ABSTRACT

Sponges show highly adaptive life history strategies and are characterized by extraordinary long life spans. Despite resembling their unicellular colonial ancestor in many ways, sponges share a majority of features with sessile filter-feeding invertebrates. Understanding the biodemography of sponges is challenged by the multiple organizational levels that may define an individual, although may shed light on the evolution of multicellular life. This thesis identifies physiological traits that characterize sponges as metazoan link to unicellular choanoflagellates and evaluates the present view on sponge individuality. Further, essential prerequisites for studying the biodemography of the cosmopolitan demosponge *Halichondria panicea* are provided, considering behavioral aspects and important bioenergetic principles that drive the potential of non-senescence. The filter-feeding capacity of *H. panicea* explants with several exhalant openings (oscula) is investigated to unravel their ability to nourish solely on phytoplankton versus free-living bacteria, suggesting that similar mechanisms as observed in more advanced filter-feeders may drive the demographic dynamics of sponges. Novel findings on a direct relationship between the filtration rate and the contractile behavior, i.e., osculum dynamics, of single-osculum *H. panicea* explants are presented, implying high individual variability in filter-feeding activity. Constant respiration rates of single-osculum sponge explants in spite of repeated contraction-expansion events in combination with gradually reduced pumping rates over longer starvation periods further indicate a possible trade-off between growth and survival. In the present thesis it is suggested that the interplay of behavioral, physiological and metabolic responses are basic principles underlying the biodemography of aging in sponges, and the presented results emphasize the demand for a reconsidered concept of sponge individuality for future investigations.