

Comparative study on the nervous system of Tunicata in order to elucidate tunicate phylogeny

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Guest

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Tunicates are exclusively marine animals and as one of the major chordate taxa possibly closest living relatives to vertebrates. However, tunicate phylogeny remains ambiguous, because molecular phylogenetic studies of the interrelationships of tunicate taxa are contradictory. In order to elucidate chordate evolution we reconstruct the phylogenetic relationships of 19 tunicate families, belonging to all five major tunicate taxa. Our final character matrix includes 118 characters (109 binary, 9 multiple state) and 49 tunicate and 5 outgroup species. In addition to classical tunicate characters (e.g. structure of branchial basket, body division, colony formation, position of gonads), that traditionally were used in ascidian taxonomy, we focussed on neuroanatomical characters. The latter played a major role in phylogenetic considerations in many other taxa.

Neuroanatomical characters are quite similar within tunicates in some aspects, but differ considerably in others. Our results confirm two monophyletic taxa within tunicates that are also described in molecular phylogenies, sessile Stolidobranchiata and planktonic salps. The phylogenetic relevance of some characters present in salps such as the absence of the brain-associated neural gland, specialized sense organs, conspicuous motoneurons, serotonergic neurons, and lateral nerve fiber tracts in the brain is difficult to ascertain, because these characters might be the result of the more active planktonic lifestyle in opposition to a sessile mode of life in ascidians. Our data also support the monophyly of Ascidiacea that has been debated by scientists for a long time. Apomorphies characterising Ascidiacea are for example sessile adults and serotonergic cells in the endostyle.