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A Helping Hand for reef dwellers *Artificial structures will be more life into the underwater world bring - their ecological value depends on careful planning*



An artificial reef. (Photo: pd)

The fishing, diving tourism and conservation can benefit from artificial reefs. For decades, therefore, they will intensively investigated. The research makes slow progress, while there are numerous aspects to be investigated.

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Ships, cars, tyres, metal scaffolding or hollow, concrete blocks of holes: The variety of structures, sunk in the sea as artificial reefs, where plants and animals settle. Their original mission was to attract fish, which then cost and time could be abgefischt. But meanwhile are also ecological and naturschutzrelevante aspects of the construction of such reefs authoritative. They will act as a breakwater, but also as a replacement habitat for due to various factors such as climate change or fisheries threatened natural reefs. Some will also use the pressure of the diving tourism to natural reefs out. Of the siedelnden on them animals such as clams, plankton from the water filter, is expected to also improve the water quality.

Concrete igloos as a home for coral

From the myriad Riffbau used for the structures, some as for certain purposes particularly suited out. Shipwrecks and ausrangierte vehicles are primarily for the dive tourism attraction, as divers from these alongside the local animal world is still exploring the interior. The fishing benefits from them, because they attract fish. Fish are also less spectacular dressed structures, such as the Reef Balls. More than half a million of these irregular-out with holes, hollow concrete igloos, with their rough surface to imitate natural reefs, according to the Reef Ball Foundation, based in America in the world's oceans have been sunk. Because of their size and structure will In addition to their function as artificial

habitat often seen as a breakwater. With established mangroves, they are suitable also for the restoration of damaged mangrove forests.

The biologist Michael Moore from Jackson, United States, keeps concrete structures for aesthetic reasons but for regions with clear water and especially for diving areas unsuitable. Moore addresses specifically for the reconstruction of damaged natural coral reefs so-called Eco Reefs here: modules and burned unglazed ceramics, to complex natural reef systems can be together. Their structure is similar staghorn coral branches, micropores improve the liability of corals, and gill-like surfaces generate turbulence, which slow the flow and the stabilization of the sediment.

Reef Balls and Eco Reefs are built on land use and transport. Artificial reefs, with the Ercon technology (Electrochemical Reef Construction) are produced, however, directly in the sea. This technology will be shaped wire bars as a direct current is created, with photovoltaic cells or wind generators can be generated. The electricity will be resolved in the water calcium and magnesium ions in the isolated grids. As a result, according to Helmut shoe makers of the University of Duisburg-Essen, who since 1985 with Ercon employed in a few months, several millimeters thick limestone crust, the natural limestone reef is very similar. A key advantage of this crust to concrete or plastic is that the reefs thanks to their animals as well as drilling populated shells could be brought into the substrate eindrängen, says the biologist. In addition, bodies could be damaged by re-creating a current equal to repair, by a polar reversal of the current facility could be resolved if necessary. So far, the Ercon-reefs only for experimental purposes. In the future, but as new habitats, to repair damaged reefs, as a sponge farms or coastal defence works were used.

Complex research

Much is in the exploration of artificial reefs is still in its infancy, although many studies have been carried out. This is the one that the scientists at the different types of reef research. It should, according Shimrit Perkol-Finkel of the University of Tel Aviv, with her colleague, Yehuda Benayahu researched artificial reefs, often simply the cheapest in the efficient structures, in particular simple metal railing. Stephen Bortone from the University of Minnesota in Duluth calls in an article in the specialist journal "Bulletin of Marine Science" therefore an urgent improvements in study designs. He suggests concentrating on a "reef standard" for research purposes to agree so that better results can be compared.

However, the study of artificial reefs complicated by the fact that to them extremely diverse processes play: its population of

organisms, their further development, the interactions within and between different types of reef dwellers and their impact on the environment of the artificial reefs. According Perkol-Finkel and Benayahu in the studies must also have the material, the size, complexity and stability of the reefs are taken into account. Also playing their surrounding substrate, the proximity to natural habitats and the depth and currents of water a role, according to the biologists. Also the design of artificial reefs, from the light and flow conditions and the deposition of sediments depended, was important - factors which, in turn, the colonization of organisms collected.

Arrest advantage for fisheries

The diversity and complexity of the research aspects is not surprised that the individual studies often different - and often Bortone, according to many - questions. This makes the comparison of results and prevents general statements. In one are the experts agree, however: In the sea sunken structures are hard after a few weeks of plants and animals lived there food or protection against enemies. This could be fishing. According to Jeffrey Tinsman from the Delaware Department of Natural Resources in the American Dover, to strengthen the fishing artificial reefs made of concrete structures, car tires and discarded vehicles designed Delaware coast, is the biomass of invertebrate animals in the region thanks to these reefs up to 400 -- times bigger than the original sandy bottom. This promotes for the fishing interesting food fish, which differ from invertebrates to feed.

It is unclear however, whether because of the artificial reefs actually more organisms live in a region or whether these structures which are only in their environment and attract living organisms. The latter could be especially for overfished species such as the Red Snapper devastating Instead they laboriously from a wide area abzufischen - what the fishing would soon unprofitable - could be fishing the animals to the artificial reefs into mass start.

With regard to this question, Robert Shipp of the University of South Alabama population development of red snapper in the Gulf of Mexico. He noted that the stock of these fish in the Gulf - the extended soft land which - rose as oil rigs were built there, the residents appropriate reef habitats. The Red Snapper also benefited thousands of concrete structures, the hobby fishermen off the coast of Alabama sunk.

Charles Wilson of Louisiana State University, however, has noted that the Red Snapper before Alabama are smaller and reproduce sooner than their fellow front of Louisiana. This would to a high use pressure from the fishing suggest, he says. If too many adult

animals caught a population, increased the remaining animals before, as has been observed elsewhere.

For the objectives of the diving tourism and the fishing industry it is sufficient when the desired types of artificial reefs to settle as quickly as possible. If the construction of such reefs, however, ecological aspects, it is not yet done so. Because if it as a replacement habitat must be approved on them the same species as communities develop on natural reefs. Under what circumstances this happens, Perkol-Finkel and Benayahu. The marine biologists compared the species of a natural reef in the Red Sea with those on a reef in the middle of this wreck is a ship that sank 1881. They noted that the types of communities on the two reef sites only to distinguish the different orientation and complexity compared, the age or the material of the reefs, however, played no role.

That these sites after more than a hundred years ago a different species compared to the natural reef, the lead researcher on various processes of settlement of this land. A different orientation and complexity of the effect of other currents, they say. To drift, for example, a greater flow more larvae and nutrients to the reef and prevent any excessive sedimentation, which has a positive effect on the settlement. The shadow could influence the settlement - whether and how should still be investigated.

Also of interest are the environmental impact of artificial reefs to their environment. The addition of hard structures in extended soft land about changing their flora and fauna and leads to major ecological shifts. According to shoe makers, for example, in artificial reefs live predatory fish at the ostamerikanischen coast in a wide radius of the reefs around worms, starfish and other soft soil inhabitants - also originally in this area live fauna - almost eradicated. Algae are in the vicinity of artificial reefs also abgeweidet much more like a team of researchers from Israel and France said. The scientists stress the fact that already in the planning of artificial reefs their impact on the living communities in the area as far as possible should be taken into account.

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