



## Molecular and morphological description of a new species of *Halisarca* (Demospongiae: Halisarcida) from Mediterranean Sea and a redescription of the type species *Halisarca dujardini*

ALEXANDER V. ERESKOVSKY<sup>1,2,4</sup>, DENNIS V. LAVROV<sup>3</sup>,  
NICOLE BOURY-ESNAULT<sup>1</sup> & JEAN VACELET<sup>1</sup>

<sup>1</sup>Université Aix-Marseille, Centre d'Océanologie de Marseille, Station marine d'Endoume - CNRS UMR 6540-DIMAR, Marseille, France

<sup>2</sup>Department of Embryology, Biological Faculty, St Petersburg State University St Petersburg 199034 Russia

<sup>3</sup>Department of Ecology, Evolution, and Organismal Biology, Iowa State University, USA

<sup>4</sup>Corresponding author. E-mail : alexander.ereskovsky@univmed.fr

### Abstract

*Halisarca harmelini* sp. nov. is described from the northwestern Mediterranean Sea at depths between 15–65 m from coralligenous rocks. The new species occurs as thin sheets only on the bryozoan *Smittina cervicornis*. Morphologically, it is characterized by its thin layer architecture, skin-like, lusterless and smooth surface, a soft, very delicate and easily torn texture, and pale-yellow colour. At the cytological level *H. harmelini* is characterized by a complex of cells with inclusions: spherulous, vacuolar, granular, microgranular and rhabdiferous cells. The new species is clearly different in cell and endobiotic bacteria content and in external morphology from all previously described species of *Halisarca*. In addition to the description of the new species, we have conducted a thorough ultrastructural investigation and re-described the type species *Halisarca dujardini* Johnston, 1842 using specimens from different region of the North Atlantic, Arctic and North Pacific. To investigate the relationships between *H. harmelini* and *H. dujardini* on the molecular level, we determined the complete mitochondrial DNA (mtDNA) sequences of the new species of *Halisarca* and compared it with that of *H. dujardini*. The two mitochondrial genomes are identical in gene content and gene arrangement but differ in size by ~1,300 bp (6.8%). The overall genetic distance between coding sequences is 0.1, much greater than what has been previously reported for individual species of non-bilaterian animals. The latter observation supports the new species status of *H. harmelini*.

**Key words:** taxonomy, Porifera, Halisarcida, *Halisarca*, new species, mitochondrial genome, *Halisarca dujardini*, N-W Mediterranean, ultrastructure

### Introduction

The taxonomy of Porifera as well as those of many other animal phyla includes numerous cosmopolitan species. However, recent investigations have showed that many of these “cosmopolites” in reality constitute complexes of species (Solé-Cava & Boury-Esnault 1999; Boury-Esnault & Solé-Cava 2004; Nichols & Barnes 2005; Blanquer & Uriz 2007). In fact, every supposedly cosmopolitan sponge species analyzed to date turned out, under closer molecular scrutiny, to be a group of several highly divergent but morphologically nearly similar species (e.g. Klautau *et al.* 1994, 1999; Muricy *et al.* 1996; Lazoski *et al.* 2001; Wörheide *et al.* 2002, 2003, 2008). The problem is especially acute for demosponge species with no mineral skeleton, as spicules are essential in traditional sponge taxonomy (e.g., Blanquer & Uriz 2007). The demosponge *Halisarca dujardini* Johnston, 1842, presents an especially difficult case as it lacks both mineral skeleton and organic spongin fibers. Although traditionally considered to be a single cosmopolitan species (Bergquist 1996; Bergquist & Cook 2002) *H. dujardini* undoubtedly also constitutes a complex of species.