Albania and site location of identified *Ficopomatus enigmaticus*.

and Frasheri, 2002). On the other hand, the river mouth itself faces various types of pollution, including those from oil-extraction waste, and a lack of integrated coastal management. Following Pano et al. (1975), water salinity observed for the area varied from a minimum of 15‰ to a maximum of 36.5‰, and water temperature varied from 9 °C to 31 °C.

Further studies on this population and on the potential dispersal of this species in adjacent areas would be of interest in improving information on the population structure and dynamics of this serpulid polychaete worm on the Albanian coast.



Figure 2. *Ficopomatus enigmaticus* in Semani River Delta.

The Southeast Adriatic Sea represents a small part of the entire Mediterranean marine zone; however, it has been subjected to intensive invasion by nonindigenous species. The dispersal vectors of the species involve both the Suez Canal and aquaculture and fishery activities, which in recent years cover large geographic areas. Following the results of different surveys (Schwindt et al., 2004a, 2004b), introduced *Ficopomatus* reefs play an important role in the hydrodynamics of the coastal lagoons by affecting the bed load transport and deposition of the sediment entering the system. Moreover, these effects would be magnified by the increase in density and size of the reefs over time. Along with that, the introduction of *Ficopomatus enigmaticus* in coastal lagoons has generated ecological changes (Schwindt et al., 2001), such as an increase in the abundance of many benthic species (Bianchi and Morri, 1996). In our observations made in the Semani River Delta and surrounding areas, the suspended sediment concentration is clearly higher where polychaetes show higher biomass. Similar conditions with increased nutrient concentration

and lower salinity were evidenced by Bianchi and Morri (1996), suggesting that these conditions might improve the reproduction and growth of *Ficopomatus enigmaticus*. On the other hand, other studies (Thorp, 1994) suggest that these environmental variables are important to the success of this exotic species.

Based on those facts, the future of the species' introduction is unpredictable; thus, there is a need for cooperation among all countries in data exchange and

introduction of an integrated approach for ecosystem and habitat conservation.

Acknowledgments

We are extremely grateful to the TAP (Trans-Adriatic Pipeline) survey team for their friendship and dedication in helping with the fieldwork. We also appreciate the generous help of L Shumka with the measurements of specimens and photos.

References

- Bianchi CN (1981). Policheti Serpuloidei. Guideper il riconoscimento delle specie animali delle acque lagunari e costiere italiane, AQ/1/96. Consiglio Nazionale delle Ricerche, Genova 5: 1–187.
- Bianchi CN, Morri C (1996). *Ficopomatus* 'reefs' in the Po River Delta (Northern Adriatic): their constructional dynamics, biology, and influences on the brackish-water biota. *Marine Ecology* 17: 51–66.
- Bonaca MO (2001). A survey of the introduced non-indigenous species in the northern Adriatic Sea. *An Ser Hist Nat* 25: 149–158.
- Cohen AN, Carlton JT (1995). Nonindigenous Aquatic Species in a United States Estuary: A Case Study of the Biological Invasions of the San Francisco Bay and Delta. Washington DC: US Fish and Wildlife Service.
- Costello MJ, Emblow CS, White R (2001). European Register of Marine Species. A Check-List of the Marine Species in Europe and a Bibliography of Guides to their Identification. Collection Patrimoines Naturels, 50. Paris: Muséum National d'Histoire Naturelle.
- Dauvin JC, Dewarumez JM, Gentil F (2003). Liste actualisée des espèces d'Annélides Polychètes présentes en Manche. An up to date list of polychaetous annelids from the English Channel. *Cah Biol Mar* 44: 67–95.
- Eno NC, Clark I, Sanderson WG (1997). Non-Native Marine Species in British Waters: A Review and Directory. Peterborough, UK: Joint Nature Conservation Committee.
- Forrest B, Taylor M, Hay C (1997). Foreign Marine Species in New Zealand: Towards a Risk Assessment and Management Model. Cawthron Report No. 424. Nelson, New Zealand: Cawthron Institute.
- Luppi TA, Bas CC (2002). Rol de los arrecifes del poliqueto invasor *Ficopomatus enigmaticus* Fauvel 1923 (Polychaeta: Serpulidae) en el reclutamiento de *Cyrtograpsus angulatus* Dana 1851 (Brachyura: Grapsidae), en la laguna costera Mar Chiquita, Argentina. *Ciencias Marinas* 28: 319–330.
- Pano N, Frasher A (2002). The coastal geomorphology of Semani river mouth – Karavasta lagoon in the southern Adriatic Sea. Second Balkan Geophysical Congress and Exhibition; 5–9 July 1999; İstanbul, Turkey, pp. 152–153.
- Pano N, Skendaj Z, Rokij N, Xheli M (1975). Kompleksi ujoj i Karavastase. Akademia E Shkencave. Tirana, Albania: Instituti Hidrometeorologjik.
- Rioja E (1943). Estudios Anelidológicos IX: La presencia de la *Mercierella enigmatica* Fauvel, en las costas argentinas. *An Inst Biol México* 14: 547–551.
- Schwindt E, Bortolus A, Iribarne OO (2001). Invasion of a reef-builder polychaetes: direct and indirect impacts on the native benthic community structure. *Biol Invasions* 3: 137–149.
- Schwindt E, De Francesco CG, Iribarne OO (2004a). Individual and reef growth of the invasive reef-building polychaetes *Ficopomatus enigmaticus* in a south-western Atlantic coastal lagoon. *J Mar Biol Assoc* 84: 987–993.
- Schwindt E, Iribarne OO, Isla FI (2004b). Physical effects of an invading reef-building polychaete on an Argentinean estuarine environment. *Est Coast Shelf Sci* 59: 109–120.
- ten Hove HA, Weerdenburg JCA (1978). A generic revision of the brackish-water serpulid *Ficopomatus* Southern 1921 (Polychaeta: Serpulinae), including *Mercierella* Fauvel 1923, *Sphaeropomatus* Treadwell 1934, *Mercierellopsis* Rioja 1945 and *Neopomatus* Pillai 1960. *Biol Bull* 154: 96–120.
- Thorp CH (1994). Population variation in *Ficopomatus enigmaticus* (Fauvel) (Polychaeta, Serpulidae) in a brackish water millpond at Emsworth, West Sussex, U.K. *Mémoires du Muséum National d'Histoire Naturelle* 162: 585–591.
- Vaas KF (1978). Immigrants among the animals of the delta-area of the SW. Netherlands. *Hydrolog Bull* 9: 114–119.