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Integrated coastal effects study: synthesis of findings

Steven M. Bay¹, Doris E. Vidal-Dorsch¹, Daniel Schlenk², Kevin M. Kelley³, Keith A. Maruya¹ and Joseph R. Gully⁴

¹*Southern California Coastal Water Research Project, Costa Mesa, CA*

²*University of California, Riverside, CA*

³*California State University, Long Beach, CA*

⁴*Sanitation Districts of Los Angeles County, Whittier, CA*

ABSTRACT

Municipal wastewater discharges constitute a major source of contaminants of emerging concern (CECs) to coastal waters, yet uncertainty exists regarding their linkage to adverse biological effects such as endocrine disruption. Limited information is available concerning the types and fate of CECs discharged to the Southern California Bight (SCB) from municipal wastewater and their potential for ecological impacts. The present study investigated the impacts of CECs from ocean wastewater discharges on SCB fish. Concentrations of CECs were measured in effluents from four major municipal wastewater dischargers. Seawater, sediment, and hornyhead turbot (*Pleuronichthys verticalis*) from the discharge sites and a reference area were collected and analyzed for chemical and biological indicators. Low concentrations of pharmaceuticals, personal care products, and industrial and commercial compounds were measured in effluent. Some CECs were also detected in sediment, seawater, and fish livers near the outfalls, confirming exposure to CECs. Fish plasma hormone analyses suggested the presence of physiological effects, including a reduced stress response, altered estrogen synthesis or estrogenic exposure, and reduced thyroxine. Most fish responses were found at all sites and could not be directly associated with effluent discharges. However, concentrations of thyroxine were lower at all discharge sites relative to the reference, and estradiol concentrations were lower at three of the four outfall sites. The physiological responses found were not associated with adverse impacts on fish reproduction or populations. Interpretation of molecular and physiological measurements in field organisms such as those used in the present study is challenging because of a lack of information on baseline conditions and uncertain linkages to apical endpoints such as survival and reproduction.

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