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Population-level ecological risk assessment of dioxins and related compounds on wild bird species from Japan

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Assessment of population-level risk posed by polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans, and dioxinlike polychlorinated biphenyls to wild bird populations was conducted by means of a probabilistic approach. Three piscivorous bird species, great cormorant, osprey and kingfisher, were selected as the target species. Population decline risk was used as an indicator. Exposure analysis provided the probability distribution of TEQs in the bird eggs on the basis of congener-specific concentration in sediment, BSAFs and BMFs. The results of exposure analysis and reported toxicity data were integrated to estimate the increment of egg mortality risk. Population-level risk characterization was performed by incorporating the estimated egg mortality risk into a model for population viability analysis. The obtained population decline risks were compared to other indicators of ecological impact (e.g., reduction in population growth rate). The risks were estimated at three pollution levels which were background level, the current level at Tokyo Bay, and the most contaminated level in the past at Tokyo Bay. For example, the population decline risks of 50% and below in three generation time at the current level at Tokyo Bay were estimated to be 0.84% on great cormorant (0.23% at reference level), 32% on osprey (14% at reference level). Thus, we quantified the range of population-level ecological risk corresponding to the range of

environmental pollution level of dioxins and the related compounds in Japan. The expression of effects posed by toxicants as population viability risk would provide common measures in the field of conservation biology and wildlife management, and would set a comprehensible basis for determination of environmental risk limits.