

**Investigating the Bald Sea Urchin Disease (BSUD) in a natural population of *Paracentrotus lividus*
in the Gulf of Naples**

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The Bald Sea Urchin Disease (BSUD) is a disease reported in captive populations in different geographical areas. Its distinguishing macroscopic features comprehend the loss of appendages and test damage, characterized by brown/greenish areas, biofilm accumulation and terminating with ulceration. Nowadays, although studies reporting this disease in different sea urchin species all over the world have increased, there are still few data on BSUD pathogenesis in the purple sea urchin *Paracentrotus lividus* that has a fundamental ecological role in the Mediterranean Sea. The aim of the present work is to investigate BSUD in the natural population of *P. lividus* from the Gulf of Naples sampled in 2021, from gross description of spines and tissues to microscopy, including histopathology, immunohistochemistry of a conserved cellular stress marker (Hsp70) and Scanning electron microscopy (SEM). Analyses were performed both in healthy and diseased individuals classified according to the disease progression. Gross observations were represented by visceral test discoloration and ulceration, loss of appendages, greenish accumulation, and visceral hyperpigmentation. SEM analysis of diseased individuals revealed the bare exoskeleton and multiplying bacteria at the base of the spines, penetrating inside the damaged test. Animal histopathology revealed inflammatory lesions and accumulations of brown pigments in the advanced disease stages. Tissue IHC localized Hsp70 at basal membrane of digestive epithelium and related mucous cells; labelling was also evident in circulating coelomocytes and in affected individuals following immune cell diapedesis. This work attempts to give further insight into this disease responsible for *Paracentrotus lividus* recent die-offs in the Mediterranean Sea.