ACCUMULATION PROFILES OF PCDD/DFs AND DIOXIN-LIKE PCBs IN WILD AVIAN SPECIES FROM KANTO REGION, JAPAN

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Introduction

It has been reported that the bird of prey is the top of the land ecosystem, and its populations decrease every year [1]. Some of them are specified as the threatened species by Japanese Law. Various factors can potentially be considered the cause of such populations decrease. One of them is the husk of the egg thins due to deterioration and persistent organic pollutant (POPs) in the environment [2]. The other factor is toxic effects of organochlorines on the top of food chain [3]. For instance, there is growing evidence that PCDDs, PCDFs and PCBs are harmful to wildlife, especially on predatory birds [4], and PCDD/DFs among the POPs has been reported to accumulate in a high concentration with the bird of prey also in Japan [5]. However, there are only few studies that analyzed the influence of PCDD/DFs exposure on the bird of prey as well as the clarification of the exposure pathway. Given this state of affairs, this research conducted the exposure analysis and the ecological risk evaluation for the bird of prey. The detailed isomer information was employed for the analysis and especially all isomers of the PCDD/DFs were targeted.

Materials and methods

Sample collection: Samples of raptorial birds were collected at Kanagawa Prefectural Nature Conservation Center, Kanagawa, Japan, which is a re-habilitation center for injured wild birds. Samples of raptorial birds were collected throughout the Kanto region, Japan (**Figure 1**). The birds that had died after the accident or sickness were provided for analysis. The Samples were juvenile and adult Northern Goshawk (*Accipiler gentilis*), adult Japanese Sparrowhawk (*Accipiter gentils*), and juvenile Peregrine Falcon (*Falco peregrinus*). In this study, liver samples were analyzed.

Figure 1 Study area in Kanto region, Japan

Analysis: Raptorial liver were freeze-dried prior to analysis. Details of the analytical procedures were based on the official method established by Ministry of the Environment, Government of Japan [6]. The ^{13}C-labeled internal standards were added to all samples and then extracted in a Soxhlet apparatus with distilled toluene for 16 hours. Multilayered silica gel chromatographic column and activated carbon column were used as cleanup procedures. Finally, ^{13}C-labeled recovery standard was spiked for HRGC/MS analysis. PCDD/DFs and dioxin-like PCBs were quantified with DB-5 column (J&W Scientific) [7].

Results and Discussions

The results reported in this paper were quantified only by DB-5 column and some of the 2,3,7,8-congeners may include co-eluting congeners. Number of analysis for each biological specimen was one.

Concentration of PCDD/DFs and Dioxin-like PCBs in liver.

Total concentrations of PCDD/DFs and dioxin-like PCBs in birds of prey are shown in **Figure 2**. Concentration of toxic PCDD/DFs and dioxin-like PCBs are shown in **Figure 3**. Dioxin-like PCBs were higher than 2,3,7,8-PCDD/DFs in all samples. Especially, PCBs #118, #105, #156 were higher than other PCBs, and it is known that these congeners were present at high concentration in the commercial PCBs [8]. The juvenile Northern Goshawk had higher PCDD/DFs and dioxin-like PCBs concentrations than the adult Northern Goshawk. This result suggested that metabolic ability might rise while growing up. However, this cannot be proven now in this study.

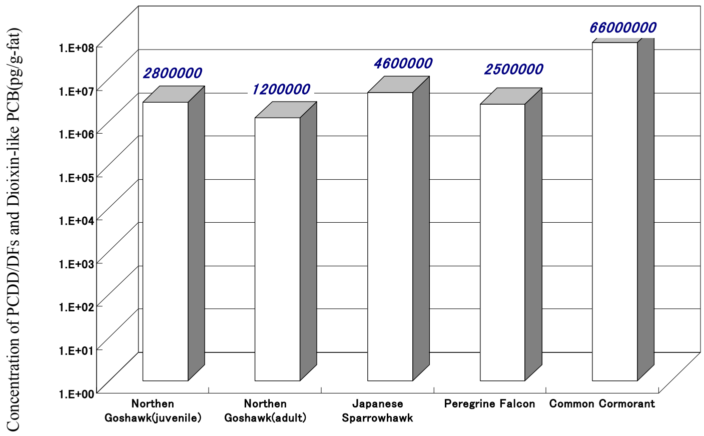

Figure 2 Total concentrations of PCDD/DFs and Dioxin-like PCBs in birds of prey.

Comparison between terrestrial prey of bird and fish-eating bird.

Average concentration of total PCDD/DFs and dioxin-like PCBs in Common Cormorant reported by Iseki et al [9]. was 66,000,000 pg/g-fat (**Figure 2**). This concentration is higher than our results for terrestrial birds of prey, especially in dioxin-like PCBs. It maybe due to the higher concentration of dioxin-like PCBs in fish [10], which is the major food of Common Cormorant.

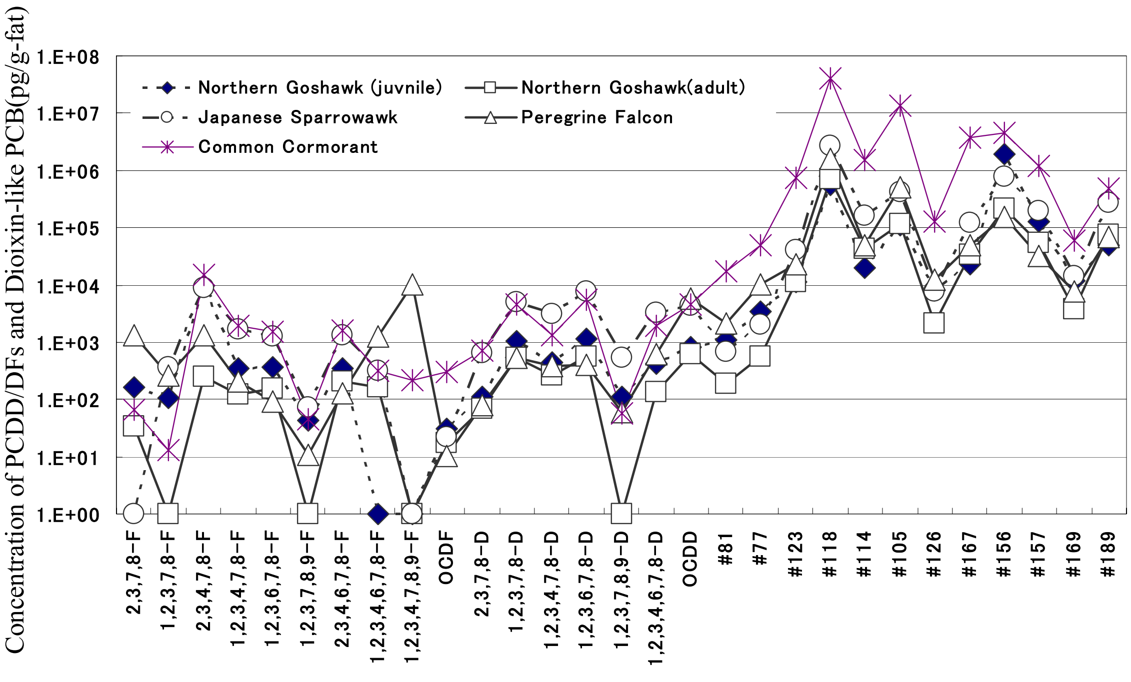

Figure 3 Concentration of PCDD/DFs and Dioxin-like PCBs in liver.
(Common Cormorant data is reported by Iseki et al. (2001) [9])

Congener pattern of PCDD/DFs and Dioxin-like PCBs .

Congener patterns of PCDD/DFs and dioxin-like PCBs in raptorial samples are shown in **Figure 4**. Northern Goshawk juvenile, Japanese Sparrowhawk, and Peregrine Falcon had similar congener patterns of PCDD/DFs and dioxin-like PCBs. These birds of prey might be living on the same kinds of food. However the pattern of PCDD/DFs of the adult Northern Goshawk looks different from rest of the prey of birds. The difference may be due to the shift of dietary component between juvenile and adult or to the difference of the metabolic ability.

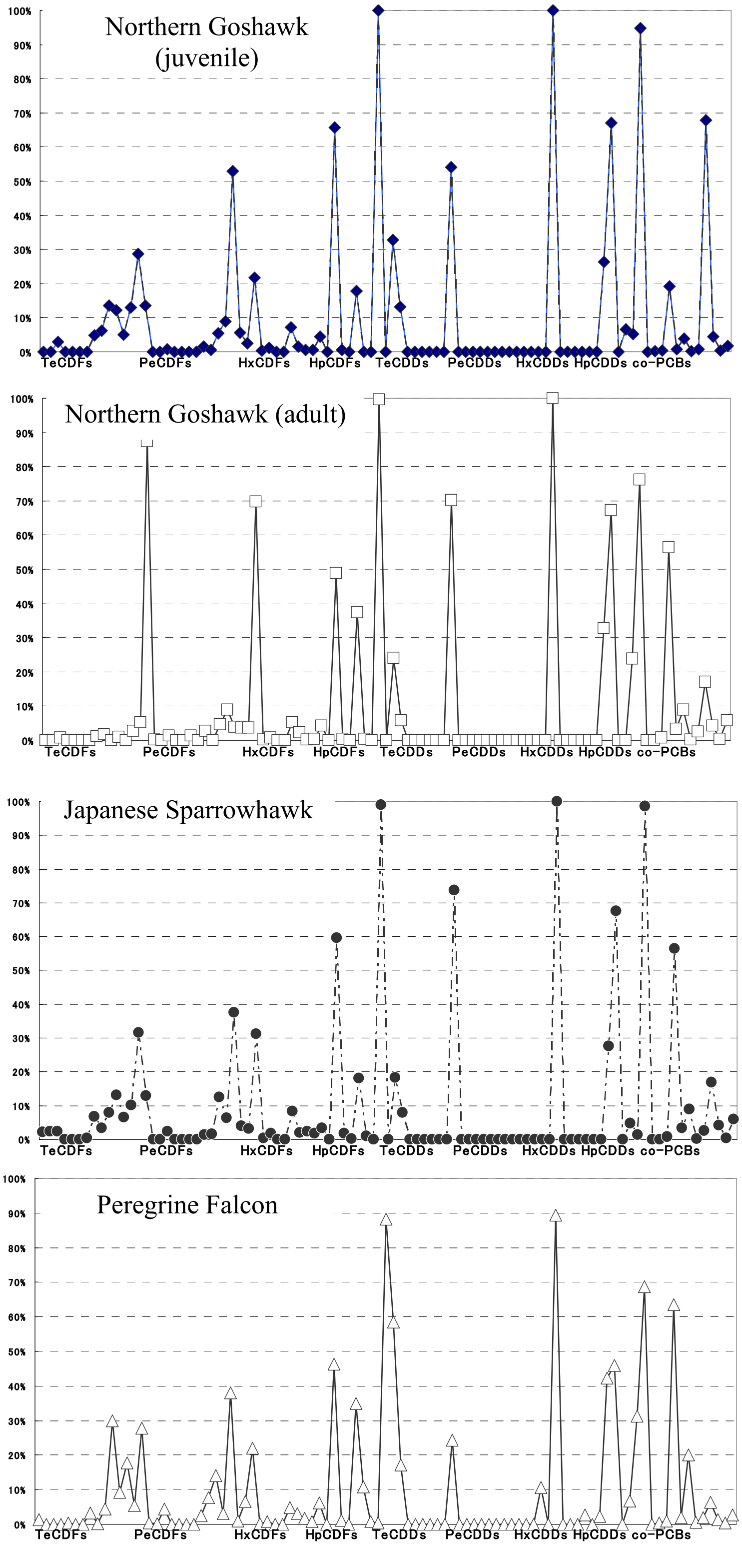

Figure 4 Congener patterns of Dioxin and Dioxin-like PCBs in raptorial sample. The plot is the proportion of a congener within each homologue.

Acknowledgements
This study was supported by the 21st Century COE Program, "Environmental Risk Management for Bio/Eco-Systems" of Ministry of Education, Culture, Sports, Science and Technology of Japan.

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