Table 1 Data. The descriptions for the columns:

Rock Density: There are four treatments (Rock). The density for each treatment is g /cubic-centimeter. Means and standard deviations calculated from individual samples (n=10 each rock type).

Lab bioerosion: There are four treatments (Rock, n = 10 each rock type). Controls are two types: 1) units without urchins for three of the Rock types: fine-grain sandstone (n=3), granite (n=3), and mudstone (n=2) and 2) units without urchins or rocks (just epoxy, n=5). Wt change (in grams) is the difference between the weight at the start and end of the one-year experiment; positive values = weight loss and negative values = weight gain. For sandstone (med-grain), granite, and mudstone, the bioerosion rate = mean of rock units – mean of controls for that type of rock. For fine-sandstone bioerosion rate = mean of rock units – ((mean of sandstone (med)/control of sandstone (med)) \* mean of rock units).

Field pit size: The volumes are reported in cubic-centimeters. The sandstone pits are from Bean Hollow, the mudstone pits are from Palomarin, and the granite pits are from two sites – Bodega and Montara Lighthouse.

Rate: Calculated as (Field Pit size)/((Lab bioerosion)/(Density)).

Field bioerosion: Calculated as (Lab bioerosion) \* (Urchin density) \* .01 (convert square meters to hectares and grams to metric tons). See S1 Table 1 for Urchin density data.

Fig. 3: Surface plot data. For each of the four rock types there are two sets of three-dimensional plotting data. Both sets of plotting data share the same X, Y coordinates. The two sets are distinguished by different Z values: Zstart = coordinates at the start of the experiment, the contour plots in the upper part of the graph, and Zend = coordinates at the end of the experiment (one year later), the contour plots in the lower part of the graph.

Fig. 4. Dissection data. All values are dry weights in grams. Test = combined spines, test, and peristomal membrane, Lantern = Aristotle’s Lantern, Gut = entire digestive tract, Gut Cont = contents of entire digestive tract, Gonad = all gonadal tissue. The first two components of the Principal Component Analysis are PC-1 and PC-2.

Fig. 5. Growth data. For each of the four rock types there are ten replicates. Each replicate was measured on three different dates: the start of the experiment (August 29, 2012), at 6 months (March 4, 2013), and at the end (August 27, 2013). Diameter (Diam) and Height of the sea urchin are reported in mm and urchin volume in is cc. The volume is calculated from diameter and height using the formula reported in Elliott et al. (2013).

Fig. 6. Field estimates of urchin and pit volumes. The sea urchin was removed from the pit and the diameter (Diam) and height (Height) in mm were recorded. Two measures (when possible) of pit Width and Depth were recorded (in mm). To measure depth, a flat metal plate with a hole in the middle was placed over the pit. The plate was 1.7 mm thick. To calculate the pit volume, the Depth is the mean of the two measurements minus 1.7, and the Width is the mean of the two measurements. The sampling dates: Montara Lighthouse on July 13, 2014, Bean Hollow on July 24, 2013 and Palomarin on July 23, 2013. Urchin volume calculated from diameter and height using the formula reported in Elliott et al. (2013). The data plotted in Fig. 6 are the cube-roots (^1/3) of volumes.

Fig. 7. Weight lost (g) in each of the 5 treatments (n=5 for each). Replicate number refer to the units used in the one-year experiment for the rock units. The glass controls were only for the waste-collection experiment.

Figs. 8 and 9. Substrate is the inorganic dry weight lost. Waste and GutC (Gut Content) are the inorganic weights attributed to bioerosion (Fig. 8). Unacc is the unaccounted percentage change in rock block mass (Fig. 9).

Fig. 10. Experiment comparison. The same units were used in both the one-year and Waste Collection (Waste C) experiments. There are two estimates of bioerosion (g) for each unit.