

# Contribution of marine microbial activities to the transformation of iodine species in seawater

N. OKABE<sup>1,2\*</sup>, Y. MURAMATSU<sup>2</sup> AND S. AMACHI<sup>3</sup>

<sup>1</sup>Institute for Environmental Sciences, 1-7, Ienomae, Obuchi, Rokkasho-mura, Kamikita-gun, Aomori 039-3212 Japan (\*n.okabe.09.11@gmail.com)

<sup>2</sup>Gakushuin University, 1-5-1 Mejiro, Toshima-ku, Tokyo 171-8588, Japan

<sup>3</sup>Chiba University, 648 Matsudo, Matsudo-shi, Chiba 271-8510, Japan

In seawater, iodine concentration is relatively constant (0.3 to 0.5  $\mu$  M). There are several, chemical forms of iodine, iodide ( $I^-$ ), iodate ( $IO_3^-$ ) and organic iodine and their concentrations in seawater are variable. Due to the oxic condition in seawater,  $IO_3^-$  is thermodynamically stable and thus a dominant species. In surface seawater, a reduced form of iodine,  $I^-$  also exists probably, due to microbial activity. Although certain nitrate-reducing bacteria were reported to reduce  $IO_3^-$  to  $I^-$  (Tsunogai and Sase, 1969; Amachi *et al.*, 2007), detailed mechanism of this reaction is still unclear.

In this study, we incubated natural seawater in 50 mL glass vials under various conditions summarized in Table 1. They were incubated under light (LED or sunlight) or dark conditions at 25°C in. The chemical forms of iodine were determined over time using HPLC-ICP-MS.

$IO_3^-$  decreased under light condition by LED. However, no clear increase in  $I^-$  was observed under this condition. On the other hand,  $IO_3^-$  was reduced to  $I^-$  only in the unfiltered sample incubated under the sunlight condition. These results suggested that reduction of iodine species is a two-stage reaction.

Table 1. conditions of seawater and results of reduced iodine

Treatments	Effects	Reduced iodine	
		LED	sunlight
Filtered (0.2 $\mu$ m)	Remove microbes and particle	×	×
Autoclaved	Both bacteria and algae are inactive	×	×
Antibiotic substance	Bacteria are inactive, but algae are active	□	□
Photosynthetic inhibitor	Bacteria are active, but algae are inactive	×	×
Unfiltered	Both bacteria and algae are active	□	○

\*□: decreased of  $IO_3^-$ , however not increased of  $I^-$