

Distribution of herbicide diuron in Shiraho coral reef and its effect on coral *Galaxea fascicularis*

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Scleractinian corals are mostly found in shallow coastlines of tropical and subtropical areas. Degrading of coral reefs in East Asia has been partly contributed by anthropogenic activities including pollution (Gomez, 1988). Herbicides including diuron enter in the aquatic ecosystem via leaching, run-off, spray drift or from antifouling paint together with Irgarol 1051 (van den Brink et al., 1997, Thomas et al., 2000). Notable contamination of herbicides has been reported in coral reefs around Great Barrier Reef, Australia (Duke et al., 2001). Recently, it has been revealed that Diuron has been widely detected in aquatic ecosystems around coral reef areas in Okinawa Island (Kitada et al 2008; Sheikh et al., 2007). There is convincing evidence that the ambient concentrations of herbicide Diuron is relevant to deleterious effects to corals (Owen et al., 2002; Watanabe et al., 2007), sea grass (Scarlette et al, 1997) and marine algae (Okamura et al., 2000; Lewis et al., 2001).

Diuron, [N'-(3,4-dichlorophenyl)-N,N-dimethyl-urea (DCMU)] is a photosystem II (PSII) herbicide derived from urea. In Japan, diuron has been extensively used in antifouling paints in shipping and agricultural activities (Okamura et al., 2003). The highest amount of this toxic substance has been used in Okinawa outside of the Tokyo metropolitan region. However, despite the extensive usage of diuron in Ryukyu Archipelago, and the associated toxicological implications in coral reefs and other marine ecosystems, very little is known about the baseline levels and behavior of diuron in coral reef waters around Okinawa. Therefore, a monitoring study of diuron was conducted around Shiraho coral reefs located at Ryukyu Archipelago, southern western Japan and also exposure experiment was carried out.

The range of diuron concentrations detected in the Shiraho coral reefs was from not detected to 90 ng/L. The mean concentrations of diuron observed in 2007 were more than 10 times higher during the winter, November (7.8 ng/L) as opposed to other seasons; summer, August, (0.3 ng/L) or the spring, May (0.5 ng/L) and June, (0.2 ng/L). For 96h exposure experiment, photosynthesis rate of the coral *Galaxea fascicularis* was significantly reduced by 6.5 % and 75.7 % relative to control when the coral exposed to 1 and 10 ug/L of diuron, respectively. Calcification rate was only significantly impacted at the highest concentration treatment 10 ug/L of diuron, which dropped to 32.7% relative to control. These findings indicate that the environmental relevance concentrations of diuron pose significant threat on carbon metabolism especially coral photosynthesis rate in ambient coastal waters.

Keywords: Diuron, herbicide, antifouling paint, coral reefs, *Galaxea fascicularis*, exposure experiment