

Stefano Schiaparelli

University of Genoa, Italy

Benthic monitoring based on underwater photogrammetry: lesson learned in Antarctica, legacy data rescue and future developments for long-term monitoring programmes

Stefano Schiaparelli, Vonda Cummings, Drew Lohrer, Simone Marini, Peter Marriott, Fabio Menna, Erica Nocerino, Andrea Peirano, Paola Piazza, Fabio Remondino

MNA, Italian National Antarctic Museum, Section of Genoa, University of Genoa, Genoa, Italy ; DISTAV, Department of Earth, Environmental and Life Sciences, University of Genoa, Genoa, Italy ; National Institute of Water & Atmospheric Research, Hamilton, New Zealand ; CNR/ISMAR-SP, Research National Council, Institute of Marine Science U.O.S. La Spezia, Lerici (La Spezia), Italy ; FBK- [3] DOM, [3] D Optical Metrology unit, Bruno Kessler Foundation, Trento, Italy ; ENEA, Marine Environment Research Center, Lerici (La Spezia), Italy ; DSFTA, Department of Physical Sciences, Earth and Environment, University of Siena, Siena, Italy

Within the coastal marine monitoring activities suggested by the SCAR (Scientific Committee for Antarctic Research) Expert Group of ANTOS (Antarctic Near-shore and Terrestrial Observing System), image-based methodologies, such as photogrammetry, have been identified as low cost and effective tools to establish long-term monitoring programs of benthic communities. Due to their non-destructive nature, image-based protocols represent suitable tools to study such fragile Antarctic habitats. The effectiveness and handiness of Computer Vision-aided photogrammetry, moreover, produce evident advantages in extreme or logistically challenging underwater environments, where field activities, especially if SCUBA-based, necessarily have to be efficient, rapid, minimize bottom time and, at the same time, guarantee useful results with the minimum environmental impact. Here we present the results of the photogrammetric processing of a collection of georeferenced videos, depicting different permanent transects deployed in 2006 and 2015 by two different international projects (NZ and Italian, respectively) at close range distances within the same area (Tethys Bay, Ross Sea, Antarctica). Despite several technological challenges faced in image elaboration for photogrammetric reconstructions, 3D models of the seabed and of large organisms were successfully obtained through photogrammetry. Thanks to the details of the models, it is possible to count invertebrates, to record their georeferenced positions and estimate shape and volume of large organisms such as sponges with an unprecedented level of detail.