



<http://dx.doi.org/10.11646/zootaxa.3646.3.3>

<http://zoobank.org/urn:lsid:zoobank.org:pub:97EEE16F-C2EE-4329-99C8-6EAF4DCE104E>

Distribution of Sipuncula in the Gulf of Valencia and Cape Nao (western Mediterranean)

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Abstract

The present study analyses the distribution and diversity of sipunculan species inhabiting soft substrata in the Gulf of Valencia and Cape Nao (western Mediterranean) in relation to the characteristics of the sediment. Eighty-seven stations in 14 localities were sampled annually from 2004 to 2008. Nine species were reported, with *Aspidosiphon* (*Aspidosiphon*) *muelleri* being the dominant species in the area and *Thysanocardia procera* the most widely distributed. Pearson correlation coefficient and multivariate analysis showed how sipunculan abundances of certain species were related to the sediment characteristics, especially grain size. The shell-dwelling species *A. (A.) muelleri* and *Phascolion* (*Phascolion*) *caupo* were dominant in stations with high amount of coarse sand and gravel, while *Sipunculus* (*Sipunculus*) *nudus* appeared in stations dominated by fine sand with low organic content. *Pn. (Pn.) caupo* and *T. procera* were reported for the first time in the study area. Moreover, it was the second record of *Pn. (Pn.) caupo* for the Mediterranean Sea.

Key words: Sipuncula, Mediterranean, distribution, diversity, ecology, zoogeography

Introduction

The Sipuncula is a small group of marine worms represented by 36 species in the Mediterranean Sea (Ferrero-Vicente *et al.* 2012). Traditionally, Mediterranean Sipuncula have aroused little interest and have been barely studied (Ferrero-Vicente *et al.* 2011; Kędra & Włodarska-Kowalczyk 2008, Murina *et al.* 1999). There has been much debate about the origin of the group and their taxonomic status, and some authors suggest including this taxonomic group within the phylum Annelida based on recent genetic studies (Dordel *et al.* 2010; Kristof *et al.* 2008, 2011; Shen *et al.* 2009; Struck *et al.* 2007, 2011). Moreover, genetic techniques seem to lead to a new classification for the sipunculan families (Kawauchi *et al.* 2012). However, sipunculan ecology has been scarcely studied and is little known. Due to the lack of taxonomic specialists on this group, species distributions are poorly understood (Kędra & Włodarska-Kowalczyk 2008; Murina *et al.* 1999). This study delves into these aspects focusing on sipunculans inhabiting soft substrata in the shallow continental shelf of the Gulf of Valencia and Cape Nao (Spanish Mediterranean). There is hardly any previous information about sipunculan species living in this area although detailed studies have been conducted in nearby areas (Ferrero-Vicente *et al.* 2011, 2012), and, in a wider range, about sipunculans from Spanish coastal areas (Pancucci-Papadopoulou *et al.* 1999; Saiz-Salinas, 1982, 1986, 1993a; Saiz-Salinas & Murina, 1982; Saiz-Salinas & Villafranca-Urchequi, 1988, 1990). In addition to this information, few isolated records can only be found, since species level for this phylum is seldom reached in general studies of macrobenthic fauna (Kędra & Murina, 2007).

Ten species of Sipuncula are known for the study area; *Aspidosiphon* (*Aspidosiphon*) *misakiensis*, *A. (A.) muelleri*, *Golfingia* (*Golfingia*) *elongata*, *Golfingia* (*Golfingia*) *vulgaris vulgaris*, *Onchnesoma steenstrupii*, *Phascolion* (*Isomya*) *tuberculosum*, *Phascolion* (*Phascolion*) *strombus strombus*, *Phascolosoma* (*Phascolosoma*) *granulatum*, *Phascolosoma* (*Phascolosoma*) *stephensoni* and *Sipunculus* (*Sipunculus*) *nudus* (Pancucci-Papadopoulou *et al.* 1999; Saiz-Salinas 1986; Saiz-Salinas & Murina 1982). Moreover nine different species have been described in previous studies close to this area, with *A. (A.) muelleri* being the most abundant