

**THE EFFECTS OF CIRCULATION, LARVAL PLANKTONIC PERIOD, ADULT
DISTRIBUTION AND POLLUTION ON BENTHIC RECRUITMENT IN
HAWAIIAN COASTAL WATERS**

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ABSTRACT

The utility of benthic larval recruitment as an indicator of anthropogenic ecosystem stress was investigated. The spatial variability of larval supply and recruitment of benthic invertebrates was determined along gradients of exposure to point (an urban sewage outfall) and non-point sources of pollution (estuaries and harbors) along the southern shore of Oahu. The results indicate that the Sand Island sewage outfall did not have a negative effect on the rates and species compositions of larval recruitment. The sewage plume enhanced the recruitment of a tunicate whose larvae were apparently entrained and transported upward with the rising plume. Significant differences in larval supply and recruitment rates were observed near non-point sources of pollution. The rates of recruitment and larval supply were significantly greater near Keehi Lagoon and significantly lower near the Pearl Harbor channel and the Ala Wai Canal. However, the common recruitment of an oceanic barnacle and the low turbidity at the recruitment-reduced sites indicated that exposure to offshore waters was responsible for reduced recruitment rates. High rates of larval supply and recruitment at the Keehi Lagoon site were due to exposure to the Keehi Lagoon plume as evidenced by the recruitment of larval species associated with Keehi Lagoon, stable isotopic ratios of carbon and nitrogen, and turbidity. The significant correlation of larval supply and recruitment at all non-point source study sites indicates: (1) recruitment is primarily a function of larval arrival for species that were identifiable and that commonly recruited at these study sites, and (2) the possible exposure of these sites to pollutants did not affect the process of recruitment. The latter suggests that benthic recruitment is not a useful indicator of pollution. Rather, the rates and species compositions of recruitment within harbors and estuaries appear to be a useful tracer of these water masses.

The interaction between larval planktonic period, circulation, and adult distribution were also investigated. It was shown that this interaction is an important determinant of the scales of larval dispersal and the distribution of larval supply and recruitment. Additionally, larval transport of two species of sessile benthic invertebrates by different physical mechanisms is described.