River plume dynamic influences transport of barnacle larvae in the inner shelf off central Chile

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Abstract

Off central Chile, around 33.5°S, the freshwater discharge of the River Maipo generates a small- to intermediate-size plume, which moves up to the north driven by the daily sea breeze and with localized effects on a costal zone of about 10–15 km. The influence of this river plume motion on abundance patterns of larval barnacles was studied in a ~12 km long transect, including 2–3 stations inside the river plume, one station on the visible turbidity front, and two stations outside the plume. Shipboard campaigns were conducted in January (summer), August (winter), and October 2003 (spring). On each occasion, conductivity–temperature–depth casts, bottom track acoustic Doppler current profiler current measurements, size-fractioned chlorophyll concentration, and stratified plankton sampling were conducted. A significantly higher abundance of barnacle nauplii was found at the river plume front than at the plume or outside the plume. Abundance was highest in the upper 10 m of the water column, where most nauplius larvae were found. The river plume appeared as a surface layer of less saline water moving north of the river mouth, with a buoyant frontal structure progressing at speeds of 5 to 20 cm s−1. Although no peak in chlorophyll was observed at the buoyant front, the highest concentration of effective prey size for feeding nauplii (chlorophyl-*a* <5 and 5–20 μm) was generally associated with less saline plume waters. Thus, the accumulation of barnacle larvae at the front may facilitate foraging, potentially increasing larval growth and energy reserves. Our results suggest that the spatial structure and temporal dynamics of river plumes should be considered by benthic ecologists as transport mechanisms that potentially affect larval delivery and settlement of barnacles on rocky shores.