ACCUMULATION OF EXTRACTABLE ORGANIC HALOGENS (EOX) AND PERSISTENT MAN-MADE ORGANOCHLORINE COMPOUNDS BY GREY-TAILED TATTLER (*Heteroscelus brevipes*)

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Introduction

A great quantity and variety of compounds are produced and used in our daily life. Many raw materials are applied for the production of industrial chemicals. It is well known that some compounds are unintentionally formed during various human activities (1, 2). Particularly, organochlorine compounds are persistent in the environment and toxic to wildlife (3). Some organochlorines are suspected as endocrine disruptors (4). In addition, several unidentified organochlorine compounds are formed and found in the environment (5-8). Analysis of extractable organic halogens (EOX) will help to understand the levels of unidentified organic halogens when their levels are compared with identified organic halogen concentrations.

A number of chemicals contribute to the pollution of sediment of the nearshore zone (9). Accordingly, organisms at the top of the food chain of an estuarine ecosystem exposed to several contaminants via diet. Grey-tailed Tattler is a migratory bird and it's annual migration ranges from East Siberia in summer to Indonesia, Philippines, Australia, Polynesia and Tasmania in winter (10). This species is also found at some estuaries located in Japan in spring and autumn. Consequently, it is suspected that this species might be exposed by contaminants in Japanese estuaries during their annual migration.

The present study was primarily designed to investigate chemical contamination in Grey-tailed Tattler collected in Japan, particularly focusing organochlorine compounds that are identified and unidentified ones.

Materials and Methods

Only dead birds that died by accidental mortality during migration were used for this study. These samples were collected by rocket nets or mist nets at the estuary of Obitsu River, Chiba, Japan in 1989 and 1992. No symptoms of disease were oberved in the bird samples. The samples were collected by the permission from Japan Government.

Approximately 5 to 10 g of adipose tissue in each sample was used for chemical analysis. EOX and Organochlorine compounds were extracted using organic solvents (acetone and hexane). The extract was washed with distilled and deionized water, and fractionated with S-X3 (Bio-Lad Laboratories Inc.) gel permeation column chromatography. Finally, a portion of the extract was sealed in a polyethylene vial which was covered with a polyethylene bag. Activation technique was carried out by using neutron flux at a rate of $3.7x10^{13}$ n/cm^2 /sec for two minutes using a research reactor (JRR-4). This experiment was conducted at Japan Atomic Energy Research Institute (JAERI), Ibaragi, Japan. The gamma-rays of ^{38}Cl (1642 and 2167 keV), ^{80}Br (616 and 666 keV) and ^{128}I (443 keV) were measured by gamma-ray spectrometry technique (11). The reproducibility of this method is 11 % for chlorine, 5.0 % for bromine and 13 % for iodine (n=3). Individual organochlorine compounds like PCBs, DDTs, HCHs, HCB and chlordane compounds (CHLs) were analysed by GC-MS and GC-ECD (12). The coefficient of variation of this method was less than 5 %.

Results and Discussion

Analytical results of EOX are shown in Table 1. The order of EOX concentrations was as follows: extractable organic chlorine (EOCl)> extractable organic bromine (EOBr)≧ extractable organic iodine (EOI). EOCl was the most predominant among organohalogens with a concentration of up to 62 mg/g, wet weight (71 mg/g, lipid weight) measured in adipose tissue. The greatest concentration of PCBs of 2.1 mg/g, wet weight (2.2 mg/g, lipid weight) was found in the adipose tissue of a male bird. It is already known that some man-made organochlorine compounds such as PCBs, DDTs, CHLs and HCB are ubiquitous in the estuary environment. Consequently, wild birds are exposed by these contaminants during their annual migration.

Proportion of known organochlorine compounds in EOCl was analysed to reveal the content of unknown organochlorine compounds. The results showed that a large part of EOCl was derived from unidentified compounds (Fig.1). A good statistical correlation was observed between the body fat contents and the concentrations of unidentified organochlorines, similar to that found for identified organochlorines such as PCBs, DDTs, HCHs, CHLs and HCB, suggesting that most constituents of unknown fraction in EOCl are lipophilic as the known organochlorine compounds. It strongly indicates that most constituents of unknown fraction in EOCl may have originated from human activities and accumulated through the process as known organochlorine contamination. However, it is also estimated that some constituents of unknown/unidentified organohalogen

compounds would be metabolites of known/identified compounds.
Further studies are needed to make clear the constituents of EOX and their relation to known organochlorine compounds such as PCBs, DDTs, HCHs, CHLs and HCB. It is important to know whether these unknown/unidentified compounds cause any physiological effects to Grey-tailed Tattler or not .

Table 1 EOX concentrations (μg/g, wet weight basis) in adipose tissue of Grey-tailed Tattlers (*Heteroscelus brevipes*) from Obitsu River, Japan.

Sampling Date	n	Fat Content (%)	EOCl	EOBr	EOI
May, 1989	7	89[a] 81-94[b]	5.4 3.2-15	1.6 1.3-2.2	0.41 0.23-0.59
Sep., 1992	13	86 74-95	9.5 1.3-62	0.86 <0.01-2.2	0.53 <0.01-1.9

a: Average
b: Min.-Max.

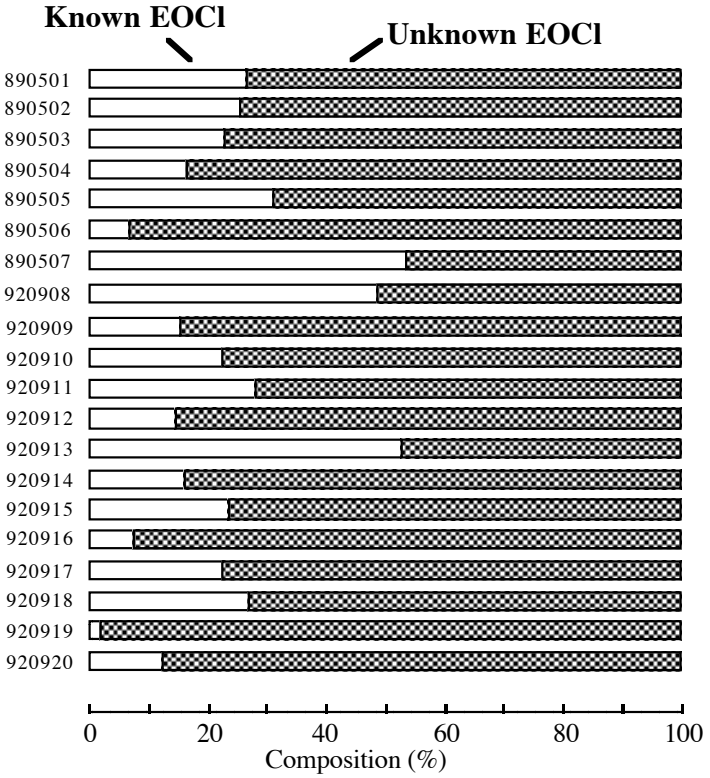

Fig.1 Known (PCBs, DDTs, HCHs, CHLs and HCB) and Unknown EOCl Compositions (%) in Adipose Tissue of Grey-tailed Tattlers (*Heteroscelus brevipes*).

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