

SOME RESULTS FROM RESEARCH ON JAPANESE ARTIFICIAL REEFS

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Over the past 10 years the Japanese have spent US\$50 million annually to construct fishing grounds by deploying artificial reefs. Some recent translations of research on the species composition, behavior of fishes, and catches at Japanese artificial reefs are reviewed.

Three studies on different artificial reefs compare the species composition of fishes caught by gill nets and trammel nets at artificial reefs with catches from nearby at flat bottom sites with similar oceanographic conditions (Kakimoto 1979; Kawasaki 1984; Hori 1985). All three studies report that there is a difference in the species composition between the artificial reef and flat bottom sites. In general species including rockfish (Sebastidae), rock trout (Hexagrammidae), scorpionfish (Scorpaenidae), and sea bass (Serranidae) were more abundant at the artificial reefs than on the flat bottom areas. Overall these studies found that when commercially valuable species were considered, the artificial reefs had standing stocks which were 1.5 to 2.5 times higher than the flat bottom areas.

Sakai (1982) compared the catches of three resident demersal species in a 5-year period at a site before the deployment of an artificial reef with the catches from two 5-year periods immediately after the deployment of the artificial reef. The three species groups considered were flatfish, scorpionfish, and octopus. In the first and second 5-year periods after the deployment of the artificial reef the catches of flatfishes had declined to 63 and 67%, respectively, of their level during the 5-year period before the deployment of the reef. The catches of scorpionfish in the first and second 5-year periods after the deployment of the reef increased 18 and 50%, respectively, from their level during the 5-year period before the deployment of the reef. The catches of octopus in the first and second 5-year periods after the deployment of the reef increased 80 and 111%, respectively, from their level during the 5-year period before the deployment of the reef. The total catches of the three species combined in the first and second 5-year periods after the deployment of the artificial reefs increased 13 and 30%, respectively, from their level during the 5-year period before the deployment of the artificial reef. However, Sakai concluded that the increase in catches did not produce a sufficient increase in revenues to justify the cost of the artificial reef when it was amortized over its 20-year expected life.

Tanaka et al. (n.d.) and Shimizu (1981) used hydroacoustics to examine the distribution of fish schools in an area containing artificial reefs. Both these studies showed that demersal and surface fish schools can at times be found in close proximity to artificial reef sites and that there are also times when there are large schools in the general area but no schools near the artificial reefs.

Studies on catch rates at artificial reef sites nationwide indicate that the annual catch per unit of artificial reef volume ranges from about 0.3 to 12 kg/m³ (Kakimoto 1985). This range includes large and small artificial reefs and covers a variety of species including migratory demersal and pelagic fishes and a variety of fishing gears. There appears to be a relationship between the enclosed volume of an artificial reef and the annual catch per unit volume from the reef. The maximum catch per unit volume was obtained with reefs of about 3,000 m³ and the catch per

unit volume decreased as the volume of the artificial reef increased or decreased from 3,000 m³ (Kanamori 1984; Sato and Sakuda 1984).

Even in regions with large artificial reef projects, catches from the artificial reefs do not contribute very greatly to increasing the total catch (Kakimoto 1985). For example, in the Niigata area about 350,000 m³ of artificial reefs have been installed since 1955 along 250 km of coastline. The average annual landing from that area is about 100,000 metric tons. Even if catches from the artificial reefs averaged 6 kg per m³, the total catches from the artificial reefs would amount to only 2% of the total landings from the region. However, the artificial reefs do provide valuable fishing grounds for fishermen using small-scale gear targeting high priced fish and it is argued that the benefits offered this sector of the fishing community contribute toward achieving a diverse and stable coastal fishery (Kakimoto 1985).

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