

Scrutinizing surficial sediment along a 600-km-long urban coastal zone: Occurrence and risk assessment of fipronil and its three degradates

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ABSTRACT

Contamination in the coastal zone is closely linked to urbanization and has become a global issue. The coastal aquatic environment is the terminal sink for many chemicals; however, little is known about the occurrence and variation among habitats as well as integrative toxicity for pesticides, i.e., fipronil, and its three major degradates (-desulfinyl, -sulfide, and -sulfone, fiproles hereafter) in sediments in urban coastlines. In the present study, we report results of a random stratified survey for fiproles in surficial sediments in five embayment habitats (strata) along the Southern California Bight (SCB), USA coastline. Fiproles were present in a small areal extent (6.8%) of the SCB embayment, and detected in 14 out of 174 stations with a total concentration of the four analytes ranging from 0.50 to 17.5 µg/kg dry weight. The area-weighted mean concentrations were 3.16 ± 3.37 , 0.584 ± 0.558 , 0.071 ± 0.103 , and 0.005 ± 0.009 µg/kg in brackish estuaries, estuaries, bays, and marinas, respectively, with the results below the detection limits in ports. Fipronil sulfone had the greatest detection frequency (8.05%) and highest mean concentration (3.24 ± 3.36 µg/kg) among the four compounds. A screening-level deterministic risk assessment for invertebrates found that, region-wide, fiproles generally posed an insignificant to low acute risk to the amphipod *Eohaustorius estuarius* in 7.36% of the SCB embayment area. In addition, high risk to the midge *Chironomus dilutus* was found in 77.5% of the fiproles-detectable area in the brackish estuary stratum that is a part of the Los Angeles River. Fipronil sulfone was identified as the major contributor of these effects. The results of this study establish a baseline of occurrence and toxicity potential for fiproles in coastal sediments of southern California.

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