Cocos Island, Guam: Passive water sampling to inform restoration efforts

Active installation, passive monitoring

What is the size and shape of a license plate and will monitor the waters of Cocos Island for the presence of chemical contaminants? In September, a team of scientists will deploy a series of passive water samplers known as PEDs, short for polyethylene devices, in the waters and sand adjacent to Cocos Island. A fish consumption advisory has been in place in Cocos Lagoon since 2006 because of elevated levels of polychlorinated biphenyls (PCBs). More recently, the pesticide DDT has been found in local fish caught adjacent to Cocos Island.

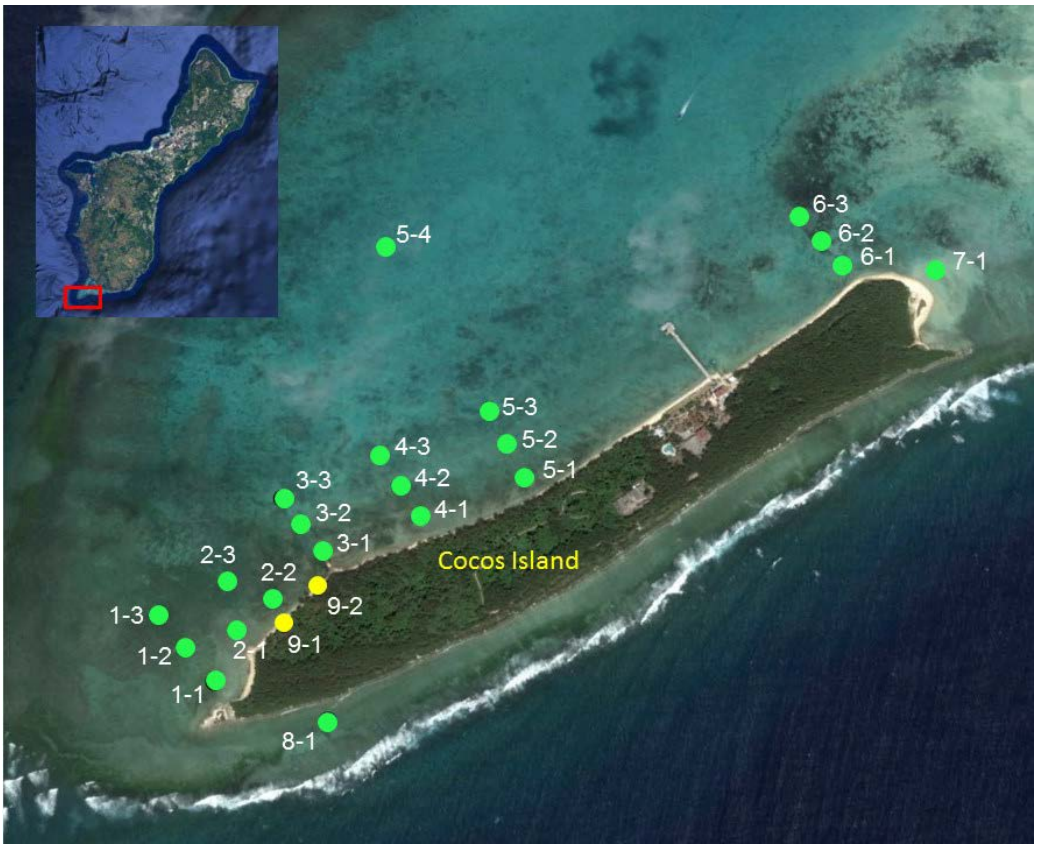

Figure 1. Proposed locations for the deployment of polyethylene devices (PEDs) in waters adjacent to Cocos Island, Guam.

The PEDs are small metal frames holding stretched polyethylene, a common plastic. Looking like a reinforced license plate frame, the devices will be placed in the sand or water around Cocos Island, where chemical contaminants like PCBs and DDT, if present, will accumulate on the plastic. After the PEDs are collected and analyzed, local resource managers will have better information on whether these chemicals are being transported in the water. This information will help inform future assessment and restoration efforts in the area of Cocos Island.

What can you expect to see?

The devices will monitor the waters adjacent to Cocos Island for a period of 30 days. The team from the National Oceanic and Atmospheric Administration (NOAA), Guam Environment Protection Agency (Guam EPA) and the US Environmental Protection Agency (USEPA) will install the PEDs the week of September 18th 2017 and in October, Guam EPA will return to collect them. During that time, the devices will sit underwater but otherwise be unmarked. The proposed deployment (Figure 1) consists of six sets of PEDs, each approximately 50 meters from shore, along the western shore of the island, where elevated concentrations of PCBs and DDT have been found in fish. Two more PEDs will be placed along a transect out from each site, at approximately 150 and 250 meters from shore. Two additional PEDs (9-1, 9-2) will be buried on the beach, just below the high water mark, to assess movement of contaminants below the surface, perhaps as they are transported by water from the island.

Background

Between 1945 and 1963, the U.S. Coast Guard operated a LORAN radio navigation station at the southern end of Cocos Lagoon. PCBs were used during that time in electrical transformers to help power the LORAN station. Beginning in 1979, PCBs were subsequently banned in the US due to health concerns. Recent US Coast Guard funded research has indicated that concentrations of PCBs in some fish adjacent to Cocos Island are above USEPA screening levels for subsistence and recreational fishers. The contamination levels are of concern to fishers, local natural resource managers, and to the public.

Typically, higher concentrations of chemical contaminants in the sand and seafloor are a source for the accumulation of contaminants in fish and other aquatic organisms. However, sediments collected in Cocos Lagoon in 2015, including those from around Cocos Island, contained very low levels of PCBs and the pesticide DDT. Because of this, sediments may not be the only source for chemical contaminants accumulating in the fish in the waters around Cocos Island. One possibility is that chemical contaminants like PCBs and DDT are being transported in the water from Cocos Island, for example through surface water runoff as might occur after a rainfall event or in groundwater, and then taken up directly by fish as they swim through the water. The fish may also be accumulating contaminants through the food chain (as they eat smaller organisms), through exposure to sediments, or perhaps a combination of all three sources.

In 2015, scientists from NOAA's National Centers for Coastal Ocean Science (NCCOS) were asked by local resource managers to assess chemical contaminants in sediments and fish throughout Cocos Lagoon. Results from this work confirmed concentrations of PCBs and the pesticide DDT were above USEPA subsistence and recreational screening levels in some fish around Cocos Island. The PEDs research will assess the possibility that contaminants like PCBs and DDT are in the water column.

Figure 2. Example of polyethylene device (PED)

Partners

The project is being funded by NOAA's Coral Reef Conservation Program (CRCP). Partners in the project include NOAA's National Centers for Coastal Ocean Science (NCCOS), Guam EPA, NOAA CRCP, NOAA Fisheries, and the USEPA. Results from the project will be included in a technical publication, possibly a manuscript for publication, as well as outreach materials to the public.

What to do if you find a PED

If you find a PED (Figure 2), please leave it alone. Though simply made, it is a sensitive piece of scientific monitoring equipment and should be treated as such. As it is a small and unobtrusive device consisting of metal and plastic, it is not expected that fish will congregate near them.

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