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The largest sponge in the world?

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Sponges (phylum Porifera) are essential components of benthic marine communities that rival reef-building corals in terms of abundance and diversity (Van Soest et al. 2012; Kerksen et al. 2014). Several marine sponges are known to attain massive sizes, thereby providing key ecosystem services such as filtering large amounts of seawater, as well as providing important habitat to a myriad of invertebrate and microbial species (McMurray et al. 2008; Kerksen et al. 2014). The largest dimensions reported for any sponge were those of a colony of *Aphrocallistes vastus* Schulze, 1887, found in shallow waters (<25 m) off western Canada. The colony measured 3.4 m in length, 1.1 m in height and 0.5 m in width (Austin et al. 2007). Large sponges are known to exist in deep water as well—for example, *Monorhaphis chuni*, which forms giant basal spicules that can reach lengths of up to 3 m (Wang et al. 2009). During a recent expedition to the Northwestern Hawaiian Islands aboard the R/V *Okeanos Explorer*, we encountered a massive sponge (Fig. 1), whose length, height and width exceeded the dimensions of the largest specimens reported in the literature. The sponge was captured on high-definition video from the two-body remotely operated vehicle (ROV) system (*Deep Discoverer* and *Seirios*) during a dive on a ridge extending north from Bank 9 (27.13082°N, 175.57085°W 2117 m, 12 August 2015), within the Papahānaumokuākea Marine National Monument. The height and width of the sponge were measured from horizontal images taken from the *Deep Discoverer* ROV while two parallel laser beams were projected onto the sponge, whereas its length was measured from a *Seirios* ROV overhead image using the dimensions of the ROV (3.15 m × 1.85 m) for calibration. ImageJ image analysis software (Wayne Rasband, National Institutes of Health, Bethesda, MD) was used to obtain the measurements. The sponge was determined to be over 3.5 m in length, 2.0 m in width and 1.5 m in width, thus exceeding the dimensions of the largest sponge previously known (Austin et al. 2007). While the massive colony was not sampled, we collected a specimen of what we believe to be the same species during a previous dive at a nearby location (27.14316°N, 176.22617°W, 2104 m). Based on a microscopic examination of spicules, that specimen was identified as belonging to the hexactinellid family Rossellidae and subfamily Lanuginellinae. Aside from these two specimens, we encountered no individuals of this non reef-building species as part of the expedition, during which we conducted a total of 18 ROV dives to depths ranging from 1096 to 4829 m. The finding of such an enormous and presumably old sponge inside the Papahānaumokuākea Marine National Monument underscores the need to protect this area using the highest conservation measures available. While not much is known about the lifespan of sponges, some massive

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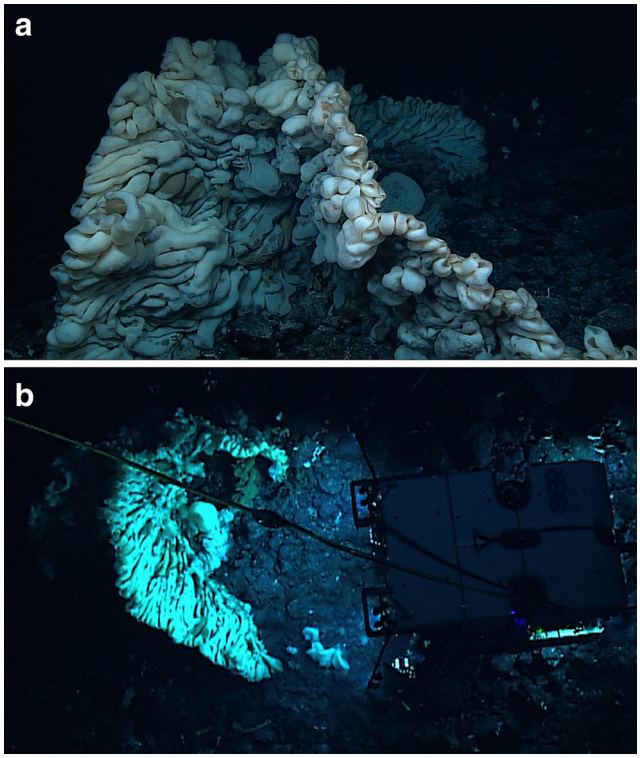

Fig. 1 The massive sponge photographed at a depth of 2117 m in the Papahānaumokuākea Marine National Monument by **a** the ROV *Deep Discoverer* and **b** its companion ROV *Seirios*

species found in shallow waters (<30 m) are estimated to live for more than 2300 years (McMurray et al. 2008). Finally, the finding of such a large organism as that reported here highlights the value of using deep-diving technologies in surveying the deepest parts of our oceans, which remain largely unexplored.

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