

Occurrence of Antifouling Biocides in the Spanish Mediterranean Marine Environment

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Abstract

A compilation of the results of a monitoring program of the recently used antifouling pesticides diuron (3-(3,4-dichlorophenyl)-1,1-dimethylurea), Irgarol 1051 (2-methylthio-4-tertiary-butylamino-6-cyclopropylamino-s-teiazine), seanine 211 (4,5-dichloro-2-n-octyl-4-isothiazolin-3-one), chlorothalonil (2,4,5,6-tetrachloro-isophthalonitrile), dichlofluanid (N'-dimethyl-N-phenylsulphanamide), TCMTB ((2-thiocyanomethylthio) benzothiazole), and three degradation products demethyldiuron (3-(3,4-dichlorophenyl)-1-methylurea), 3,4-dichlorophenylurea and 2-methylthio-4-tert-butylamino-s-triazine (Irgarol degradation product) that was carried out between April 1996 and February 2000 in enclosed seawaters from Catalonia and Almeriacutea (Spanish Mediterranean coast) is reported. Nine points were sampled along the Catalan coast: Barcelona Olympic port, Masnou, Blanes, Sant Carles de la Ragravepita, Tarragona, Cambrils and Salou marinas as well as the Cambrils and Tarragona fishing harbors and in marinas and ports from Almeria: Aguadulce port, Almeriacutea port, Almerimar fishing harbour and Almerimar marina. The analytical methodologies were based on Solid Phase Extraction followed by liquid chromatography (LC) or gas chromatography (GC) coupled to a mass spectrometry (MS) or -Diode Array Detector. The main pollutants found in the sampled points were diuron and Irgarol 1051 that were detected at concentrations up to 2.19 $\mu\text{g l}^{-1}$ and 0.33 $\mu\text{g l}^{-1}$, respectively. On the other hand, seanine 211 was found at the highest concentration (up to 3.7 $\mu\text{g l}^{-1}$) during the summer of 1999. Low concentrations of dichlofluanid and the above mentioned degradation products were detected for the first time in the Spanish coasts. Chlorothalonil, TCMTB were not found at concentrations higher than 1 and 20 ng l^{-1} respectively which were the limit of determination (LOD) of the method for these compounds. In general the contamination at the different marinas is higher at the end of spring and in summer where the boating activity is also higher. **This paper shows for the first time that the contamination by the new antifouling pesticides in Spanish coastline, basically marinas and fishing harbours, is permanent along the whole calendar year. So, preventive actions by the harbour authorities will be needed in the near future in order to monitor and control the levels and effects of the new antifouling biocides in the marine environment.**

Keywords: Antifouling biocides; Irgarol; Diuron; Mediterranean sea