



Q&A

OFFSHORE



Q1: There are machines and animals in this the scene that use sonar - where the echoes of soundwaves are used to work out distances. How many vessels and animals can you see scanning their underwater surroundings?

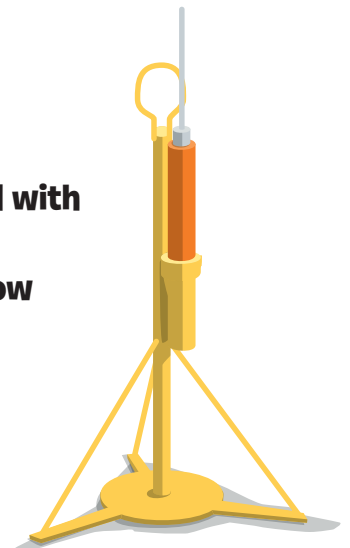
A: There are loads of sonar scanning sea surveyors in this scene - both mechanical and biological! There's a manned submarine in (E,3), as well as four other unmanned survey vessels in (B,1), (C,3), (E,2) and (G,3) - and there's a sneaky one being towed by a boat in (G,4). Some of the larger boats in the scene also have sonar devices attached to their bellies, and the geophysical vessel in (F,5)

uses sonar to see underwater. As for the animals, there are two dolphins by the underwater wreck who use sonar to help them navigate and identify objects in their surroundings. They are so good at it, in fact, that they can tell the difference between a BB pellet and a kernel of corn from 50 feet away! I wonder what they'll make of the rusty shipwreck!

Q2: Check out the vessels roaming around underwater. These ROVs (Remotely Operated Vehicles) work out their positions using sonar - measuring the distances to the sea bed 'transponders', which are laid with the help of navigation satellites thousands of kilometres up in space. Can you identify the coordinates of the two yellow transponders below the surface of the water?

A: Transponders like the ones in (D,2) and (F,3) are used across a wide variety of underwater work, such as ocean science, salvage efforts, oil and gas exploration, marine archaeology, and even law

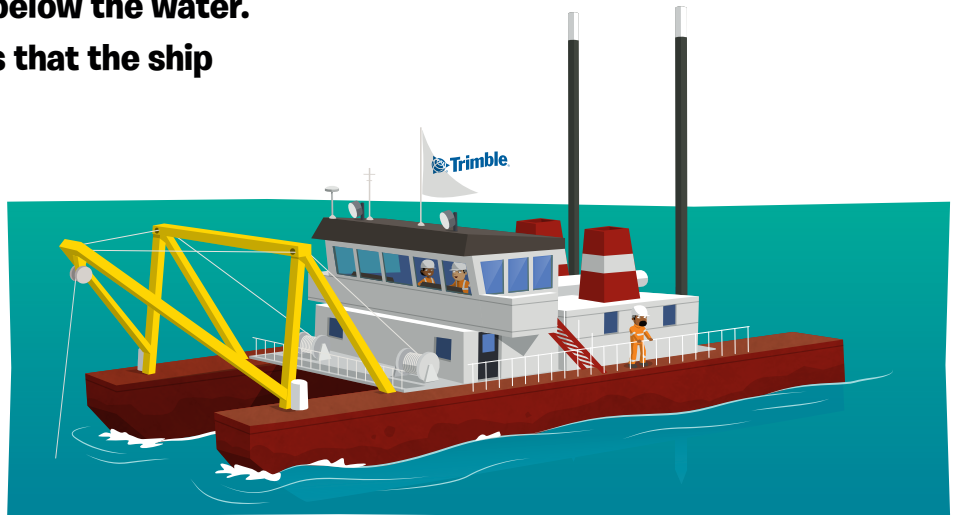
enforcement and military missions! They are set before the work starts, and they send sonar signals that give a receiver its location relative to their position.



Q3: The impressive looking barge in (D,5) is dredging the seabed - moving material from one place to another. It depends on underwater mapping data collected by devices on the other vessels, both above and below the water.

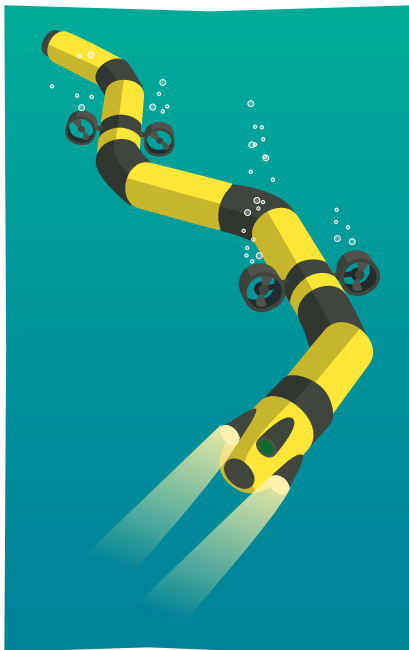
Can you spot any rocky hazards that the ship might need to avoid?

A: Although she might be singing the surveyors onboard a sweet siren song, the boat should avoid Hannah the Mermaid on that hefty looking rock in (D,4)! Thankfully, the boat will be using navigation systems, sonar and radar to help it traverse the water safely. Myths of mermaids have been around for thousands of years, and according to the stories, the ocean gemstone aquamarine is made from mermaids' tears, and a kiss from a mermaid gives you gills!



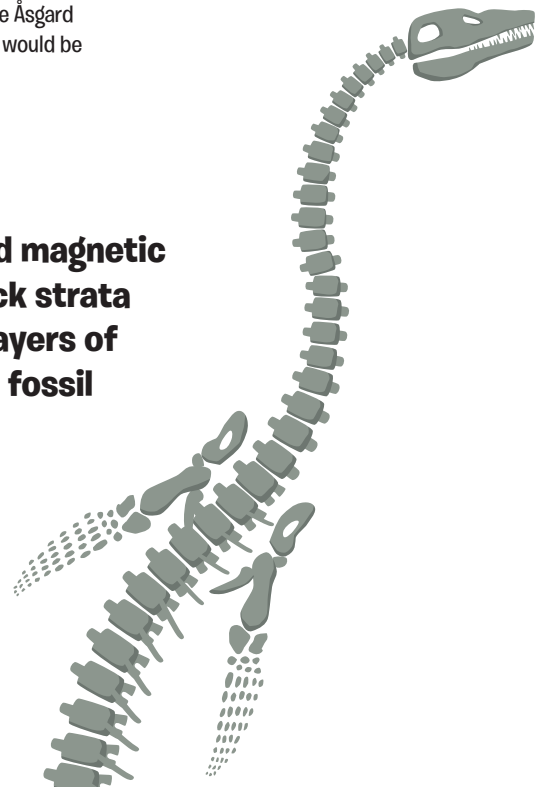
Q4: Have you noticed the long pipe stretching across the seabed? It carries oil or gas from the platform at (H,6) to shore. There is a robotic 'sea snake' ROV nearby - what do you think it's up to?

A: The supple sea snake is busy scanning the oil pipe to check for any damage. It is able to 'live' permanently underwater, and when it isn't busy doing maintenance jobs, it sits on the seabed, ready to be deployed. This is much more cost effective and easier than sending a remote-controlled robot down from the surface; the sea snake is already there, raring to go. Robots like this are now being piloted offshore at the Åsgard field in the Norwegian Sea. Jörmungandr would be proud!



Q5: The 'GeoPhysical' vessel (F,5) uses sound waves and magnetic readings from an array of 'hydrophones' to map the rock strata below the surface of the seabed. Can you look at the layers of underground rock and identify the species of dinosaur fossil trapped deep in the strata?

A: The fossil in (D,1) is that of a Plesiosaurus, a long-necked marine reptile that lived during the early part of the Jurassic period, around 200 million years ago. The famous Loch Ness Monster has been explained away by some as a living fossil Plesiosaurus, and some sonar and aerial photography evidence has even been put forward as proof of the monster's existence! In 1954, and as recently as 2011, boat captains have taken sonar images of large, unidentified objects which seemed to follow their boats. And in 2014, it was reported that an Apple Maps satellite image showed a large creature, about 30 metres long, swimming just below the surface of the loch!



Q6: Surveyors use facilities like the base station (I,5) to keep track of GPS satellites, checking to see how much they drift out of orbit. These satellites provide accurate positioning measurements for vessels working offshore all over the world.

Can you guess how many GPS satellites there are in space?

A. 24 B.124 C. 44

A: There are 24 GPS satellites in space, working together to create a network that covers the whole planet. However, there are thousands of other artificial satellites in space. Since 1957, when the Soviet Union launched Sputnik 1, almost nine-thousand satellites from more than 40 countries have been launched. Only two-thousand or so of these remain in use, with the rest having become space junk! At that rate, our spaceships will soon need windscreen wipers!

