

# **Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah:**

## **II. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Chukars, Pheasants and Waterfowl**

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In the preceding paper (Smith *et al.* 1973) mercury and selected pesticide levels found in muscle tissue of fish in Utah were presented. This paper presents mercury and selected pesticide levels found in chukars, pheasants, and waterfowl.

### MATERIALS AND METHODS

All samples were transported frozen after collection to Utah State University. The different species and areas of collection are listed in Table 1. Only breast muscle tissues of chukars, pheasants and waterfowl were used for analyses of mercury and pesticide levels except for a limited number of adipose tissues from the body cavity of chukars and pheasants. Mercury analysis was performed on a Coleman mercury analyzer, model MAS-50, utilizing the method of HATCH and OTT (1968). Pesticides and PCB's were analyzed according to the method of STREET (1964). The details of various methods have been described in the preceding paper. In adipose tissue of chukars and pheasants, lipid contents were determined after the procedure of BRAGDON (1951).

### RESULTS AND DISCUSSION

The results of the various analyses are shown in Table 2. The levels of mercury found in chukars is quite low with a 0.05 ppm mean for 34 samples of breast muscle tissue analyzed. This might be expected in view of the chukar habitat which is typically removed from agricultural areas where exposure to significant quantities of mercury treated grains might be possible. These mercury levels detected in chukar tissues could logically serve as standards for "natural" mercury background values.

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TABLE 1

Species sampled for pesticide and mercury analysis in Utah, 1970-71, by number, location, and date collected.

Species	Number of Samples	Location	Date Collected
Chukar	3	Hogup Mountain, Box Elder Co.	11/70
( <u>Alectoris</u> ,	5	Confusion Range, Millard Co.	11/70
<u>graeca</u> )	3	West Side Promontory, Box Elder	11/70
	6	Morgan, Morgan Co.	11/70
	6	Southeast Myton, Duchesne Co.	11/70
	8	Echo Canyon, Morgan Co.	12/70
	2	Lakeside Mountains, Tooele Co.	10/70
Pheasant	13	Box Elder County	9/70-6/71
( <u>Phasianus</u>	18	Cache County	7/70-11/71
<u>colchicus</u> )	10	Davis County	11/70
	14	Emery County	9/70-7/71
	16	Millard County	9/70-7/71
	13	Sevier County	10/70-7/71
	10	Uintah County	9/70-6/71
	14	Utah County	10/70-6/71
	7	Washington County	10/70-11/70
	18	Weber County	9/70-6/71
Selected	10	Clear Lake WMA <sup>a</sup> , Millard Co.	12/70
waterfowl	13	Farmington Bay WMA, Davis Co.	11/70
( <u>Anatidae</u> sp.)	4	Brown's Park WMA, Daggett Co.	11/70
	2	Bear River, Cache Co.	11/70
	6	Ogden Bay WMA, Weber Co.	11/70
	8	Clearfield, Davis Co.	12/70
	2	Pocatello Valley, Box Elder Co.	11/70
	2	Promontory Point, Box Elder Co.	12/70
	1	Portage Creek, Box Elder Co.	12/70
	1	S. Blackhawk Club	10/70
	1	W. Layton Sloughs, Davis Co.	10/70

<sup>a</sup>, Waterfowl Management Area

Eight pheasants of 135 analyzed either equalled or exceeded the 0.5 ppm mercury guideline level established by the Food and Drug Administration. Of these eight pheasants only one of 0.72 ppm was collected during the hunting season. Six of the high samples were collected in the months of June and July and one high sample (0.53 ppm) was collected in September.

Two samples of waterfowl (0.695 ppm and 0.743 ppm mercury) were above and two samples (0.478 ppm and 0.473 ppm) were near the FDA mercury guideline levels. The mean for divers (0.591 ppm) was somewhat higher than that of dabblers (0.154 ppm) but this result is probably due to the limited sampling (2 samples) of divers.

TABLE 2

Levels of mercury, DDT, DDE, dieldrin and PCB (ppm, wet weight basis) in the breast muscle of chukars, pheasants and waterfowl in Utah.

Compound	Species <sup>a</sup>	No. of birds birds	No. of with detectable residue	Mean $\pm$ S.D. for positive samples	Range for birds with residues	% of birds with residues above FDA guideline or tolerance
Mercury	Chukars	34	34	0.050 $\pm$ 0.027	0.010-0.110	0
	Pheasants	135	135	0.146 $\pm$ 0.243	0.010-2.080	6
	Waterfowl	48	48	0.166 $\pm$ 0.163	0.037-0.743	4
p,p'DDT	Chukars	29	25	0.017 $\pm$ 0.015	0.002-0.064	0
	Pheasants	113	109	0.018 $\pm$ 0.016	0.001-0.119	0
	Waterfowl	48	42	0.023 $\pm$ 0.039	0.003-0.240	0
p,p'DDE	Chukars	29	25	0.009 $\pm$ 0.016	0.001-0.075	0
	Pheasants	111	94	0.015 $\pm$ 0.070	0.002-0.678	0
	Waterfowl	48	43	0.046 $\pm$ 0.115 <sup>b</sup>	0.003-0.580 <sup>b</sup>	4
Dieldrin	Chukars	29	24	0.013 $\pm$ 0.023	0.001-0.092	0
	Pheasants	125	111	0.007 $\pm$ 0.010	0.001-0.084	0
	Waterfowl	48	39	0.040 $\pm$ 0.065	0.002-0.348	2
PCB's	Chukars	29	29	0.071 $\pm$ 0.072 <sup>c</sup>	0.030-0.300 <sup>c</sup>	--
	Pheasants	52	47	0.075 $\pm$ 0.065	0.020-0.400	--
	Waterfowl	46	46	0.261 $\pm$ 0.235	0.004-1.000	--

<sup>a</sup>, Scientific names of species are shown in Table 1.

<sup>b</sup>, Two samples were abnormally high with levels of 6.70 (shoveler) and 8.82 (pelican) ppm in breast muscle tissue and are not incorporated into the mean.

<sup>c</sup>, One sample contained 7.7 ppm PCB and is not incorporated into the mean.

Dieldrin was found in 83% of the chukar samples, 96% of the pheasant samples, and 87% of the waterfowl samples analyzed. DDE was found in 86% of the chukar samples, 85% of the pheasant samples and 90% of the waterfowl samples. None of the samples of chukar or pheasant breast muscle tissues were found to have levels of DDT + DDE above the 5.0 ppm tolerance guideline established by the Food and Drug Administration for edible portions of fish (FEDERAL REGISTER, 1954). Two samples of 48 waterfowl breast muscle tissues analyzed contained no DDT but had abnormally high levels of DDE. They were a shoveler duck (6.70 ppm) and a pelican (8.82 ppm).

Adipose tissue from the body cavity of six chukars and 18 pheasants were also analyzed for DDT and DDE. Results are shown in Table 3. None of the adipose tissues showed values of DDT + DDE above the 7.0 ppm tolerance level on a lipid basis.

TABLE 3  
Analyses of chukar and pheasant adipose tissue  
(ppm, lipid basis)

Compound	Species	# of Birds Analyzed	Mean $\pm$ S.D.	Range Minimum-Maximum
Dieldrin	Chukars	6	0.198 $\pm$ 0.310	0.056-0.830
Dieldrin	Pheasants	18	0.162 $\pm$ 0.357	N. D.-1.577
p,p'DDT	Chukars	6	0.243 $\pm$ 0.139	0.087-0.441
p,p'DDT	Pheasants	18	0.558 $\pm$ 0.961	N. D.-3.090
p,p'DDE	Chukars	6	0.100 $\pm$ 0.055	N. D.-0.155
p,p'DDE	Pheasants	18	0.680 $\pm$ 0.040	N. D.-3.703
PCBs	Chukars	6	1,817 $\pm$ 0.833	0.200-2.500
PCBs	Pheasants	18	2,100 $\pm$ 1.313	0.500-4.600

N.D., None detected

PCB's were found in measurable quantities in breast muscle tissue of all chukars, 90% of the pheasants, and all of the waterfowl analyzed. Levels in 29 chukars ranged from 0.05 ppm to 7.7 ppm. Levels in 47 pheasants ranged from 0.02 to 0.40 ppm. Levels in 46 waterfowl ranged from 0.004 to 1.000 ppm.

The six adipose tissues of chukars ranged from 1.9 to 2.5 ppm and the 18 adipose tissues of pheasants ranged from none to 4.2 ppm PCB. Levels of PCB's found in chukars, pheasants, and waterfowl are higher than those found for dieldrin, DDT, or DDE.

#### SUMMARY

Levels of mercury and selected pesticides were determined in muscle tissue of chukars, pheasants and waterfowl collected from various regions within the state of Utah. None of the chukar tissue, 6% of the pheasant tissue and 4% of the waterfowl tissue analyzed contained mercury concentrations greater than the FDA limit of 0.5 ppm. None of the chukars or pheasants and only 2% of the waterfowl inspected contained dieldrin concentrations above the FDA tolerance level of 0.3 ppm. None of the chukars or pheasants contained levels of DDT + DDE above 5.0 ppm FDA tolerance level. The majority of the waterfowl tissue contained levels of PCB's higher than selected pesticide levels. No definite relationship between the levels of mercury and pesticides or PCB's was noted.

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