Helping the Reef Biome Emigrate Away from Florida's Dying Reefs

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- The Terra Sub Aqua Tripod (TSAT) is a module designed for installation on sand or sediment seafloors to support biological activity. The TSAT uses rebar legs to anchor stacks of porous mineral substrates, such as shell rock coquina. These substrates are drilled onshore to boost their surface area, form habitats for marine organisms, and make it simple to thread them onto the rebar. The TSAT parts are prepared onshore and assembled on the seafloor using the sand or sediment as anchor, allowing for small vessel/hand deployment.
- TSAT is sturdy and offers vertical habitat like mature Elkhorn coral. The drilled coquina shell rock supports a microbiome that forms over the first year, comprised of anaerobic bacteria internally and aerobic bacteria, protozoans, algae, larvae, eggs, fish fry and invertebrates near and on the rock surface.
- New hard-bottom habitat is created in the sand flats, triggering development of a diverse coral reef ecosystem with all trophic levels, from microbes to apex predators, represented. TSATs withstand hurricanes, while plankton settling creates a diverse reef microbiome during the initial months. This microbiome supports small organisms like copepods, isopods, and rotifers, which provide food for juvenile fish on and within the rock's porous surfaces. The TSAT serves as a stable holdfast and protective cover for a food web which develops over time resulting in a complete marine biome in 5-10 years. As the community matures, fish schools begin to extend beyond the TSAT habitat and attract and support larger species that depend on cleaning stations, shelter, and food resources.
- TSATs may be arranged in dense linear formations which function as hatcheries and nurseries for fish. The TSAT structure is built for durability and features a vertical design that withstands hurricane-strength force. The coquina shell rock, with approximately 30% porosity, develops a microbiome in the first year that includes internal anaerobic bacteria and external aerobic bacteria, along with protozoans, algae, larvae, eggs, fish fry, and upright cover for fish maturation. Sessile organisms including corals, sponges, bivalves, macroalgae, coralline algae, and various invertebrates typically reach maturity within 2 to 10 years.
- TSATs can be set up as separate patch reefs with, for example, 6-meter geometric spacing. This encourages mobile herbivores like Tangs, Hogfish, and Goatfish to clean the seafloor across a broad area, helping prevent Blue-green Algae growth, harmful algal blooms, and excessive seafloor heating caused by the Albedo effect.
- TSATs may create reef habitat farther offshore and north along the Atlantic coast. The TSAT is applicable to reefs surrounded by sand bottom and in decline due to human activity as a dynamic refuge. TSATs are appropriate for establishing Marine Protected Areas (MPAs), as sand flats typically remain unused for fishing activities except in locations where shipwrecks or other debris are present.