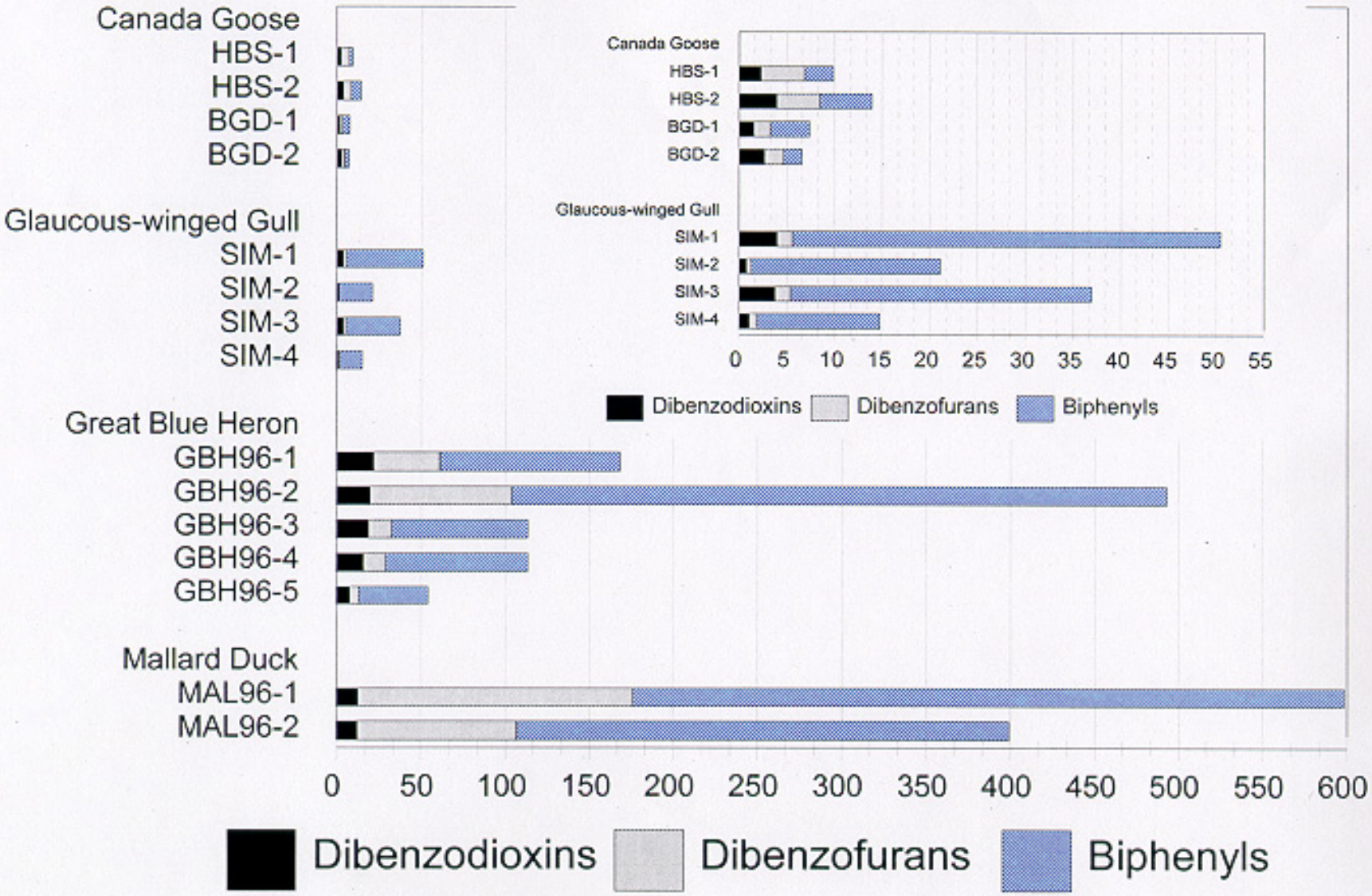

Figure 8. Comparison of TCDD-equivalent contributions in pg/g (ppt) in eggs collected in Commencement Bay in 1995 and 1996 between avian species and between dibenzodioxins, dibenzofurans, and biphenyls.

A3.3 Metals

Antimony, arsenic, cadmium and silver were not detected in the eggs of all four avian species analyzed (**Table 11**). One Canada goose egg sample contained 330 μg/g (ppm dry weight) chromium, while all remaining samples were below the 1996 non-detect level of 0.50 μg/g dry weight. The same goose egg sample contained 170 μg/g dry weight nickel while all other samples were at or below the non-detect level. Copper values generally ranged from 2.30 - 4.00 μg/g dry weight for all species. However, two heron egg samples contained copper values as high as 5.4 and 7.0 μg/g dry weight (**Figure 9**). Lead levels appeared relatively equal among the four species and was at or below the 1996 non-detect levels of about 0.50 μg/g dry weight. Mercury values appeared to be highest in heron eggs with values ranging between 0.77 and 1.50 μg/g dry weight. Selenium generally ranged from not detected to 0.45 μg/g dry weight for all species except heron. Selenium values in heron eggs ranged from 1.1 to 2.7 μg/g dry weight. Zinc was detected relatively equal among species with all values below approximately 86 μg/g dry weight. Overall, metal residues detected were below concentrations associated with adverse effects such as mortality or reproductive impairment (Elliot *et al.* 1989; Blus *et al.* 1985; Block 1992; Fimreite *et al.* 1971; Eisler 1985,1987; Lemly 1993; Thomas 1997).

Contaminant	Canada Goose n=4	Glaucous-winged Gull n=4	Great Blue Heron n=5	Mallard Duck n=2
	Geo. Mean (Range) *µg/g dry weight*	*Geo. Mean (Range)* *µg/g dry weight*	*Geo. Mean (Range)* *µg/g dry weight*	*Geo. Mean (Range)* *µg/g dry weight*
Metals				
Antimony	<0.05 (<0.05 - <0.05)[1]	<0.05 (<0.05 - <0.05)[1]	<0.10 (<0.10 - <0.10)[1]	<0.10 (<0.10 - <0.10)[1]
Arsenic	<0.05 (<0.05 - <0.05)[1]	<0.05 (<0.05 - <0.05)[1]	<0.50 (<0.50 - <0.50)[1]	<0.50 (<0.50 - <0.50)[1]
Cadmium	<0.05 (<0.05 - <0.05)[1]	<0.05 (<0.05 - <0.05)[1]	<0.50 (<0.50 - <0.50)[1]	<0.50 (<0.50 - <0.50)[1]
Chromium	0.61 (<0.05 - 330.00)[1]	0.08 (<0.05 - 0.27)[1]	<0.50 (<0.50 - <0.50)[1]	<0.50 (<0.50 - <0.50)[1]
Copper	2.91 (2.30 - 4.00)	3.24 (2.70 - 4.00)	4.02 (2.60 - 7.00)	3.29 (2.70 - 4.00)
Lead	0.30 (0.20 - 0.53)	0.26 (0.22 - 0.34)	<0.50 (<0.50 - <0.50)[1]	<0.50 (<0.50 - <0.50)[1]
Mercury	<0.01 (<0.01 - <0.01)[1]	0.07 (<0.01 - 0.16)[1]	1.06 (0.77 - 1.50)	0.13 (0.12 - 0.14)
Nickel	0.65 (<0.05 - 170.00)[1]	0.08 (<0.05 - 0.40)[1]	<0.50 (<0.50 - <0.50)[1]	<0.50 (<0.50 - <0.50)[1]
Selenium	0.23 (0.16 - 0.35)	0.18 (<0.05 - 0.37)[1]	2.08 (1.10 - 2.70)	0.21 (0.10 - 0.45)
Silver	<0.05 (<0.05 - <0.05)[1]	<0.05 (<0.05 - <0.05)[1]	<0.20 (<0.20 - <0.20)[1]	<0.20 (<0.20 - <0.20)[1]
Zinc	67.29 (56.00 - 85.00)	62.26 (48.00 - 86.00)	44.98 (37.00 - 56.00)	50.28 (32.00 - 79.00)
Butyltins	*µg/kg dry weight*	*µg/kg dry weight*	*µg/kg dry weight*	*µg/kg dry weight*
Monobutyltin	1.40 (<1.00 - 3.80)[1]	1.91 (<2.00 - 6.60)[1]	2.05 (<2.00 - 9.00)[1]	<4.00 (<4.00 - <4.00)[1]
Dibutyltin	<1.00 (<1.00 - <1.00)[1]	3.03 (<2.00 - 42.00)[1]	3.14 (<2.00 - 19.00)[1]	<4.00 (<4.00 - <4.00)[1]
Tributyltin	<1.00 (<1.00 - <1.00)[1]	4.47 (<2.00 - 200.00)[1]	<2.00 (<2.00 - <2.00)[1]	<4.00 (<4.00 - <4.00)[1]
Tetrabutyltin	<1.00 (<1.00 - <1.00)[1]	<2.00 (<2.00 - <2.00)[1]	<2.00 (<2.00 - <2.00)[1]	<4.00 (<4.00 - <4.00)[1]
Phthalates, Phenols and PAHs	*µg/kg wet weight*	*µg/kg wet weight*	*µg/kg wet weight*	*µg/kg wet weight*
4-Chloro-3-methylphenol	<400.00 (<400.00 - <400.00)[1]	<800.00 (<800.00 - <800.00)[1]	<56.00 (<56.00 - <56.00)[1]	66.63 (37.00 - 120.00)
Hexachlorobenzene	<400.00 (<400.00 - <400.00)[1]	<800.00 (<800.00 - <800.00)[1]	<56.00 (<56.00 - <56.00)[1]	34.21 (<18.00 - 65.00)[1]
Dimethylphthalate	<200.00 (<200.00 - <200.00)[1]	<400.00 (<400.00 - <400.00)[1]	<56.00 (<56.00 - <56.00)[1]	<56.00 (<56.00 - <56.00)[1]
Diethylphthalate	<200.00 (<200.00 - <200.00)[1]	<400.00 (<400.00 - <400.00)[1]	<56.00 (<56.00 - <56.00)[1]	59.87 (<56.00 - 64.00)[1]
Di-n-butylphthalate	<200.00 (<200.00 - <200.00)[1]	<400.00 (<400.00 - <400.00)[1]	100.72 (42.00 - 280.00)	583.95 (310.00 - 1100.00)
Bis (2-ethylhexyl) phthalate	<200.00 (<200.00 - <200.00)[1]	363.68 (<400.00 - 520.00)[1]	123.90 (<38.00 - 480.00)[1]	1214.91 (180.00 - 8200.00)
Percent Lipid	2.2% (1.3% - 8.8%)	8.2% (5.1% - 11.0%)	5.8% (4.3% - 7.2%)	13.0% (12.5% - 13.5%)
Percent Moisture	69.5% (66.0% - 71.0%)	77.5% (74.0% - 81.0%)	N/A	N/A
Correction Factor (WW)	N/A	N/A	1.0 (0.99 - 1.05)	0.92 (0.92 - 0.92)

Table 11. Mean and range values for trace metals in µg/g (ppm) dry weight; butyltins in µg/kg (ppb) dry weight; phthalates, phenols, and PAHs in µg/kg (ppb) wet weight; and percent lipid, percent moisture, and wet weight conversion factors in avian egg tissues collected in Commencement Bay in 1995 and 1996.

[1]Detection Limit for some or all of the values.

N/A = not available

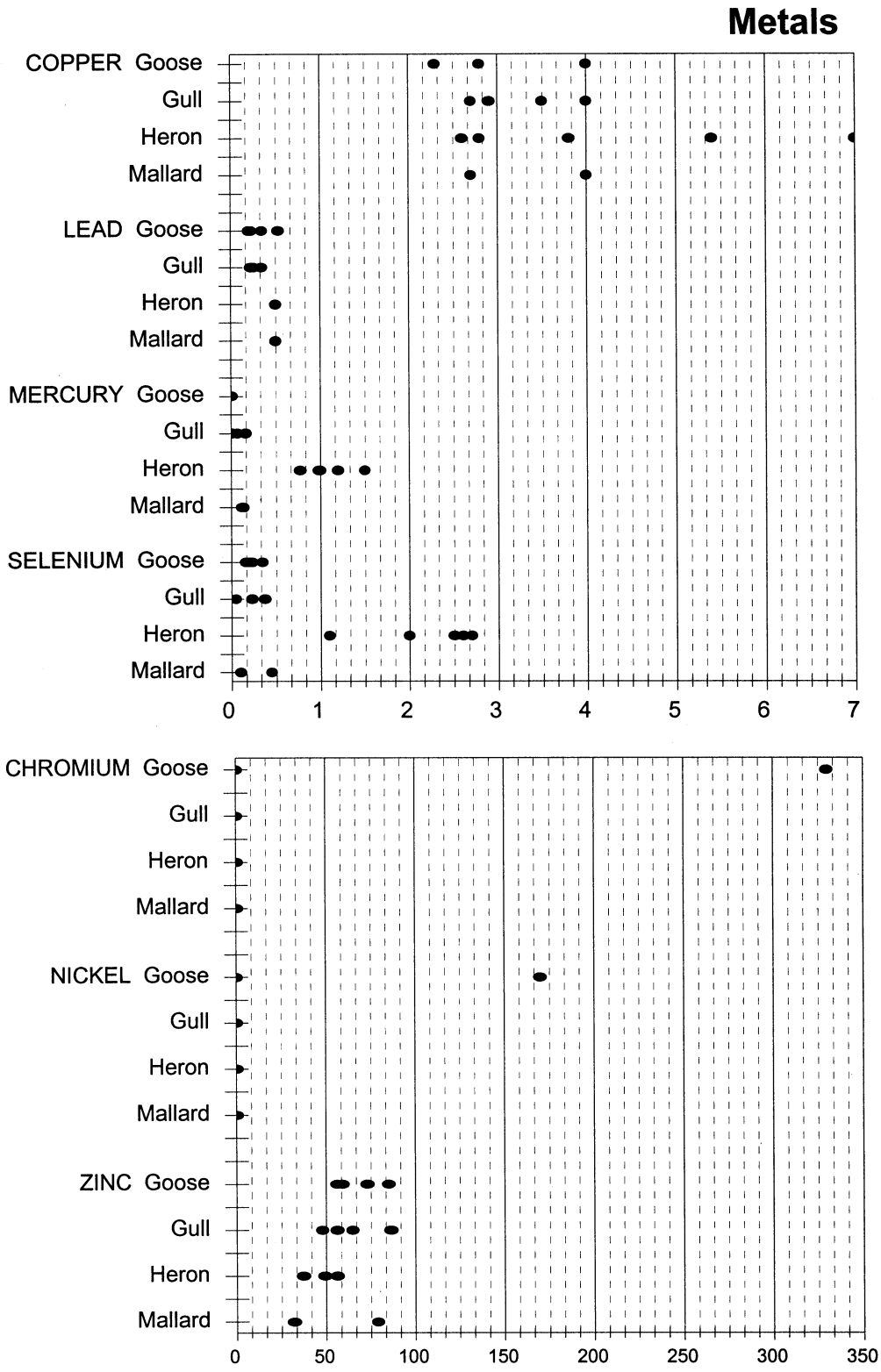

Figure 9. Comparison of trace metal values in µg/g (ppm) dry weight between avian species egg tissues collected in Commencement Bay in 1995 and 1996.

A3.4 Pesticides, Butyltins, and other analytes

Most conventional pesticides were at or below the detection limit in the avian egg tissues analyzed (**Table 12**). However, residues for the organochlorine pesticide DDT were high enough to compare across species (**Figure 10**). Values for 4,4' -DDT, -DDD, and -DDE appeared highest in heron eggs with one sample for DDE detected at approximately 1300 μg/kg (ppb) wet weight. The level of DDE detected were not above critical values associated with impaired reproductive success (Block 1992; Noble *et al.* 1986; Blus 1982, 1984; Henny *et al.* 1984, 1985; Fitzner *et al.* 1988). As with some of the trace metals and butyltins analyzed in 1996, limited sample volumes resulted in higher pesticide detection levels for heron and mallard.

Levels and ranges for butyltins are found in **Table 11**. One gull sample tested highest overall with a tributyltin value of 200 μg/kg (ppb) dry weight (**Figure 10**). The majority of samples were at or below the non-detect level of about 1.0-2.0 μg/kg dry weight. The one exception was one heron egg that was detected with 9.0 and 8.0 μg/kg dry weight for monobutyltin and dibutyltin, respectively.

Certain phthalates, phenols and PAHs were also analyzed in avian egg tissue (**Table 11**). However, high detection level limits reported in the 1995 samples for these analytes made cross-species comparisons infeasible.