Cover of hard substrate determines species diversity

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Exploration of the deep sea

The deep seabed is one of the most unexplored — and is one of the largest — regions in the world(1, 2, 3). It is exceptionally difficult to sample because of its extreme conditions. In newer years, video sampling has become the main method for deep sea exploration. Submersibles are equipped with cameras and takes pictures or video footage of the creatures living in these inaccessible areas. Figure 1 shows a picture of a deep-sea sponge with a crustacean associate.

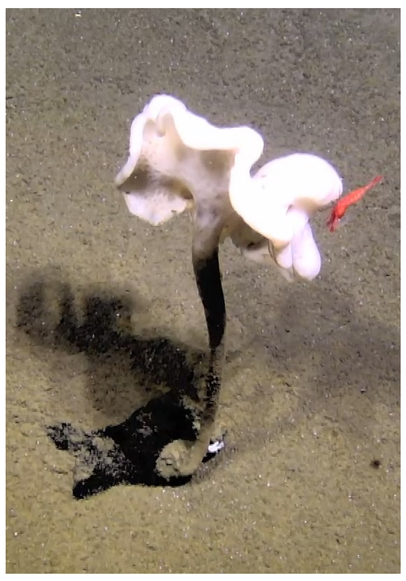

Figure 1: A deep-sea sponge with a crustacean associate.
Picture taken from video footage analysed in this project.

The goal of this project is to determine the importance of substrate on the biological diversity on the deep seabed. Video footage from an extinct volcano close to the Atlantic mid-ocean ridge at depths between 2800 and 3000 meters (see Figure 2 for placement) was analysed by counting the number of species and number of individuals of each species. Individuals were counted when they crossed a central line. Every minute, a picture was extracted and placed in a software. A grid was placed over and the squares with hard substrate was counted. The number of squares with substrate was divided by the total number of squares to estimate the percentage.

Figure 2: A map showing the approximate placement of the underwater volcano.
Picture created by Hans Tore Rapp

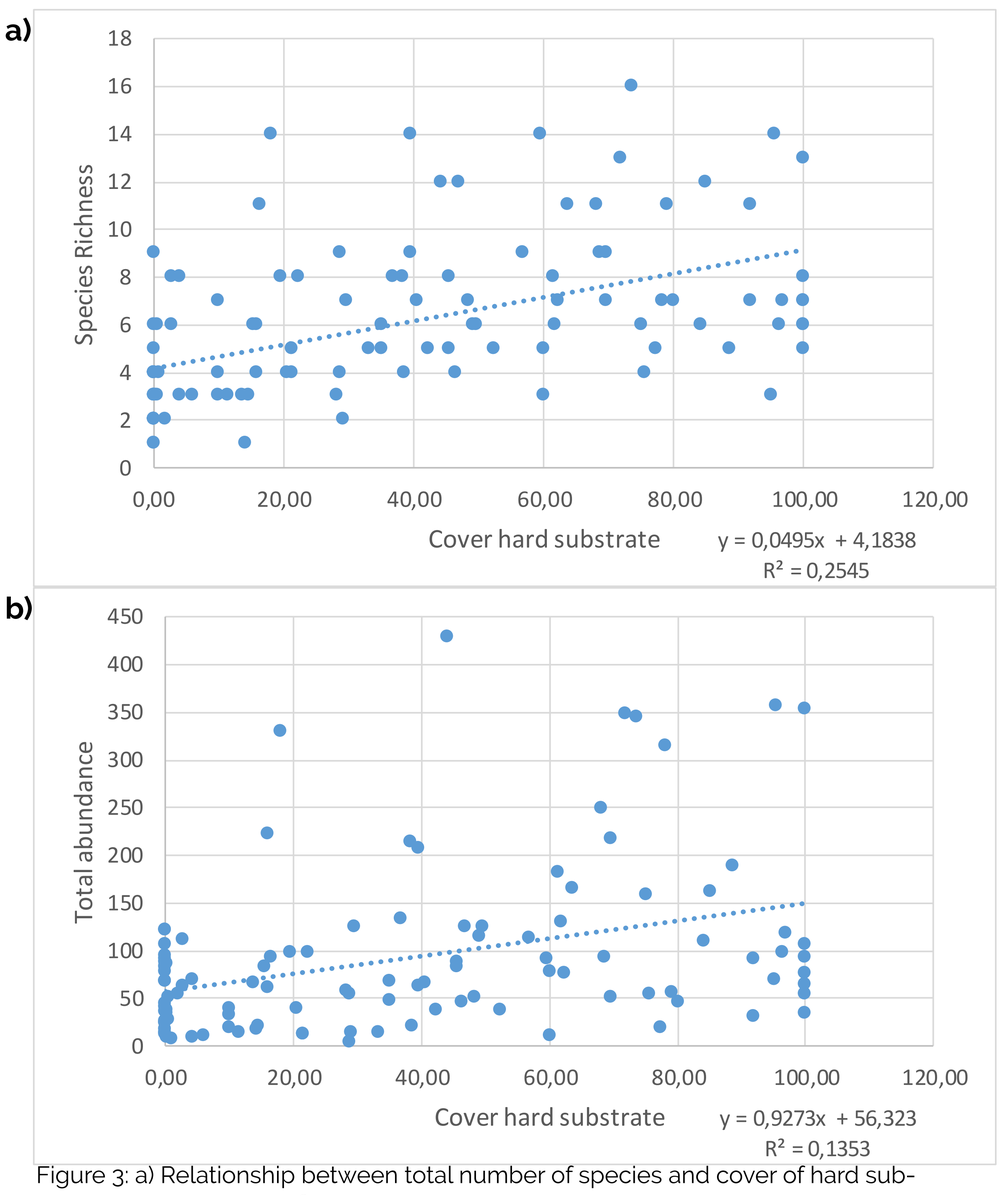

Figure 3: a) Relationship between total number of species and cover of hard substrate. with correlation R^2 in the lower right corner. b) Relationship between total number of individuals with correlation R^2 in the lower right corner.

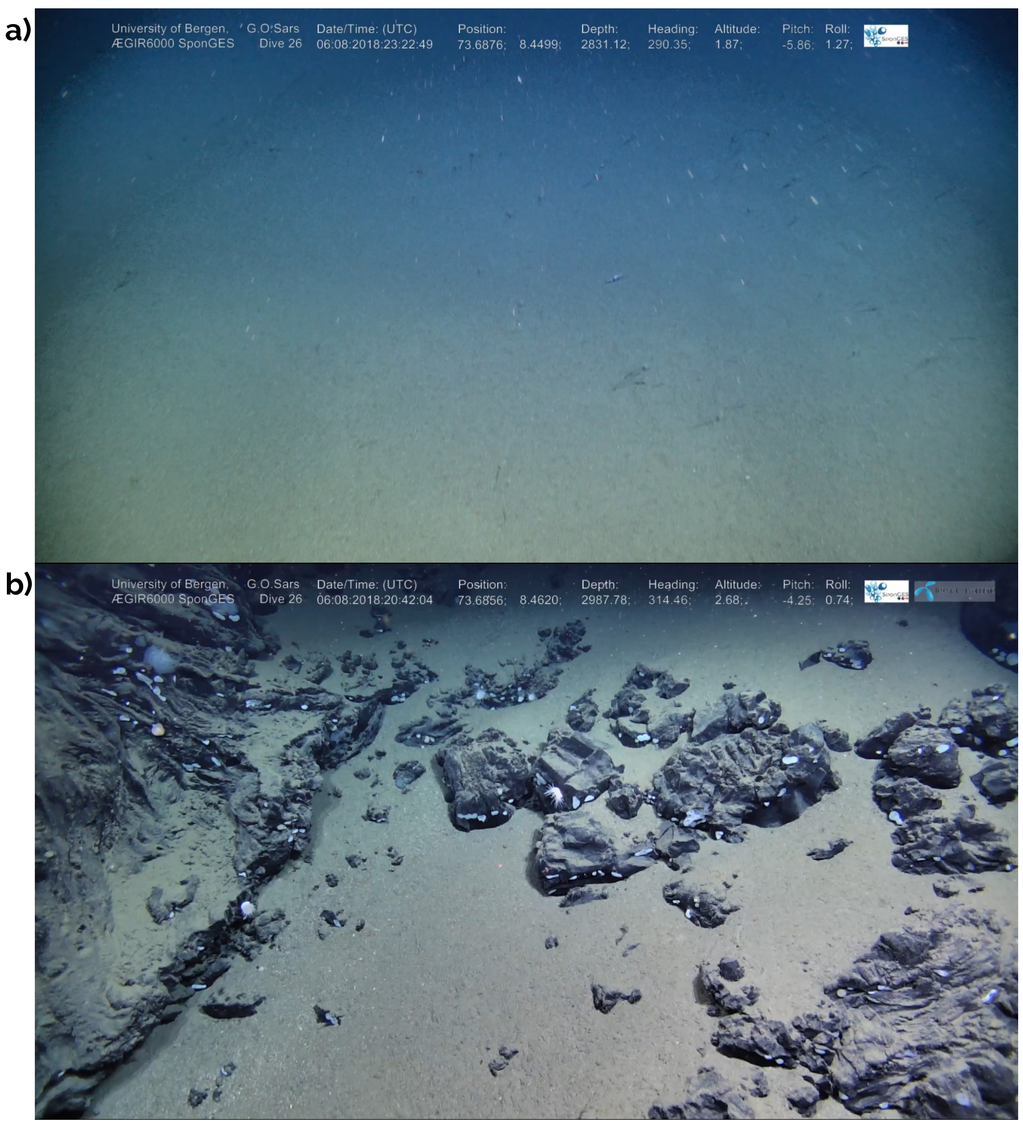

Figure 4: a) An example of soft substrate deep seabed. b) An example of mostly hard substrate seabed.
Pictures taken from video footage analysed in this project.

Importance of Hard substrate

When looking at how the amount of hard substrate affect the species richness, there is a clear correlation (Figure 3 a). Hard substrate supports more species than the soft substrate. The total number of individuals is less correlated with hard substrate (Figure 3 b).

Figure 4 a shows an example of soft substrate. It has only one species present. However, there are several individuals. Figure b shows an example of hard substrate. It has several different species present in a high number. Thus, these two pictures show that hard substrate supports a higher species diversity.

References:

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