Article

Phylogeny and an integrated biogeography of *Acanthotetilla* Burton, 1959 (Demospongiae: Spirophorida: Tetillidae): two-way traffic on the peri-African track

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Abstract

The recent description of Indonesian and Brazilian species of *Acanthotetilla* motivated the onset of a phylogenic and biogeographic revision of this taxon, to figure whether it had an Atlantic or an Indo-Pacific origin, and whether a Tethyan or southern African route might have been followed. A datamatrix with 27 morphological characters and 63 character states was tabulated and run on PAUP*4.0 using a parsimony algorithm. The resulting phylogenetic hypothesis was converted in a Taxon Area Cladogram (TAC) and used as a basis for a comparative analysis of the evolutionary history of the comprised biogeographic provinces, which in turn was contrasted to additional poriferan phylogenies. The *Acanthotetilla* TAC was further used in a dispersal-vicariance analysis with the software DIVA 1.1, and in a manual panbiogeographic analysis. The resulting preferred tree has a high Bootstrap support, as a consequence of the largest ever ratio of morphological character states employed per OTU among published poriferan phylogenies. The result shows Central Indo-Pacific provinces basal to the whole clade, then Western Indo-Pacific provinces basal to the Tropical Western Atlantic ones, thus unequivocally suggesting colonization of the latter from the former, and likely following a southern African route. It is suggested here that this might have been accomplished through rafting on rings of the Agulhas Current. The dispersal – vicariance analysis undertaken postulated a recent dispersal event with recolonization of the Seychelles from the western Atlantic. The panbiogeographic map for *Acanthotetilla* also points to Western Indo-Pacific origin of Tropical Western Atlantic species. A comparison with 10 additional sponge phylogenies did not recover any prevailing trends for the relationships of the major areas utilized in the present analyses, but identified two taxa with likely Central Indo-Pacific origins (*Thrinacophora, Placospongia*), and one with a Western Indo-Pacific origin of Tropical Western Atlantic clades (*Petromica*). The integrated biogeographic approach to the analysis of *Acanthotetilla* data permitted distinct interpretations, which might have been overlooked in case a single method was chosen *a priori*.

Keywords: Porifera, morphology, integrated biogeography, cladistic biogeography, dispersal-vicariance analysis, panbiogeography

Introduction

The biogeographic scenario for *Acanthotetilla* Burton, 1959 has markedly changed in the latter years as a consequence of new species being found in areas where the genus had not been previously recorded. Van Soest (1994) considered it a typical case of discontinuous distribution, given its Central western Atlantic—Western Indian Ocean occurrence known at that time. The recent description of a species from Indonesia (De Voogd & Van Soest 2007) and of two southwestern Atlantic species (Peixinho *et al.* 2007) expanded the genus' distribution easterly and strengthened the western hemisphere imprint in its evolution.

Peixinho *et al.* (2007) proposed two alternative scenarios for the colonization of northeastern Brazil by *Acanthotetilla*. The first scenario, dubbed Hypothesis 1, predicted invasion from the north; while the second one, Hypothesis 2, suggested a southern route around Cape of Good Hope. These authors went further in listing a few