

## Fish assemblages associated with artificial reefs of concrete aggregates or quarry stone offshore Miami Beach, Florida, USA



Few studies have compared the suitability of different artificial reef construction materials in terms of their efficacy in acquiring diverse faunal assemblages. We compared the fishes associated with 12 co-located reefs constructed of limestone quarry boulders, concrete-gravel aggregate, or concrete-tire aggregate (four of each substrate) in 7 m of water, 200 m offshore Miami Beach, Florida, USA. All 12 reefs were deployed 100 m apart the same day in two lines of six. The four quarry stone reefs consist of a pile of 50 boulders each. The remaining eight reefs, of concrete-gravel aggregate and concrete-tire aggregate, were each constructed with 25 1.5 m edge and 25 1.2 m edge tetrahedron modules. Every two months from October 1998 to February 2001, SCUBA divers recorded fish species, abundance, and length, as well as spiny lobster, *Panulirus argus*, abundance. One hundred and forty-six species of fishes were recorded during the study period. The abundance and species richness of fish on each treatment exhibited a significant ( $p < 0.05$ ) seasonal variation with summer months having the greatest numbers and winter the lowest. There was no

significant difference in total fish or spiny lobster abundance or fish biomass amongst the three reef types ( $p > 0.05$ ). Likewise, multi-dimensional scaling of Bray-Curtis dissimilarity indices did not indicate clustering of fish assemblages by reef type. Comparison of pre-deployment fish counts from the reef sites and neighboring hard bottom and jetty with counts from the same sites two years post-deployment indicate the artificial reefs increased both fish abundance and richness in the local area.

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**Obtenir le document :** EDP Sciences

**Mots clés :** Artificial reef, Fish

**Thème (issu du Text Mining) :** MILIEU NATUREL

**Date :** 2002-04-15

**Format :** text/xml

**Source :** [https://doi.org/10.1016/S0990-7440\(02\)01154-3](https://doi.org/10.1016/S0990-7440(02)01154-3)

**Langue :** Anglais

**Télécharger les documents :** [https://www.alr-journal.org/10.1016/S0990-7440\(02\)01154-3/pdf](https://www.alr-journal.org/10.1016/S0990-7440(02)01154-3/pdf)

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