The secrets of the deep sea

Two-thirds of the Earth's surface is covered by oceans, most of which is deep sea. It is incredible how much life is hidden in these vast worlds, even though they have hardly been explored yet.

The habitat of the deep sea

The deep sea is often compared to a wasteland devoid of life. However, there is life that can be found in the deepest sea trenches and at hot, toxic thermal springs. Such as meter-long tubeworms, giant protozoa, bizarre fish, sea feathers and crabs. The seabed of the Marinane Trench, which is located about 2,000 kilometers east of the Philippines, is the deepest part of the ocean at 11,034 meters. If one speaks of the deep sea, it already begins at a depth of 800 meters.

The conditions for life in the deep sea do not seem inviting, but the chemical composition of the seawater has not changed for millions of years. The average temperature of the deep sea is between 2 to 3°C. There are two factors that make life in the deep sea seem so unreal:

- the darkness
- the immense pressure

The rays of sunlight reach to a depth of about 900m, but the energy of the light is barely sufficient for plant growth above 150m. The atmospheric pressure at sea level is about one bar. Every ten meters the pressure increases by another bar. Thus, at a depth of 10,000 meters, about one ton of weight weighs on one square centimeter.

Lebewesen in der Tiefsee

Forscher gingen bis zur Mitte des 19. Jahrhunderts davon aus, dass es in der Tiefsee kein Leben gibt. 1860 kamen Zweifel dieser These aus, da in diesem Jahr festgekrustete Tiere an einem defekten Telegraphenkabel entdeckt wurden. Dieses Kabel wurde aus einer Tiefe von 1.800 Meter geborgen. 1869 erbrachte eine Expedition der H.M.S Porcupine südwestlich von Irland den Beweis für Leben in der Tiefsee. Während der Expedition wurden Bodenproben aus einer Tiefe von 4.000 Metern entnommen. Diese bestätigten das Leben in der Tiefsee. Mit zunehmender Wassertiefe nimmt die Zahl der Lebewesen zwar ab, die Artenvielfalt ist dennoch sehr groß.

Die Tiere der Tiefsee fallen durch ihr bizzares Aussehen auf. So bizzar wie sie aussehen, haben sie auch ausgefallene Namen:

- Seefledermaus
- Peitschenangler
- Vampirtintenfisch

Der Meeresboden weist eine äußerst vielfältige Artenvielfalt auf. 200.000 Arten von Bodenbewohnern konnten bereits identifiziert werden. Es wird davon ausgegangen, dass es noch Millionen von weiteren Arten gibt, vor allem winzige Tiere im Tiefseeschlamm. Auch die tiefsten Seegräben werden, vor allem von Muscheln, Borstenwürmer und Seegurken, bewohnt. In einer Tiefe von 4.000 Meter machen Seegurken die Masse aller Organismen aus. In 8.500 Meter sind es sogar um die 90 Prozent. Xenophyophoren (Träger fremder Körper) sind die größten bisher bekannten Einzeller, welche eine Größe von 25 Zentimeter erreichen. Sie leben vor allem an erloschenen Seevulkanen. Ihr Gehäuse setzt sich aus abgestorbenen Plankton zusammen und bietet anderen Arten, wie zum Beispiel Schlangensternen (Verwandte der Seesterne) und auch Asseln einen Unterschlupf.

Life in the deep sea

Researchers assumed until the middle of the 19th century that there is no life in the deep sea. In 1860, doubts about this thesis came to light, as in that year encrusted animals were discovered on a defective telegraph cable. This cable was recovered from a depth of 1,800 meters. In 1869, an expedition of the H.M.S Porcupine southwest of Ireland provided evidence of life in the deep sea. During the expedition, bottom samples were taken from a depth of 4,000 meters. These confirmed life in the deep sea. Although the number of living creatures decreases with increasing water depth, the diversity of species is still very great.

The animals of the deep sea stand out because of their bizarre appearance. As bizarre as they look, they also have fancy names:

- Sea bat
- whip fisherman
- Vampire squid

The ocean floor has an extremely diverse array of species. 200,000 species of bottom-dwellers have already been identified. Millions more species are believed to exist, especially tiny animals in deep-sea mud. Even the deepest sea trenches are inhabited, mainly by mussels, bristle worms and sea cucumbers. At a depth of 4,000 meters, sea cucumbers make up the mass of all organisms. At 8,500 meters, they even account for around 90 percent. Xenophyophores (carriers of foreign bodies) are the largest single-celled organisms known so far, reaching a size of 25 centimeters. They live mainly on extinct sea volcanoes. Their shell is composed of dead plankton and provides shelter for other species, such as brittle stars (relatives of starfish) and also isopods.

Adaptation of animals to the deep sea habitat

A major factor that the deep-sea creatures have to cope with is darkness. They have developed different strategies for this. For example, the eyes of some are highly sensitive and enormously large. The large eyes help them to perceive the little light optimally. The colossus squid has eyes that are larger than footballs. The pelican eel again has tiny eyes and lives at depths of up to 7,000 meters - in complete darkness.

Researchers have found that there is a special spectacle at depth. Bluish flashes of light from bioluminescent organisms interrupt the darkness. It is believed 90 percent of deep-sea inhabitants can produce their own light. For example, the copepod (Metridia longa) can emit a bluish glowing cloud. Researchers suspect this method is to help irritate predators. The cloud should be attacked first and the actual prey can flee. But bioluminescence should also serve to camouflage or attract prey.

Because of the small amount of food, the organisms have to divide their energy well. Many of the predators lie in wait for their prey instead of actively hunting. A good example of this is the frogfish. This has a bioluminescent appendage on its head, which attracts potential victims.

What knowledge exists about the deep sea fauna?

Research in the deep sea is extremely expensive and demanding. In addition to deep-sea submersibles, such as the "Alvin," there are now also remote-controlled diving robots. Incidentally, the Alvin was used to discover the first submarine thermal springs. If animals are brought to the surface for research, they usually survive only a few hours. This is due to the enormous difference in pressure. From the Marinanengraben, however, could already be found in a

titanium block, in which the pressure conditions remain constant at deep-sea level. The animals could be observed by the researchers through a small opening in the block.

In conclusion, despite the research mentioned above, the seemingly endless expanses of the deep sea have only been explored to a very small extent. The influence of humans, on the ecosystem through overfishing, pollution and climate change. Biologies are finding it increasingly difficult to analyze the natural state of the deep sea ecosystem. The ecosystems are destroyed by the mentioned factors before they can be explored.

In any case, care should be taken to protect the deep sea habitat. This is also shown by the results of the "CeDAMar" (Census of the Diversity of Abyssal Marine Life) project. It is a project of marine biologists who studied the biodiversity of the deep sea. The census lasted from 2000 - 2010, ten years. At the end of the project, the biologists presented their results. A total of 1,200 species were newly discovered and described. The project team also created a freely accessible Database, which lists the species known and discovered so far. More than 200,000 entries can already be accessed on the platform. Although it sounds like a huge amount of data, scientists believe that only a fraction of the species living in the deep sea are known.