MEDIA RELEASE

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Scientists Create First-Ever Map of Deep Seafloor – Radically Different Patterns of Biodiversity between the Deep Sea and Land Revealed

12/05/2016 - For the first time, a light has been shone on the diversity of creatures that exists in the world's dark, deep seas.

A team of scientists including **Tim O'Hara, Senior Curator of Marine Invertebrates, Museum Victoria** and **Skipton Woolley, PhD student, Museum Victoria and The University of Melbourne** have created the first map of seafloor diversity across the world's oceans. This map **reveals for the first time how fundamentally different patterns of biodiversity are in the deep oceans compared to those in shallow waters or on land.**

Focusing on brittle and basket stars (which are related to starfish), the ground-breaking results have been **published today in the leading scientific journal *Nature*.**

The deep seafloor remains the least explored ecosystem on Earth – it is immense, remote, and expensive to survey so gaining accurate knowledge about the variety of life in the deep sea is difficult. Only by pooling the knowledge derived from hundreds of years of research – from pioneering voyages to explorations by modern submersibles – can we begin to comprehend the patterns of life at these great depths.

To create the map the team combined collection databases from museums around the world, then supplemented this data with scientific literature to **create one 'mega database' which charts where marine invertebrate species have been found**. This project was supported through the ARC Centre for Excellence for Environmental Decisions (CEED) and the Marine Biodiversity Hub, which is funded through the Australian Government's National Environmental Science Programme.

"We lack information about where seafloor animals are distributed and why some areas support more species than others. This is a problem for deep-sea conservation. It is very difficult to protect deep-sea animals and sustainably manage human activities such as deep-sea fishing and mining if we don't know where animals live," Tim O'Hara said.

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Using sophisticated computer software, **the team analysed the global distribution of thousands of species of brittle and basket stars to predict and measure patterns of where species occur across the seafloor**. Brittle-stars make a good target for such analysis as they are abundant across seafloors from the equator to the poles, and from shallow water to the depths of the ocean trenches. They were then able to **use this data to compare biodiversity patterns across three different ocean depths: the continental shelf (20-200m), upper continental slope (200-2,000m) and deep-sea (2,000-6,500m).**

Importantly, **the researchers discovered that in the deep-sea the number of species peaks closest to the continents, at temperate latitudes (between 30 and 50 degrees south and north). This differs from patterns of biodiversity on land or shallow waters where vastly more species exist in tropical regions**. This dramatic difference in diversity between creatures that live in the deep oceans and those which live closer to the surface was a real surprise to the researchers involved. How can this difference in diversity be explained?

"**The answer is due to the difference in the amount of energy available to creatures living in the depths of the deep-sea**," answers Skipton Woolley.

"Very little light or heat from the sun penetrates the deep-sea making it a uniquely energy-poor environment. Energy comes instead from microscopic animals and plants (plankton) that grow in the warmth of Earth's surface waters and ultimately sink to the seafloor to be consumed by hungry creatures living in the dark. There are more plankton in the southern and northern oceans than near the equator.

"On the other hand, ecosystems on land and shallow water receive energy from the sun, and this energy is highest in tropical areas, which therefore support a higher number of species."

The team hopes that as data from around the world is collected, global maps of seafloor diversity will continue to become more detailed, increasing our knowledge about the distribution of marine biodiversity. **Maps such as these are crucial for managing the conservation and sustainable use of the deep oceans.** The United Nations is currently negotiating a new international agreement for the management of the high seas through the UN Convention on the Law of the Sea.

"**With the mining of minerals on the seafloor slowly becoming a reality, it is vital that we understand the conservation needs of animals that live at these great depths**," said Tim O'Hara.

Interviews with **Tim O'Hara, Senior Curator, Museum Victoria** and **Skipton Woolley, PhD Student, Museum Victoria and The University of Melbourne** are available.

For interviews and images please contact:
Anna Quinn
External Relations, Museum Victoria
P: (03) 8341 7136 | M: 0437565300 | E: aquinn@museum.vic.gov.au

Gabrielle Sheehan
ARC Centre of Excellence for Environmental Decisions
P: (03) 9670 6599 | M: 0409 945 001 | E: gabrielle@curriecommunications.com.au

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