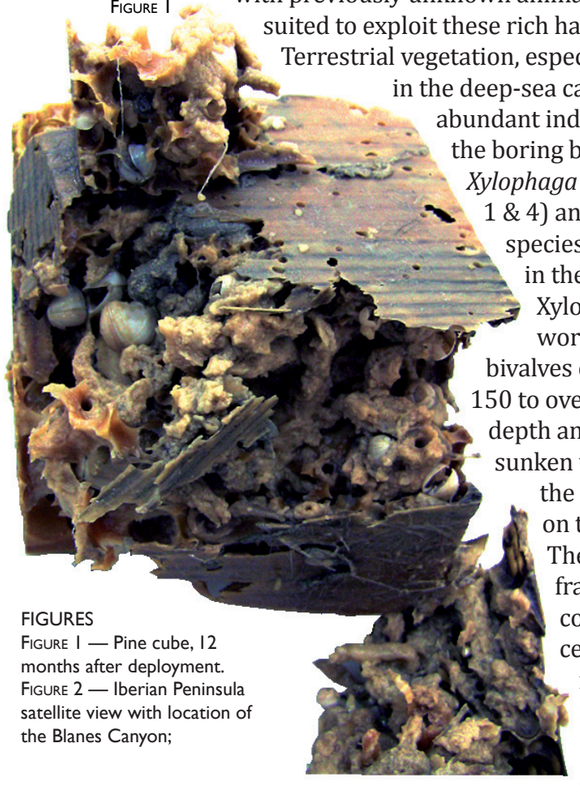
SECRETS OF THE CANYON

Our knowledge of the animals living in the Mediterranean Sea is better than for any other ocean, but, even here, the deep-sea still holds more secrets. Our team opted to investigate deep undersea canyons and their fauna and their connections to land.

Do flood-ravaged rivers sweep debris into the ocean and offer up a feast for deep-sea fauna? If so, mounds of detritus at the bottom of submarine canyons may teem with previously unknown animals uniquely suited to exploit these rich habitats.

Terrestrial vegetation, especially wood, in the deep-sea can sustain abundant individuals of the boring bivalve genus *Xylophaga* (Figures 1 & 4) and over 50 species are known in the subfamily Xylophagainae worldwide. These bivalves occur from 150 to over 5000 m in depth and bore into sunken wood using the toothed ridges on their shells. They eat wood fragments by converting the cellulose to a more readily metabolized form using gill-associated symbiotic bacteria. Only one species, *X. dorsalis* is known from the Mediterranean.

Figure 1



FIGURES
Figure 1 — Pine cube, 12 months after deployment.
Figure 2 — Iberian Peninsula satellite view with location of the Blanes Canyon;

To find out if more unknown species exist here, the Blanes Submarine Canyon (north-west Mediterranean) and adjacent open slope (Figures 2 & 3) were targeted. Three replicate moorings containing pine and oak pieces (to represent the most common trees inland) were deployed at various depths both in and away from the canyon. These were collected after 3, 9 and 12 months. Boring bivalves are a good group to study, as they live inside the wood, which means that they are not lost during recovery.

Our collected bivalves are all new species; here we call them *Xylophaga* spp. *A*, *B* and *C*.

We found that these three different species colonized the wood at different times. The first colonizer was *X. A*, the only species found in the 1200 m samples after 3 months. The species was more abundant inside than outside the canyon, and appeared to prefer pine rather than oak cubes (Figure 5). Nine months after deployment, the three *Xylophaga* species had already colonized the wood, with abundances about 40 times higher inside the canyon than at the adjacent slope, where the colonization rate did not increase with deployment time (Figure 5). After 12 months, the 900 m deep pine cubes were so extensively bored that some crumbled, and the largest *Xylophaga* specimens may have been lost during recovery. While *X. A* was the dominant species, being most abundant at 900 and 1200 m deep, *X. B* clearly preferred pine cubes (Figures 1 & 5). In turn, *X. C* was rare, appearing only nine months after deployment at 1200 m deep. Different wood types deployed at the same depth, in the same conditions, and during the same time, were colonized by different species, suggesting that the species actively select their preferred substrates.

More wood-boring bivalves occurred inside than outside of Blanes Canyon, strongly supporting the view that the canyon concentrates land-derived vegetal fragments. Specifically, the Canyon's position near the Tordera River identifies it as an important source of vegetal debris, despite having intermittent flow. It is likely that pulses of vegetal debris enter the canyon during floods, which are historically well-documented. An ancient trade vessel which sank in the Mediterranean would also have created the same abundance of food, and attracted the same attention from boring bivalve species. These little-known animals may help to explain why there are so few wooden ships on the seafloor—they have been digested.

Figure 2

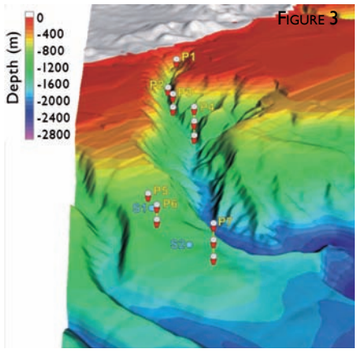


Figure 3

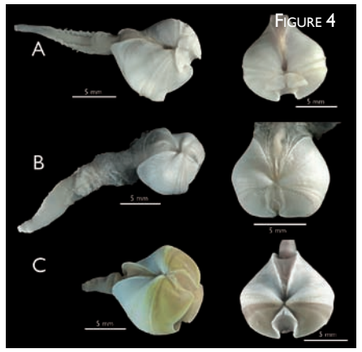


Figure 4


Figure 5

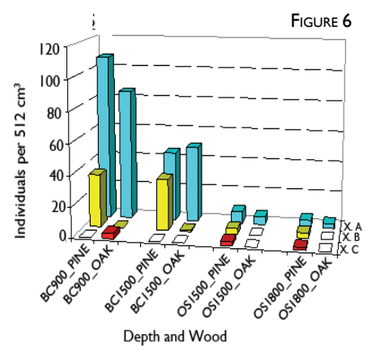


Figure 6

FIGURES
Figure 3 — 3D reconstruction showing the location of the deployments (courtesy of Professor Miquel Canals)
Figure 4 — The *Xylophaga* species in lateral and dorsal views.
Figure 5 — Detail of an experimental trap, 12 months after deployment
Figure 6 — Abundances of the three *Xylophaga* species at the different depths and after 12 months deployment inside the Blanes Canyon (BC) and in the adjacent Open Slope (OS).

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Voight, J.R., 2008. Deep-sea wood-boring bivalves of *Xylophaga* (Myoida: Pholadidae) on the Continental Shelf: a new species described. *JMBA*, **88(7)**, 1459–1464. DOI:10.1017/S0025315408002117.