

The Acute Oral Toxicity, Repellency, and Hazard Potential of 998 Chemicals to One or More Species of Wild and Domestic Birds

E. W. Schafer, Jr., W. A. Bowles, Jr., and J. Hurlbut¹

U.S. Fish and Wildlife Service, Wildlife Research Center, Bldg. 16, Denver Federal Center, Denver, Colorado 80225

Abstract. The acute oral toxicity, repellency, and hazard potential of 998 chemicals to one or more of 68 species of wild and domestic birds was determined by standardized testing procedures. Red-winged blackbirds were the most sensitive of the bird species tested on a large number of chemicals, and an index based on redwing toxicity and repellency may provide an appropriate indication of the probability of acute avian poisoning episodes. Avian repellency and toxicity were not positively correlated (*i.e.* toxicity varied independently with repellency).

In a program designed to evaluate chemicals as potential avian toxicants, stupeficients, or repellents, personnel of the Wildlife Research Center at Denver, Colorado have tested (since 1960) over 2000 chemicals for acute oral toxicity to one or more species of wild and domestic birds. The purpose of this paper is to summarize the data on 998 known chemicals, draw appropriate generalizations from the data, and make recommendations on how these data might be used to predict acute avian poisoning potential.

Methods

The chemicals included technical and analytical grade, pesticidal, pharmaceutical, and other commercial or experimental compounds that were either purchased or solicited from cooperating firms. For presentation purposes, they have been arranged according to Chemical Abstracts Registry Numbers (CAS), and are identified by an accepted trade, coined, product

or other chemical name that is **not** included in the 9th Collective Index of Chemical Abstracts Service.²

Wild-trapped birds were preconditioned to captivity for 2 to 6 weeks and were usually dosed by gavage with solutions or suspensions of the test chemical in propylene glycol, according to methods described by DeCino *et al.* (1966), Schafer (1972), and Schafer *et al.* (1967). Other oral dosing methods were occasionally used (pellets, gelatin capsules) but are not noted in the tables (Schafer, 1972). LD₅₀ values were calculated by the method of Thompson (1948), Thompson and Weil (1952), and Weil (1952). Repellency tests were conducted by the methods of Starr *et al.* (1964) and Schafer and Brunton (1971), and R₅₀'s (analogous to LD₅₀'s) were calculated either by the method of Litchfield and Wilcoxin (1949) or Thompson and Weil (1952).

A repellency-toxicity index (hazard factor) was calculated by assuming that at the R₅₀ level, a sixty-five g male redwing would consume 50% of his approximate individual maximum food capacity of 1 g. By making this assumption, it was possible to estimate the mg/kg of a chemical that could conceivably be ingested by a redwing at a given R₅₀ level. This value, when divided by the acute oral LD₅₀, provides an index for indicating how likely it would be for acute oral poisoning to occur in the wild. An index value >1.00 indicates well-accepted toxic agents that have definite potential for causing acute poisoning episodes, an index value ≥0.25 ≤1.00 indicates these compounds with a possible potential, and an index value <0.25 indicates those compounds with little or no potential to cause acute avian poisoning episodes, at least in redwings.

Because of the large amount of data accumulated, an attempt was made to determine the significance of and/or correlation between the two of the measured parameters. Statistical comparisons of species sensitivities and ranked data were made by Friedmans ranking procedure (Friedman 1937) and ANOVA followed by Duncans Multiple Range Test. Although the non-parametric Friedmans procedure is a more accurate and valid

¹ Present address: Department of Chemistry, Metropolitan State College, Auraria Campus, 1006 11th Street Denver, CO 80204

² Because of the length and complexity of chemical abstracts nomenclature, the names used to identify chemicals in Table 2 were extracted from several sources. Primary consideration was given to the common name, but shortened chemical names, code numbers, or registered trademarks were also used but may not be specifically identified

method for determining the significance of our data, ANOVA resulted in a similar evaluation and allowed us to separate the three most-tested species. In addition, Pearson and Spearman correlation coefficients (Snedecor & Cochran 1971) were calculated for redwing R_{50} 's and LD_{50} 's (when both values were known) to determine possible correlations.

Results

The 68 bird species tested, along with their currently accepted scientific names and a four letter species code that was used in the following tabular data, are detailed in Table 1. Table 2 presents a tabular listing of the acute oral toxicity (LD_{50}) of the 998 chemicals to one or more of three avian species (redwing, starling, coturnix) plus the avian repellency values (R_{50}) and the toxicity-repellency index for redwings. Redwing, starling, and coturnix data were analyzed for those cases where LD_{50} 's (other than \leq or \geq values) were available for all these species ($n = 73$) or for redwings and starlings along ($n = 130$). It was shown that redwings were significantly more sensitive than starlings ($p = 0.001$), and that starlings and coturnix were not different ($p = 0.05$). The difference in toxicological sensitivity between redwings and starlings was 2.1x and the difference between coturnix and redwings was 1.4x. This agrees with previously published observations of the relative sensitivity relationships of redwings compared to other wild and domestic avian species (Schafer 1972; Schafer *et al.* 1979).

Statistical comparisons of the correlation between redwing LD_{50} 's and R_{50} 's were made to determine the validity of observations made over the past 20 years indicating that avian repellent activity appears to increase with increasing acute oral toxicity. Of the 998 chemicals tested, redwing R_{50} 's and LD_{50} 's are presented for 836. Of the 836, R_{50} and LD_{50} values for 501 chemicals (60.0%) were both greater than selected minimum activity levels (1.00% for R_{50} and 100 mg/kg or (90 mg/kg) for LD_{50}), 84 (10.1%) were repellent at or below 1.00% but toxic above 100 mg/kg, 75 (8.9%) were toxic at or below 100 mg/kg but repellent above 1.00%, 41 (4.9%) were not usable and 135 (16.2%) possessed activity in the range ($R_{50} \leq 1.00\%$, $LD_{50} \leq 100$

mg/kg) that could be used to examine the relationship between these two factors. However, neither Pearson or Spearman correlation coefficients (0.33 and 0.43, respectively) showed any positive correlation between R_{50} 's and LD_{50} 's. Thus, the data indicate that gross acute toxicity, as defined by the LD_{50} , is not positively related to gross repellency, as defined by the R_{50} , at least over the small range examined.

The repellency/toxicity index or acute avian hazard index was calculated for 377 chemicals where one or both R_{50} and LD_{50} values were known. Those chemicals for which the LD_{50} and R_{50} were only known to exceed some value could not be used in subsequent calculations since no meaningful value or trend could be determined by the index. Of the 223 chemicals for which definite index values could be calculated, 124 fell into the >1.00 class, 47 into the $\geq 0.25 \leq 1.00$ class and 52 in the <0.25 class. Examples of some chemicals in the >1.00 class (hazardous) are: Mitomycin C, TEM, thiotepa, famphos, parathion, and dimethoate. Examples of chemicals in the possibly hazardous class ($\geq 0.25 \leq 1.00$) are: coumaphos, aprocarb, fen-sulfthion, fenitrothion, and malathion. Examples of chemicals that fall into the probably non-hazardous class (<0.25) are: lidane, sulphenone, chlorpropham, thiram, and chlorothion. This index appears to have great potential for predicting those chemicals that may cause acute avian poisoning episodes in the field. It is the first time, to our knowledge, that an attempt has been made to equate potential hazards to an index that combines the toxicity of a compound with a behavioral measure that predicts how much of the chemical could potentially be consumed in a field situation. Thus, field application of a highly toxic chemical that is aversive to birds could have the same or less likelihood of inducing acute avian poisoning as a less toxic chemical that was more readily accepted.

Table 3 presents acute oral toxicity data of 82 chemicals to one or more of seven additional avian species. Table 4 presents the acute oral toxicity and repellency data of 90 chemicals to one or more of 58 other species of birds.

Table 1. Species code, common, and scientific names of birds referred to in this paper

Species code	Common name	Scientific name
akes	American kestrel	(<i>Falco sparverius</i>)
bbgr	Blue-black grassquit	(<i>Volatia jacarina</i>)
bbmp	Black-billed magpie	(<i>Pica pica</i>)
bhcb	Brown-headed cowbird	(<i>Molothrus ater</i>)
bjay	Blue jay	(<i>Cyanocitta cristata</i>)
brcb	Bronzed cowbird	(<i>Tangavius aeneus</i>)
bowl	Barn owl	(<i>Tyto alba</i>)

Table 1. (cont'd)

Species code	Common name	Scientific name
brth	Brown thrasher	<i>(Toxostoma rufum)</i>
btgr	Boat-tailed grackle	<i>(Cassidix major)</i>
btpa	Brown-throated conure	<i>(Aratinga pertinax)</i>
budg	Budgerigar	<i>(Melopsittacus undulatus)</i>
bwqu	Common bobwhite	<i>(Colinus virginianus)</i>
bwte	Blue-winged teal	<i>(Anas discors)</i>
cbth	Curve-billed thrasher	<i>(Toxostoma curvirostre)</i>
ccro	American crow	<i>(Corvus brachyrhynchos)</i>
cfm	Cassins finch	<i>(Carpodacus cassinii)</i>
cgoo	Canada goose	<i>(Branta canadensis)</i>
cgra	Common grackle	<i>(Quiscalus quiscula)</i>
chac	Plain chachalaca	<i>(Ortalis vetula)</i>
chaw	Cooper's hawk	<i>(Accipiter cooperii)</i>
cotq	Coturnix	<i>(Coturnix coturnix)</i>
cpig	Rock dove or common pigeon	<i>(Columba livia)</i>
crav	Northern raven	<i>(Corvus corax)</i>
cwax	Cedar waxwing	<i>(Bombycilla cedrorum)</i>
dicl	Dickcissel	<i>(Spiza americana)</i>
edov	Eared dove	<i>(Zenaidura macroura)</i>
gcsp	Golden-crowned sparrow	<i>(Zonotrichia atricapilla)</i>
gdov	Common or ground dove	<i>(Columbina passerina)</i>
geag	Golden eagle	<i>(Aquila chrysaetos)</i>
gosp	Golden sparrow	<i>(Passer luteus)</i>
grja	Green jay	<i>(Cyanocorax yncas)</i>
hfin	House finch	<i>(Carpodacus mexicanus)</i>
hlar	Horned lark	<i>(Eremophila alpestris)</i>
hspa	House sparrow	<i>(Passer domesticus)</i>
idov	Inca dove	<i>(Scardafella inca)</i>
larb	Lark bunting	<i>(Calamospiza melanocory)</i>
mald	Mallard	<i>(Anas platyrhynchos)</i>
mdov	Mourning dove	<i>(Zenaida macroura)</i>
mhaw	Northern harrier (Marsh hawk)	<i>(Circus cyaneus)</i>
mpar	Monk parakeet	<i>(Myiopsitta monachus)</i>
mwea	Northern masked weaver	<i>(Ploceus taeniopterus)</i>
ofpa	Orange-fronted conure	<i>(Aratinga canicularis)</i>
pind	Common pintail	<i>(Anas acuta)</i>
rbis	Red bishop	<i>(Euplectes orix)</i>
rbgu	Ring-billed gull	<i>(Larus delawarensis)</i>
rbqu	Red-billed quelea	<i>(Quelea quelea)</i>
rbse	Ruddy-breasted seedeater	<i>(Sporophila minuta)</i>
recb	Red-eyed cowbird	<i>(Tangavius aeneus)</i>
rdgo	Ruddy ground dove	<i>(Columbina talpacoti)</i>
rnph	Ring-necked pheasant	<i>(Phasianus colchicus)</i>
robi	American robin	<i>(Turdus migratorius)</i>
rwbb	Red-winged blackbird	<i>(Agelaius phoeniceus)</i>
scrj	Scrub jay	<i>(Aphelocoma coerulescens)</i>
sdov	Scaly dove	<i>(Scardafella squammata)</i>
shcb	Shiny cowbird	<i>(Molothrus bonariensis)</i>
shcr	Sandhill crane	<i>(Grus canadensis)</i>
star	European starling	<i>(Sturnus vulgaris)</i>
swha	Swainson's hawk	<i>(Buteo swainsoni)</i>
tcbb	Tricolored blackbird	<i>(Agelaius tricolor)</i>
turk	Wild turkey	<i>(Meleagris gallopavo)</i>
valq	California quail	<i>(Loportyx californica)</i>
vwea	Village weaver	<i>(Ploceus cucullatus)</i>
wcsp	White-crowned sparrow	<i>(Zonotrichia leucophrys)</i>
wfdo	White-fronted dove	<i>(Leptotila verreauxi)</i>
wwdo	White-winged dove	<i>(Zenaida asiatica)</i>
yhbb	Yellow-headed blackbird	<i>(Xanthocephalus xanthocephalus)</i>
ybmp	Yellow-billed magpie	<i>(Pica nuttalli)</i>

Table 2. Acute oral toxicity and repellency of 998 chemicals to Redwinged blackbirds, Starlings, and Coturnix Quail

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starting LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Phenobarbital	50066	+ 100(a,e)	+1.00	—	—	—	—
Mitomycin C	50077	7.50	+1.00	+76.9	+10.3	+ 17.8	+ 10.0—+100(m)
Hexobarbital sodium	50099	+ 100(a,e)	+1.00	—	—	—	—
Metharbital	50113	+ 100(a,e)	+1.00	—	—	—	—
Lysergide	50373	1.78(a,e)	—	—	—	+ 31.6(a,e)	—
Chlorpromazine	50533	—	—	—	—	+ 74.0—+100(a,e)	—
Reserpine	50555	100(a,e)	—	—	—	—	—
Niclosamide	50657	+ (60.0)	0.850	65.4	-1.09	—	—
Alloxan	50715	—	1.70	—	—	—	—
Dactinomycin	50760	1.00—3.16	+0.100	+ 7.69	+ 7.69	+ 3.16	+ 3.16
Aspirin	50782	100—+100(a,e)	+1.00	+76.9	+ 0.769	—	—
Piperonyl butoxide	51036	+ 100(a)	+1.00	—	—	+ 100(a)	—
Procaine HCl	51058	—	—	—	—	+ 100—+953(a,e)	—
Triethylenemelamine	51183	2.87—5.62	+1.00	+76.9	+27.4	3.66—4.22	100—133(g)
2,4-Dinitrophenol	51285	13.3(a)	—	—	—	42.2—46.0(a)	—
<i>α</i> -Amphetamine SO ₄	51638	56.2	0.121	9.30	0.165	—	—
Tremorine	51730	100(a,e)	+1.00	+76.9	+ 0.769	—	—
Urethane	51796	+ 100(a)	+0.100	—	—	+ 100(a)	+ 316(m)
Tetramethylethylenediamine	51809	+ 100	+1.00	—	—	17.8	237(f,m)
Thiotepa	52244	5.62	0.805	61.9	11.0	—	—
Cyclobarbitol	52313	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	+ 100—316(m)
Allobarbitol	52437	+ 100—133(e)	—	—	—	—	—
Cycloleucine	52528	+ 178	+1.00	—	—	+ 100(a,e)	—
Bay 37341	52608	4.22(a)	0.237	18.5	4.39	+ 100(a)	—
Trichlorfon	52686	37.0—75.0	0.110—0.562	43.2	1.17	43.0	—
Famphos	52857	1.78(c)	0.133	10.2	5.75	+ 42.2(e)	—
Hydroxydione sodium	53101	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
Nicotine	54115	17.8	0.650	50.0	2.81	42.2	42.2—316(m)
6-Azauridine	54251	+ 100	+1.00	—	—	—	+ 100—316(m)
Pentylentetrazole	54955	+ 100	0.826	63.5	-0.635	—	+ 316(f)
3,4-Diaminopyridine	54966	75.0	+1.00	+76.9	+ 1.03	+1000	+1000
<i>gamma</i> -Picolinic acid	55221	+1000	+1.00	—	—	+ 500(a)	—
Bay 37342	55378	7.50—10.0(a)	0.110	8.46	1.13	—	—
Fenthion	55389	1.69—3.50(a,b,c)	0.060	4.62	2.73	5.30—17.8(a,c)	17.8(c)
Busulfan	55981	56.2	+1.00	+76.9	+ 1.37	—	316—750(g)
Tetraethylammonium chloride	56348	—	+1.00	—	—	—	—
Tributyltin oxide	56359	+ (30.0)	0.316	24.3	-0.810	—	—
Parathion	56382	2.37(a,b,c,e)	0.133	10.2	4.31	5.62(a,c,e)	4.22(c)
Coumaphos	56724	1.78—3.60(a,b,c)	0.002—0.020	1.53	0.864	75.0—316(a,c)	13.3(c)
Chlorobutanol	57158	+ 100(a,e)	+1.00	—	—	—	—
Strychnine	57249	—	0.030	—	—	+ 100—+665(a,e)	237(f)
Pentobarbital sodium	57330	75.0(a,e)	—	—	—	+ 127(e)	+ 316(f)
Meprobamate	57534	—	—	—	—	—	—
9,10-Dimethyl-1,2-benzanthracene	57976	+ 100	+1.00	—	—	500—+500(e)	—
Caffeine	58082	316	0.180	13.9	0.044	—	—
Menadiene	58275	+ 316	+1.00	—	—	—	—
DID 47	58366	23.7(a)	0.089	6.85	0.289	—	—
Perphenazine	58399	31.6(a,e)	+1.00	+76.9	+ 2.43	100(a,e)	—
Promazine	58402	—	—	—	—	+ 325—+335(a,e)	—
Theophylline	58559	—	0.316	—	—	—	—
Lindane	58899	75.0(a)	0.121	9.31	0.124	100(a)	+ 100
Bromodeoxyuridine	59143	+ 100	+1.00	—	—	—	—
4-Chloro- <i>m</i> -cresol	59507	+ (113)	+1.00	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starting LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Sulphenone	80002	+ 100	0.080	6.15	- 0.062	—	—
Dapsone	80080	—	+1.00	—	—	—	—
Diazald	80115	+ 100	+1.00	—	—	—	—
CI 37151	80228	+ 100(a)	+1.00	—	—	+ 100(a)	—
Tiglic acid	80591	+ (111)	+1.00	—	—	—	—
Chlormezanone	80773	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
4-Amino-1-benzoylaminoanthraquinone	81469	+ (113)	+1.00	—	—	—	—
1-Amino-2,4-dibromanthraquinone	81492	—	+3.16	—	—	—	—
Quinizarin	81641	+ 316	1.65	127	- 0.402	—	—
3,9-Dibromobenzanthrone	81981	—	+1.46	—	—	—	—
Benzanthrone	82053	—	0.290-+3.16	—	—	—	—
Anthrilmide	82224	—	0.200-0.230	—	—	—	—
1-Amino-2-methylanthraquinone	82280	+ (40.0)	0.600	46.2	- 1.16	—	—
1,5-Dinitroanthraquinone	82359	—	+2.66	—	—	—	—
1-Methylaminoanthraquinone	82382	+ (113)	0.600	—	- 0.409	—	—
1,8-Dichloroanthraquinone	82439	+ 316	0.600	46.2	- 0.537	—	—
1-Chloroanthraquinone	82440	+1000	0.422	32.3	- 0.032	—	—
1-Aminoanthraquinone	82451	+ 316	+1.00	—	—	—	—
1,5-Dichloroanthraquinone	82462	+ 316	+1.00	—	—	—	—
1-Anthraquinonesulfonic acid	82495	+ (113)	+0.100	—	—	—	—
Acenaphthoquinone	82860	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
Buelzine	82951	+ 100(a)	+1.00	—	—	+ 100(a)	—
Ampyrone	83078	+ (101)	+1.00	—	—	—	—
Acenaphthene	83329	+ (98.0)	+1.00	—	—	—	—
Skatole	83341	+ (90.0)	+1.00	—	—	—	—
1-Amino-2-anthraquinonesulfonic acid	83625	—	0.800	61.5	- 0.683	—	—
Theobromine	83670	—	1.27	—	—	—	—
Phenanthrenequinone	84117	+ (104)	0.800	61.5	- 0.591	—	—
9,10-Anthraquinone-2-sulfonic acid	84480	+ (113)	+1.00	—	—	—	—
Anthraquinone-2,6-disulfonic acid	84504	+ (113)	+1.00	—	—	—	—
2-Methylanthraquinone	84548	+ (113)	0.800	61.5	- 0.544	—	—
Anthraquinone	84651	+ 100-+300(a)	0.100-0.600	46.1	- 0.154	—	—
Methylmethanthranilate	85016	—	+1.90	—	—	—	—
Phenanthrene	85018	+ (113)	+1.00	—	—	—	—
2,2-Terephthaloyl dibenzoic acid	85596	+ (100)	+1.00	—	—	—	—
Methylmethanthranilate	85916	—	+1.00	—	—	—	—
Chromoflavine	86408	—	0.619	47.6	0.847	—	+ 100(m)
Aziphos-methyl	86500	56.2	0.160	12.3	1.54	27.0(a)	—
Fluorene	86737	+ (101)	+1.00	—	—	—	—
3,4,5-Trimethoxybenzaldehyde	86817	422	+1.00	+76.9	+ 0.183	—	—
Ethylanthranilate	87252	—	+1.00	—	—	—	—
Violic acid	87398	+ 100	+1.00	—	—	—	—
6-Chloropurine	87423	+ 100	+1.00	—	—	—	—
Pyrolan	87478	—	0.040	—	—	—	—
3-Chloro- <i>o</i> -toluidine	87605	237	+1.00	+76.9	+ 0.325	38.7(a)	+ 100-316(m)
Pyrogallol	87661	75.0	+1.00	+76.9	+ 1.03	562	—
Chloranilic acid	87887	+ (96.0-96.3)	0.580-+1.00	—	—	—	—
Vinylpyrrolidone	88120	+ (98.0)	+1.00	—	—	—	—
2-Carboxyfurran	88142	+ (98.0)	+1.00	—	—	—	—
Ex 5004	88368	+ 100(a,e)	+1.00	—	—	—	—
Anthranilamide	88686	1000	+1.00	+76.9	+ 0.077	+ 100(a,e)	+1000
2-Nitroaniline	88744	750	+1.00	+76.9	+ 0.103	+1000	750
TIBA	88824	+ 100	+1.00	—	—	—	—

Dinoseb	88857	7.50	0.648	49.8	6.64	7.10-8.30(a)	—
2,4-Dinitrobenzene sulfonic acid	89021	+ 100(a)	+1.00	—	—	+ 100(a)	—
Norphenazone	89258	+ (96.0)	+1.00	—	—	—	—
3,5-Dihydroxy-2-naphthoic acid	89350	+ 100	+1.00	—	—	+ 100	—
1,4-Dimethoxy-2-nitrobenzene	89394	+ 100(a)	0.680	57.3	- 0.523	+ 100(a)	—
1,2,4-Trichloro-5-nitrobenzene	89690	+ 100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
2-Hydroxybenzohydroxamic acid	89736	+ 100	0.562	43.2	- 0.432	+ 100	—
(+)-Pulegone	89827	+ 316	+1.00	—	—	—	—
Resacetophenone	89849	+ (101)	+1.00	—	—	—	—
Salicylaldehyde	90028	+ (111)	+1.00	—	—	—	—
2-Aminoanisole	90040	750	+1.00	+76.9	+ 0.103	+1000	422
1-Naphthol	90153	+ (100)	+1.00	—	—	—	—
Hymecromone	90335	+ 100	+1.00	—	—	—	—
Anthrone	90448	+ (113)	+1.00	—	—	—	—
3,4,5-Trimethoxyimamic acid	90506	422	+1.00	+76.9	+ 0.183	—	—
Michlers ketone	90948	100	+1.00	+76.9	+ 0.769	—	+ 316(m)
Toluene-2,6-diisocyanate	91087	100	—	—	—	+ 100	—
Isatin	91565	+ (101)	+1.00	—	—	—	—
Diphenyl	92524	+ (96.0)	+1.00	—	—	—	—
Scopoletin	92615	+ 100	+1.00	—	—	—	—
3-Hydroxy-2-naphthoic acid	92706	+ (68.0)	0.422	32.3	- 0.475	—	—
Tritosol	92717	+ (96.2)	+1.00	—	—	—	—
Phenothiazine	92842	+ 100(e)	+1.00	—	—	—	—
Quinaldic acid	93107	+ 100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
Methyleugenol	93152	+ 316	+1.00	—	—	+ 100(a)	—
Isoeugenol methylether	93163	+ 316	+1.00	—	—	+ 316	—
Umbelliferone	93356	+ 100	+1.00	—	—	—	—
Thioquinox	93754	+ (106)(a)	+1.00	—	—	—	—
Benzocaine	94097	56.0(a)	+1.00	+76.9	+ 1.37	+ 316(a)	—
Tetracaine	94246	+ 100(e)	+1.00	+76.9	—	+ 100-298(e)	—
Butamben	94257	+ 100(e)	+1.00	+76.9	+ 0.769	+ 100(a,e)	—
Chalcone	94417	+ 100	+1.00	—	—	—	—
Safrole	94597	+ 316	0.237	18.2	- 0.058	+ 316	—
Ethohexadiol	94962	+ 100	+1.00	—	—	—	—
5-Chloro- <i>o</i> -anisidine	95034	+ 100(a)	0.316	24.6	- 0.246	+ 100(a)	—
Indene	95136	+ (101)	+1.00	—	—	—	—
Benzothiazole	95169	+ (96.0)	+1.00	—	—	—	—
<i>o</i> -Chloroaniline	95312	+ 100-562(a)	+1.00	+76.9	+ 0.137	+1000	+1000
<i>o</i> -Fluorotoluene	95323	+ 100	+1.00	—	—	100	—
<i>o</i> -Toluidine	95534	+ 100-316	+1.00	+76.9	+ 0.243	+ 100-422	+1000
<i>o</i> -Phenylenediamine	95545	133	+1.00	+76.9	+ 0.578	+1000	+1000
<i>o</i> -Aminophenol	95556	+1000	+1.00	—	—	+1000	316
<i>o</i> -Chlorophenol	95578	+ (113)	+1.00	—	—	—	—
3,4-Xylydine	95647	5.62(a)	+1.00	+76.9	+13.7	10.0(a)	—
4-Chloro- <i>o</i> -toluidine	95692	75.0	+1.00	+76.9	+ 1.03	+ 100	—
Methylhydroquinone	95716	+ (148)	+1.00	—	—	—	—
3-Chloro- <i>p</i> -toluidine	95749	1.00-2.37(a)	+1.00	+76.9	+76.9	3.16-4.22(a,k)	1.00
3,4-Dichloroaniline	95761	237	0.316	24.6	+76.9	562	—
5-Chloro- <i>o</i> -toluidine	95764	+1000	+1.00	+76.9	0.104	+1000	—
3-Chloro-1,2-propanediol	96242	+ 100	+1.00	+76.9	+ 3.25	—	316-422(g)
Thioglycerol	96275	+ 100	+1.00	—	—	—	—
Butyrolactone	96480	+ 100	—	—	—	—	—
2-Aminothiazole	96504	+ (98.0)	+1.00	—	—	—	—
2-Nitro- <i>p</i> -anisidine	96968	+ 100(a)	0.316	24.6	- 0.246	+ 100(a)	—
4-Chloro-3-nitrobenzoic acid	96991	75.0-100(a)	+1.00	+76.9	+ 1.03	+ 100(a)	—
Dichlofenthion	97176	14.0-17.8(a,c)	0.170-0.826	63.5	3.57	80.0-2370(a,c)	316(c)
5-Chloro-2,4-dimethoxyaniline	97507	+ 100(a)	0.680	52.3	- 0.523	+ 100(a)	—
Eugenol	97530	+ 316	+1.00	—	—	+ 316	+ 316
Isoeugenol	97541	+ 316	+1.00	—	—	—	—
Disulfiram	97778	+ (111)	+1.00	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starling LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Furfural	98011	+ (98.0)	+1.00	—	—	—	—
Thiophene-2-aldehyde	98033	+ (101)	+1.00	—	—	—	—
Benzotrithloride	98077	+ 100	+1.00	—	—	—	—
Benzene sulfonic acid	98113	+ 100(a)	+1.00	—	—	75.0(a)	—
4- <i>tert</i> -Butylcatechol	98293	+ (96.0)	+1.00	—	—	—	—
Cumene	98828	+ (98.0)	+1.00	—	—	—	—
<i>alpha</i> -Methylbenzylamine	98840	+ 100	+1.00	+76.9	+ 0.432	750	562
2-Pyridinecarboxylic acid	98986	178	+1.00	+76.9	+ 0.103	+1000	+1000
3-Carboxyaniline	99058	750	+1.00	24.6	0.185	+1000(a)	562
3-Nitroaniline	99092	133(a)	+1.00	—	—	—	—
Citrazinic acid	99116	+ (104)	+1.00	—	—	—	—
Dichloran	99309	+ 100	0.562	43.2	- 0.432	—	—
5-Nitro- <i>o</i> -toluidine	99558	+ 100(a)	0.422	32.3	- 0.323	+ 100(a)	—
5-Nitro- <i>o</i> -anisidine	99592	+ 100(a)	0.680	52.3	- 0.523	+ 100(a)	—
<i>m</i> -Dinitrobenzene	99650	42.2(a)	0.316	24.6	0.585	+ 100(a)	—
Methylparaben	99763	—	+0.100-+1.00	—	—	—	—
Cymene	99876	+ 316	+1.00	—	—	—	—
4-Aminoacetophenone	99923	+ 100-237(a)	0.540	41.5	0.175	+ 100-422	133-316
4-Nitroaniline	100016	75.0-100(a)	0.316	24.6	0.328	+1000(a)	1000
TMPD	100221	13.3	0.487	37.5	2.82	23.7	42.2(m)
4-Vinylpyridine	100436	100	+1.00	+76.9	+ 0.769	—	—
Phenyl cyanide	100470	+ 100(a)	+1.00	—	—	+ 100(a)	—
Benzyl alcohol	100516	+ 100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	+1000
Nicotinyl alcohol	100550	+ 1000	+1.00	—	—	—	—
Triphenylguanidine	101019	+ 100(a)	0.562	43.2	- 0.432	—	—
Dyrene	101053	+ 100	0.237-0.520	40.0	- 0.400	—	—
Chloropropan	101213	+ 500	0.120	9.23	- 0.018	+ 500	—
4,4'-Methylenedianiline	101779	+ (148)	+1.00	—	—	—	—
Phenylurethane	101995	+ 100	+0.100	—	—	+ 100	—
1,3-Diphenylguanidine	102067	+ 100(a)	0.564	43.4	- 0.434	—	—
1-Amino-2,3-dimethoxybenzene	102567	+ 100-+100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
Tributylamine	102829	+ (101)	+1.00	—	—	—	—
<i>beta</i> -Nitrostyrene	102965	—	0.900	—	—	—	—
Azobenzene	103333	+ (98.0)	+1.00	—	—	—	—
Acetanilide	103844	+ 100(e)	+1.00	—	—	+ 100(e)	—
Chlorophenesin	104290	+ 100	+1.00	—	—	—	—
4-Propylanisole	104450	+ 316	+1.00	—	—	+ 316	—
Anethole	104461	316	+1.00	+76.9	+ 0.243	—	—
Cinnamaldehyde	104552	+ (96.0)	+1.00	—	—	—	—
<i>p</i> -Tolunitrile	104858	+ 100	+1.00	—	—	—	—
<i>p</i> -Anisidine	104949	+ 316-+316(a)	+1.00	+76.9	+ 0.240	+ 316-+1000(a)	+1000
4-Methylthioaniline	104961	178-237(a)	+1.00	+76.9	+ 0.324	+1000(a)	562
Methylurethane	105408	+ 100(a)	+1.00	—	—	+ 100(a)	—
<i>beta</i> -Citronellol	106229	—	—	—	—	—	—
<i>p</i> -Cresol	106445	+ (96.0)	+1.00	—	—	—	—
4-Thiocresol	106456	+ (98.0)	+1.00	—	—	—	—
<i>p</i> -Chloroaniline	106478	—	—	—	—	1000(a)	237
<i>p</i> -Chlorophenol	106489	+ (113)	+1.00	—	—	—	—
<i>p</i> -Toluidine	106490	56.2(a)	+1.00	+76.9	+ 1.37	42.2(a)	237
<i>p</i> -Phenylenediamine	106503	100	+1.00	+76.9	+ 0.769	562	100
Quinone	106514	—	—	—	—	—	—
Acrolein	107028	+ 10.0-+100(a)	—	—	—	+ 10.0-+100(a)	—
Butyric acid	107926	—	+1.00	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starling LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Dianthron	117102	+ 316	+1.00	—	—	—	—
Anthraxin	117124	+ (113)	+1.00	—	—	—	—
1,5-Disulfoanthraquinone	117146	+ (113)	+1.00	—	—	—	—
Quercilin	117395	+ 100	+1.00	—	—	—	—
Anthraquinone-2-carboxylic acid	117782	+ (113)	+1.00	—	—	—	—
2-Aminoanthraquinone	117793	+ 316	0.340	26.1	- 0.083	—	—
Dichlone	117806	+ 316	+5.60	846	- 8.46	—	—
Chloramil	118752	+ (100)	+1.00	—	—	—	—
Uramil	118785	+ 100	+1.00	+76.9	+ 0.103	+1000	+1000
2-Aminobenzoic acid	118923	750	+1.00	24.6	18.5	31.6(a)	—
3-Nitro- <i>p</i> -toluidine	119324	3.16(a)	0.316	—	—	7.94-860(a)	—
Isolan	119380	—	—	—	—	—	—
Benzoin	119539	+ (98.0)	+1.00	—	—	—	—
Anthrazene	120127	+ (111)	+1.00	—	—	—	—
3-Amino-4-methoxybenzanilide	120354	+ 100(a)	+1.00	—	—	+ 100(a)	—
Isosafrole	120581	+ 1000	0.750	57.7	- 0.058	—	—
Indole	120729	+ (100)	+1.00	—	—	—	—
<i>N,N'</i> -Dimethyldithiooxamide	120796	7.50-10.0	0.237	18.2	2.43	42.2	17.8(m)
Catechin	120809	+ 100	+1.00	—	—	—	—
<i>N,N'</i> -Didodecylidithiooxamide	120887	+ (102)	+1.00	—	—	—	+1000(f)
2-Limidazolidinone	120934	+ 100	+1.00	—	—	—	—
Vanillic acid	121346	+ 100	+1.00	—	—	—	—
Triethylamine	121448	+ 100	+1.00	76.9	- 0.769	+ 100(a)	—
3-Amino-4-chlorobenzo trifluoride	121506	+ 100(a)	+1.00	—	—	—	—
Acetylsulfanilyl chloride	121608	+ (104)	+1.00	—	—	—	—
2-Amino-5-nitrothiazole	121664	+ (98.0)	+1.00	—	—	—	—
Malathion	121755	400	1.55	119	0.298	—	—
Bomyl	122101	0.950-1.00(a)	—	—	—	9.50-10.0(a)	—
Fenitrothion	122145	17.8-25.0(a)	0.100	7.69	0.432	11.0	56.2
Diphenylamine	122394	+ (101)	+1.00	—	—	—	—
<i>p</i> -Chlorophenoxy acetic acid	122883	+ (104)	+1.00	—	—	—	—
<i>p</i> -Aminophenol	123308	56.2	+1.00	+76.9	+ 1.37	+1000	+1000
Succinimide	123568	+ (96.0)	+1.00	—	—	—	—
Paraldehyde	123637	+ 100(a,e)	+1.00	—	—	—	—
Pyrrolidine	123751	+ (101)	+1.00	—	—	—	—
Baytan	123886	+ 316	+1.00	—	—	—	—
Caprylic acid	124072	—	+1.00	—	—	—	—
1,6-Hexanediamine	124094	+ (101)	+1.00	—	—	—	—
Caprylic aldehyde	124130	+ (111)	+1.00	—	—	—	—
Dodecylamine	124221	+ (98.0)	+1.00	—	—	—	—
Carbonic anhydride	124389	3.94 × 10 ⁶ (g)	—	—	—	4.69 × 10 ⁶ (g)	3.92 × 10 ⁶ (g)
Unsic acid	125462	+ 100	+1.00	—	—	—	—
ENT 17596	126158	+ 100	+1.00	—	—	—	—
Butonate	126227	158(a)	+1.00	+76.9	+ 0.487	280(a)	—
Oxethazine	126272	+ 100(a,e)	+1.00	—	—	—	—
1-Bromo-2,2-dimethoxypropanone	126385	+ 100	+1.00	—	—	—	—
Ethinamate	126523	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
2,4-Dimethylthiazole	126818	+ (102)	+1.00	—	—	—	—
Demeclocycline	127333	—	+1.00	—	—	—	—
1,8-Diamino-4,5-dihydroxyanthraquinone	128949	+ (67.0)	0.800	61.5	- 0.918	—	—
1,4-Diaminoanthraquinone	128950	+ (87.0)	0.800	61.5	- 0.707	—	—
2-Methyl-1-nitroanthraquinone	129157	+ (113)	+1.00	—	—	—	—
1,5-Diaminoanthraquinone	129442	+ (113)	+1.00	—	—	—	—

129646	Carbic anhydride	+	100	+	1.00	—	—	—	—	—	—
130154	1,4-Naphthoquinone	+	133	—	0.316-0.562	—	—	—	—	—	—
130892	Quinine HCl	+	100	+	1.00	43.1	0.324	—	—	—	—
131099	2-Chloroanthraquinone	+	316	+	1.00	—	—	—	—	—	—
131113	Dimethylphthalate	+	100	+	1.00	—	—	—	—	—	—
131146	2,6-Diaminoanthraquinone	+	(113)	+	1.00	—	—	—	—	—	—
132649	Dibenzofuran	+	(102)	+	1.00	—	—	—	—	—	—
133062	Caplan	+	100	+	0.650-1.67	128	- 1.28	—	—	—	—
133186	Phenylethylanthranilate	—	(101)	+	1.00	—	—	—	—	—	—
133324	Indolebutyric acid	+	(113)	+	1.00	—	—	—	—	—	—
133539	Dichloroxylenol	+	(113)	+	1.00	—	—	—	—	—	—
134203	Methylanthranilate	—	500	+	1.00	—	—	—	—	—	—
134623	Diethyltoluamide	+	(100)	+	0.820-3.90	300	- 0.600	—	—	—	—
135193	2-Naphthol	+	(96.0)	+	1.00	—	—	—	—	—	—
135206	Cupferron	+	316	+	1.00	—	—	—	—	—	—
135773	1,2,4-Trimethoxybenzene	—	300	+	1.00	—	—	—	—	—	—
137053	Mecrylate	—	300	+	0.623	—	—	—	—	—	—
137268	Thiram	—	100(a)	+	0.650	47.9	0.160	—	—	—	—
137304	Ziram	+	100	+	1.00	50.0	0.500	—	—	—	—
138590	Shikimic acid	+	100	+	1.00	—	—	—	—	—	—
140103	<i>trans</i> -Cinnamic acid	+	100	+	1.00	+76.9	+ 0.769	—	—	—	—
140205	Meralluride	+	(98.0)	+	1.00	—	—	—	—	—	—
140318	Aminoethylpiperazine	+	(98.0)	+	1.00	—	—	—	—	—	—
140567	Fenaminosulf	+	17.8(a)	+	0.750	57.7	3.24	—	—	—	—
140578	Aramite	+	100	—	—	—	—	—	—	—	—
140658	Pramocaine	+	100(a,e)	+	1.00	—	—	—	—	—	—
140670	Estragole	+	316	+	1.00	—	—	—	—	—	—
141322	<i>n</i> -Butyl acrylate	+	(103)	+	1.00	—	—	—	—	—	—
141662	Dicrotophos	+	(101)	+	1.00	—	—	—	—	—	—
141902	2-Thiouracil	+	1000	+	1.00	—	—	—	—	—	7.50(c)
142085	2-Hydroxyppyridine	+	100	+	1.00	—	—	—	—	—	—
143077	Lauric acid	—	(98.0)	+	1.00	—	—	—	—	—	—
143271	Hexadecylamine	—	42.2(a,e)	+	1.00	—	—	—	—	—	—
143500	Chlorocone	+	100(a,e)	+	1.00	+76.9	+ 1.83	—	—	—	—
143828	Probarbital sodium	+	100(a,e)	+	1.00	—	—	—	—	—	—
144025	Barbital sodium	+	100(a,e)	+	1.00	13.7	- 0.137	—	—	—	—
146543	Triflupromazine	+	(104)	+	0.562	—	—	—	—	—	—
148016	Dinitolmide	+	100	+	1.00	—	—	—	—	—	—
148243	8-Quinololn	+	100(a,e)	+	0.422	—	—	—	—	—	—
149155	Butacaine sulfate	+	100	+	1.00	—	—	—	—	—	—
149917	Gallic acid	+	(113)	+	1.00	32.4	0.324	—	—	—	—
150130	4-Carboxyaniline	+	1000	+	1.00	—	—	—	—	—	—
150765	<i>p</i> -Methoxyphenol	+	(113)	+	1.00	—	—	—	—	—	—
150787	1,4-Dimethoxybenzene	—	100	+	1.00	—	—	—	—	—	—
151053	Dimethylbenzylcarbinol acetate	—	100	+	1.00	—	—	—	—	—	—
152169	Schradan	—	100	+	1.00	—	—	—	—	—	—
153184	Rutin	+	(90.0)	+	1.00	—	—	—	—	—	—
155419	U 5036	+	(101)	+	1.00	—	—	—	—	—	—
260946	Acridine	+	(98.0)	+	1.00	—	—	—	—	—	—
288131	Pyrazole	+	(100)	+	1.00	—	—	—	—	—	—
288324	Imidazole	+	100	+	1.00	—	—	—	—	—	—
288880	1 <i>H</i> -1,2,4-Triazole	+	100	+	1.00	—	—	—	—	—	—
290879	<i>s</i> -Triazine	+	100	+	1.00	+76.9	- 0.769	—	—	—	—
291214	Thioform	+	100	+	1.00	—	—	—	—	—	—
297789	Isobenzan	+	3.16(c)	—	—	—	—	—	—	—	—
297972	Thionazin	+	2.37(c)	—	0.237	—	—	—	—	—	—
297994	Phosphamidon	+	1.78-3.16(a,c,e)	—	0.030	18.6	7.85	—	—	—	—
298000	Methyl parathion	+	10.0(a,e)	—	0.318	2.31	1.30	—	—	—	—
298022	Phorate	+	1.00(a)	—	0.047	24.5	2.45	—	—	—	—
						3.62	3.62				

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwingsed blackbird R ₅₀ (%)(5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starting LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Disulfoton	298044	3.16(a)	0.091	7.00	2.19	+ 31.6(a)	—
Ephedrin	299423	562	—	—	—	—	—
Ronnel	299843	75.0–80.0(a)	0.080–0.422	32.4	0.432	353–375(a)	—
DMPA	299854	100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
Cruformate	299865	100(a,e)	0.562–+1.00	+76.9	+ 0.769	+ 100(a,e)	—
Amphetamine	300629	+ (84.0)	—	—	—	—	—
Chloral hydrate	302170	+ 100(e)	+1.00	—	—	+ 100–+422(e)	—
2-Iodosobenzoic acid	304916	+ 316	+1.00	—	—	+ 316	+ 316
Aldrin	309002	23.7(c)	—	—	—	5.00–23.7(a,c)	42.2(c)
Secobarbital sodium	309433	75.0(a,e)	+1.00	+76.9	+ 1.03	+ 100(a,e)	—
Azacosterol	313053	422	+1.00	+76.9	+ 0.183	—	422–562(g)
Mexacarbate	315184	10.0–13.3(a,c,d,e)	0.040	3.08	0.308	23.7–31.6(a,c,d,e)	2.37(c)
Emetine HCl	316427	56.2	—	—	—	+ 100	—
5-Azacytidine	320672	100	+1.00	+76.9	+ 0.769	—	+ 100(m)
5-Chloro salicylic acid	321142	75.0–+100(a)	0.680	52.3	0.697	75.0–+100(a)	—
Chlorogenic acid	327979	+ 100	+1.00	—	—	—	—
Trichloronate	327980	1.60–4.22(a,c)	0.160	12.3	6.48	110–1000(a,c)	23.7(c)
HRS 1422	330643	10.0(a,d,e,h)	0.076(h)	5.85	0.585	+ 100(a,d,e)	—
Caffeic acid	331395	+ 100	+1.00	—	—	—	—
Methyl trifluoromethanesulfonate	333277	+ 100	+1.00	—	—	—	+ 1000
Diazinon	333415	2.00–3.16(a,c)	0.020	1.54	0.769	110–316(a,c)	4.22(c)
Bay 38 156	333437	1.60–1.78(a)	0.110	8.46	4.75	5.00(a)	—
Thiamylal sodium	337473	+ 100(a,e)	+1.00	—	—	—	—
Mecloqualone	340578	+ 100–178(a,c)	0.650	50.0	0.281	+ 100(e)	—
3-Acetylpyridine	350038	178	+1.00	+76.9	+ 0.437	1000	422
Pentazocine	359831	+ 100–562(a,e)	1.00	76.9	0.137	+ 100(a,e)	—
N,N,N',N'-Tetramethylbenzidine	366290	+ 100	+1.00	—	—	—	+ 316(m)
3-Chloro-4-fluoroaniline	367215	+ 100	0.316	24.6	—	+ 100	—
4-Fluoroaniline	371404	100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
3-Fluoroaniline	372190	56.2(a)	+1.00	+76.9	+ 1.37	+ 100(a)	—
Chloridiazepoxide HCl	438415	316–360(e)	+1.00	+76.9	+ 1.124	+ 100(a,e)	1000
Diazepam	439145	+ 316(e)	0.667	51.3	0.162	+ 100(a,e)	—
Trifluoperazine HCl	440175	+ 100(a,e)	0.438	33.7	0.337	+ 100(a,e)	—
3-Fluoro-p-toluidine	452777	1.78(a)	0.316	24.6	13.8	1.33(a)	—
6-Azauracil	461892	+ 100	+1.00	—	—	—	+ 100(m)
3-Aminopyridine	462088	13.3	0.562	43.2	3.25	133	178
1,5-Pentanediamine	462942	+ (101)	0.800	61.5	—	—	—
Cineole	470826	—	1.57	32.4	2.43	3.16–23.7(a,c)	17.8–178(c)
Chlorfenvinphos	470906	10.0–13.3(a,c)	0.422	—	—	—	—
Ellagic acid	476664	+ 100	+1.00	—	—	—	—
Taxifolin	480182	+ 100	+1.00	—	—	—	—
Dithranol	480228	+ (100)(a)	1.23	94.6	—	—	—
Naringenin	480411	+ 100	+1.00	—	—	—	—
5-Nitrobarbituric acid	480682	+ (104)	+1.00	—	—	—	—
Cinchonidine	485712	+ 100	0.524	40.3	0.403	—	+ 100
Fluorenone	486259	+ (96.0)	+1.00	—	—	—	—
Flavanone	487263	75.0	+1.00	+76.9	+ 1.03	—	—
1-Epicatechin	490460	+ 100	+1.00	—	—	—	—
2,4,5-Trimethoxybenzoic acid	490642	+ 1000	+1.00	—	—	—	—
Biochannin A	491805	+ 100	+1.00	—	—	—	—
CI Solvent yellow 34	492808	—	0.562	—	—	—	—
Euchrysin	494382	+ 100	0.282	21.7	0.217	—	—
Hippuric acid	495692	+ (101)	+1.00	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwings blackbird R ₅₀ (%)(5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Startling LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
3-Amino-1,2-propanediol	616308	+ 100	+1.00	—	—	—	—
2-Pyrrolidone	616455	+ (98.0)	+1.00	—	—	—	—
2-Furyllamine	617890	+ (96.0)	+1.00	—	—	—	—
N-Acetylpiperidine	618428	+ (96.0)	+1.00	—	—	—	—
p-Nitrodiphenyl ether	620882	+ (100)	+1.00	—	—	—	—
1,3,5-Trimethoxybenzene	621238	+ 1000	+1.00	—	—	—	—
4-Chlorobenzonitrile	623030	—	+1.00	—	—	—	—
3-Dimethylamino-1,2-propanediol	623574	+ 100	+1.00	—	—	—	—
N-Ethylurethane	623789	+ 100(a)	+0.100	—	—	+ 100(a)	—
3-Iodoaniline	626017	+ 100(a)	+1.00	—	—	+ 100(a)	—
3-Chloropyridine	626608	1000	+1.00	+76.9	+ 0.077	1000	750
4-Chloropyridine	626619	+ 100	+1.00	—	—	+ 1000	+ 100(m)
4-Hydroxypyridine	626642	+ 100-+1000	+1.00	—	—	+ 100	+ 1000
Propyl carbamate	627123	+ 100	+1.00	—	—	—	—
Hexyl cyanide	629083	—	+1.00	—	—	—	—
Naphthocaine	629505	+ 100	—	—	—	—	—
Hexadecyl acetate	629709	+ 100	+1.00	—	—	—	—
Carbon monoxide	630080	1334(6)	—	—	—	2213(6)	2103(6)
Methylsyringol	634366	+ 1000	+1.00	—	—	—	—
4-Chloro-3-nitroaniline	635223	100(a)	0.316	24.6	0.246	+ 100(a)	—
Trimetozine	635416	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
Distamycin A	636475	— (72.0)	0.422	32.3	+ 0.449	—	+ 316(m)
3-Pyridylsulfonic acid	636737	+ 100	+1.00	+76.9	+ 0.137	—	+ 56.2(m)
Coniine HBr	637490	56.2	+1.00	—	—	—	—
Trichloroacetic acid	638164	+ 100	+1.00	—	—	—	—
Triphenyl tin chloride	639587	—	0.422	—	—	—	—
Fluoroacetamide	640197	+ 5.62	+1.00	+76.9	+13.7	—	13.3(f)
1,3,5-Trimethoxyphenol	642717	+ 1000	+1.00	—	—	250(a)	—
Dimetilan	644644	—	0.800	—	—	—	—
Hexamethylmelamine	645056	—	+1.00	—	—	—	316(f)
Aminoxy acetic acid	645885	—	—	—	—	—	—
Carbanolate	671045	—	—	—	—	—	—
U 17556	672060	2.37-6.00(a,c,*)	0.091	70.0	5.26	11.5(a,c,d,e)	7.50(c)
RE 5305	673198	13.3(d,e,h)	0.030	2.31	0.502	+ 100(d,e)	—
Hemp	680319	+ 100	+1.00	+76.9	+ 0.077	5.00-6.00(a,d)	1000(f)
N-Methyl-2-pyridone	694859	+ 100	+1.00	—	—	+ 1000	+ 1000
4-Pyridinealdoxime	696548	+ 100	+1.00	—	—	—	422(f)
2-(2-Nitrovinyl)furan	699183	+ 100	+1.00	—	—	—	—
Tetramethyl-1,2-benzenediamine	704018	—	+1.00	—	—	—	+ 316(m)
Prilocaine	721506	+ 100(a,e)	—	—	—	+ 100(a,e)	—
Phosmet	732116	17.8(a)	0.244	18.8	1.05	+ 100(a)	—
EPTC	759944	100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
Adamantamine	765151	+ 100(a)	—	—	—	+ 100(a)	—
Dodecyl thiocyanate	768945	+ 178	+1.00	—	—	—	—
Carbophenothion	786196	+ 7.50(a)	0.282	21.7	2.89	5.62(a)	+ 100-+316(m)
Calcium citrate	813945	+ (100)	+1.00	—	—	—	—
Cupric oxalate	814915	+ (111)	1.00-1.10	84.6	0.762	—	—
Dimethoxane	828002	+ (98.0)	+1.00	—	—	—	—
Mescaline HCl	832928	+ 100	+0.316	—	—	—	—
Sudan I	842079	+ 500	+1.00	—	—	—	—
Naphthol Yellow S	846708	—	+1.00	—	—	—	—
Levopromazine	851683	100(a,e)	0.650	50.0	0.500	+ 100(a,e)	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starting LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Tribromoethanol	1329868	316	—	—	—	+ 316-445(e)	422
Cuprous oxide	1371391	+ (50.0)	0.660	50.8	- 1.02	—	—
Tannin	1401554	+ 100	+1.00	—	—	—	+ 100-+316(m)
Bacitracin	1405874	+ 100	+1.00	—	—	—	—
Humic acid	1415936	+ (101)	+1.00	—	—	—	—
Niclosamide	1420048	+ (96.0)	+1.00	—	—	—	—
Amidephrine mesylate	1421687	+ 100	+1.00	—	—	—	+ 316(m)
Guanazole	1457772	+ 100	+1.00	40.0	0.533	—	—
Tributyl tin chloride	1461229	75.0-+100(a)	0.520	1.54	0.864	+ 100(a)	—
Naftalofos	1491414	1.78-2.37(a)	0.020	—	—	—	+1000(f)
Trifluoro methanesulfonic acid	1493136	+ 100	+1.00	—	—	+ 100	—
Ethylcyclohexane carbamate	1541191	+ 100	+1.00	—	—	—	—
Gallocyanine	1562852	+ 100	+1.00	—	—	—	—
Carbofuran	1563662	+ 100	0.028	2.15	5.11	5.62(c)	—
Daminazide	1596845	+ 100	+1.00	—	—	—	—
Metaxalone	1665481	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
1-(4-Ethoxyphenyl)ethanone	1676637	+ (96.0)	+1.00	—	—	—	—
4-Aminobutyronone	1688717	42.2	—	+76.9	+ 5.78	178	178
Nellite	1754581	13.3(a,e)	+1.00	57.7	0.769	75.0(a,e)	—
Akton	1757182	75.0	0.750	—	—	—	—
1,2-Diaminoanthraquinone	1758685	+ (113)	+1.00	50.0	0.067	+1000	750
3-(Methylthio)aniline	1783819	750	0.650	—	—	+1000	+1000
2-Cyanoaniline	1885296	+ 1000	+1.00	—	—	+1000	+ 316(m)
2,4,6-Triphenoxy-s-triazine	1919488	+ 178	+1.00	—	—	—	—
Vernolate	1929777	+ 100(a)	+1.00	—	—	+ 100(a)	—
N-Serve	1929824	—	+1.00	—	—	—	—
AC 24055	1933502	56.2(a,e)	+1.00	+76.9	+ 1.37	75.0(a,e)	—
Phenyl N-methylcarbamate	1943799	+ 100(a,d,e)	+1.00	—	—	+ 100(a,d,e)	—
4-Amino-3-picoline	1990905	2.37(a)	0.486	37.4	15.8	3.16(a)	—
Burylate	2008415	+ 100(a)	+1.00	—	—	+ 100(a)	—
Aminocarb	2032599	50.0(a,d,e)	0.150	11.5	0.231	+ 100-212(a,d,e)	—
Methiocarb	2032657	4.67-12.6(a,b,*)	0.050-0.089(h)	6.85	1.47	11.3-+50.0(c,d)	8.84-10.4(c)
2-Amino-4-morpholino-s-triazine	2045252	+ 100	+1.00	—	—	—	+ 316
Bis(4-chloro-2-nitrophenyl)disulfide	2050660	+ (96.0)	+1.00	—	—	—	—
Trifluoperidol HCl	2062773	133(e)	0.178	13.7	0.137	+ 100(a,e)	—
Benperidol	2062842	+ 100(a,e)	0.562	43.2	0.432	+ 100(a,e)	—
1-Chloro-2,5-dimethoxybenzene	2100427	+ 100(a)	+1.00	—	—	+ 100(a)	—
EPN	2104645	3.16(a,c,e)	0.464	35.7	11.3	+ 100(a)	10.0(c)
4-Benzylpyridine	2116656	+ 17.8(a)	0.800	61.5	3.46	+ 100(a)	—
Pemoline	2152343	100(a,e)	+1.00	+76.9	+ 0.769	+ 100(a,e)	—
Methiocarb sulfone	2179251	42.2-147(a)	0.562	43.2	1.03	—	—
1-Phenylcyclohexylamine	2201243	+ (98.0)	+1.00	—	—	—	—
Dowco 159	2213845	+ 56.2(a,e)	0.800	61.5	1.10	+ 100(a,e)	—
Ethyl N,N-dibutylcarbamate acid	2217881	+ 100(a)	+0.100	27.3	0.049	+ 100(a)	562
3-Cyanoaniline	2237301	562	0.355	—	—	+ 100(a,e)	—
Fencamfamin	2240144	+ 100(a,e)	+1.00	—	—	—	—
d-Phellandrene	2243336	—	1.78	—	—	—	—
Phenethyl isothiocyanate	2257092	+ 100	0.750	57.7	0.577	—	316-+316(f)
Olin 53139	2271934	—	+1.00	—	—	—	—
Dowco 177	2274911	+ 100(a)	0.422	32.3	0.323	+ 100(a)	—
Phencapton	2275141	+ 178(a)	0.316	24.3	0.135	+ 178(a)	—
Tripropyltin chloride	2279767	+ (79.0)	0.800	61.5	0.779	—	—
Omite	2312358	+ 100	+1.00	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starling LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
Chlorophacinone	3691358	+ 100(a)	—	—	—	—	—
Hercules 8717	3692908	15.0(a,d,e)	0.316	24.3	1.62	+ 29.0-150(a,d,e)	—
1,5-Dichloro-2,4-dinitrobenzene	3698837	+ 100	0.824	63.4	- 0.634	—	—
2-Picolylamine	3731519	562	+1.00	+7.69	+ 0.137	+1000	750
3-Picolylamine	3731520	+ 1000	+1.00	—	—	+1000	+1000
4-Aminomethylpyridine	3731531	+ 100-+ 1000	0.856	65.8	- 0.066	—	—
Denatonium benzoate	3734336	+ 100	+1.00	—	—	—	—
Dioxanide furoate	3736810	+ (98.0)	+1.00	—	—	—	—
ENT 17591	3737222	+ 100	+1.00	—	—	—	—
ENT 6249a	3750434	13.3	—	—	—	23.7	75.0-+100(f)
2-Chloro-4,6-diamino-1,3,5-triazine	3797624	+ 100	+1.00	—	—	—	+ 316
Chlorprocaine HCl	3858897	+ 100(a,e)	+1.00	—	—	—	—
SD 8786	3971899	42.2(a,e)	0.562	43.2	1.03	+ 100(a,e)	—
Ronnoxon	3983457	17.8(a,e)	0.400	30.8	1.73	+ 100(a,e)	—
Dowicide Q	4080313	+ 100(a)	+1.00	—	—	+ 100(a)	—
VC 3-668	4104034	—	+1.00	—	—	—	—
Gophacide	4104147	4.22-4.46	—	—	—	—	—
Ethyl carbazate	4114312	23.7-+100	0.540	41.5	1.75	17.8(a,e)	100(m)
7-Hydroxy-4,8-dimethylcoumarin	4115768	+ 100	+1.00	—	—	—	—
Valnoctamide	4171135	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
Sudan black B	4197255	+ 100-+ 500	+1.00	—	—	—	—
2-Phenoxytetrahydropyran	4203503	+ 1000	+1.00	—	—	—	—
Kelevan	4234791	+ (104)	+1.00	—	—	—	—
Trichloroacetophenone	4252782	+ 100	+1.00	—	—	—	—
2-Bromoethane sulfonic acid Na salt	4263529	+ 100	+1.00	—	—	—	—
Tybamate	4268364	+ 100(a)	+1.00	—	—	+ 100(a)	+ 1000(f)
Rauwolfine	4360127	178	+1.00	+76.9	+ 0.432	—	+ 100(m)
Sudan green	4392681	+ 500	+1.00	—	—	—	—
MES	4432319	+ 100	+1.00	—	—	—	—
Clothizamide dimaleate	4434202	+ 100(a,e)	0.650	50.0	- 0.500	+ 100(a,e)	+ 316(m)
2,4,5-Trimethoxybenzaldehyde	4460860	422	+1.00	+76.9	+ 0.182	—	—
4-Mercaptopyridine	4556234	+ 100	+1.00	—	—	—	750
Thionicotinamide	4621663	+ 100	+1.00	—	—	—	—
(+)-Fenchone	4695629	+ 316	+1.00	—	—	—	—
Triocetylphosphine	4731537	+ (98.0)	+1.00	—	—	—	—
5-Chloroisatoic anhydride	4743173	+ 100	+1.00	—	—	—	—
Lilly 21784	4806875	75.0(a,e)	+1.00	+76.9	+ 1.03	+ 100(a,e)	—
3-Piperidino-1,2-propanediol	4847932	+ 100	+1.00	—	—	—	—
Pentyl-2-furoic acid	4996489	(98.0)	+1.00	—	—	—	—
4-Acetamidopyridine	5221421	42.2(a)	—	—	—	—	—
Carboxin	5234684	42.2	+1.00	+76.9	+ 1.83	13.3(a)	—
Metomidate	5377208	56.2-100(a,e)	+1.00	+76.9	+ 1.37	178-+178(e)	—
Citral	5392405	—	—	—	—	—	—
3,3'-Thiobispropionamide	5459109	+ 1.00	+1.00	—	—	—	—
1,2,5-Triacetoxy pentane	5470860	+ (98.0)	+1.00	—	—	—	—
Capuride	5579135	+ 100(a,e)	+1.00	—	—	100(e)	—
Bromchlorenone	5579851	(42.1)	0.316	24.3	- 0.577	+ 100(a,e)	—
Dimefadane	5581408	+ 100(a,e)	0.930	71.5	0.954	+ 100(a,e)	—
Mesoridazine	5588330	+ 100(a)	0.562	43.2	- 0.432	+ 100(a)	—
Thiothixene	5591457	+ 100(a,e)	+1.00	—	—	+ 100(a,e)	—
Chlorpyrifos-methyl	5598130	100	+1.00	+76.9	+ 0.769	+ 100	—
Dowco 217	5598527	13.3(a,e)	0.154	11.8	0.890	56.2(a,e)	—

Chlorethate	5634377	+ 100(a,e)	—	—	—	+ 100(a,e)	—
l-Bornylacetate	5655518	316	+1.00	+76.9	+ 0.243	—	—
Acetophenazine maleate	5714001	75.0(a,e)	+1.00	+76.9	+ 1.03	100(a,e)	—
Ethyl-4-nitrophenyl carbamate	5819216	75.0(a)	0.316	24.6	0.328	+ 100(a)	—
Chloropropylate	5836102	+ 100	+1.00	—	—	—	+ 100(m)
Benaphyllin	5878615	+ 100	0.422	32.5	—	—	—
4-Propylveratrole	5888528	+ 316	+1.00	—	—	+ 316	—
Narlene	5902523	75.0(a)	0.030	2.31	0.031	—	+ 316(m)
1,3-Bis(dimethylamino)isopropanol	5966518	+ 100	+1.00	+76.9	—	—	100(m)
Benoxinate HCl	5987826	133	+1.00	—	—	—	—
d-Limonene	5989275	(111)	+1.00	—	—	—	—
N 244	6012926	+ 100(a)	0.020-0.110	8.46	—	—	—
p-Aminopropiophenone HCl	6170258	237	—	—	—	422	133
p-Aminopropiophenone SO ₄	6170269	133	+1.00	—	—	178	178
p-Toluenesulfonic acid, monohydrate	6192525	+ 100	+1.00	—	—	—	+ 316
Morin HCl	6202273	+ 100	+1.00	—	—	—	—
Triallyl citrate	6299736	—	+1.00	—	—	—	—
4-Chloro-2,5-dimethoxyaniline	6358641	+ 100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	—
Bithionolate sodium	6385586	(75.0)	0.750	57.7	—	—	—
Allylycarb	6392467	13.3(a,d,e)	0.100	7.69	—	10.0-13.3(a,d,e)	—
3-Chlorobenzanthrone	6409445	—	0.340	—	—	—	—
Tridodecylphosphine	6411241	+ 100	+1.00	—	—	—	—
HRS 1635	6436051	75.0(a)	0.422	32.3	0.431	+ 100(a)	—
Sodium silicate	6834920	(100)	+1.00	—	—	—	—
Monocrotophos	6923224	+ 100	0.056	4.31	4.31	3.16-5.62(a,c,e)	4.22(c)
2-Benzylamino pyridine	6935279	+ 100	0.680	52.3	—	+ 100	—
4-Chloro-2,5-dimethoxynitrobenzene	6940530	+ 100	0.282-+1.00	+76.9	+43.2	1.33(a)	1.33
2-Chloro-4-acetotoluidide	7149793	+ 100	+1.00	—	—	—	+ 316(m)
HEPES	7365459	+ 100	+1.00	—	—	—	—
Dimethyloctylamine	7378996	(101)	+1.00	—	—	—	+1000
4-Chloropyridine HCl	7379353	+ 100-+1000	+1.00	—	—	—	—
Aluminum	7429905	(111)	+1.00	—	—	—	—
Carbon	7440440	(100)	+1.00	—	—	—	—
Thallium sulfate	7446186	—	+1.00	—	—	34.6-56.6(a)	—
Lithium chloride	7447418	422	+1.00	+76.9	+ 0.183	+1000	422
Trichloromelamine	7673098	+ 100	+1.00	—	—	—	—
Sodium fluoride	7681494	—	+1.00	—	—	+ 200	—
Bay 75546	7682908	—	0.056	4.31	1.82	+ 100(a)	—
Crotoxyphos	7700176	56.2	0.649	49.9	0.888	—	—
Sulfur	7704349	—	+0.316-+1.00	—	—	—	—
Starlicide	7745893	2.41(a,j)	0.800	61.5	25.5	—	—
3-Bromo-p-toluidine	7745917	1.90(a)	0.760	58.5	30.8	3.16-4.11(a,j,k)	2.24-10.0(i)
Dowco 105	7780338	600	0.090	6.92	0.012	6.60-7.50(a)	—
Potassium alum dodecahydrate	7784249	(100)	+1.00	—	—	—	—
Ammonium alum	7784250	(100)	+1.00	—	—	—	—
Phosdrin	7786347	1.78(c)	—	—	—	3.90-7.50(a,c)	23.7(c)
Bone oil	8001852	—	+1.00	—	—	—	—
Neem oil	8002651	1000-+1000	+1.00	+76.9	+ 0.077	—	—
Chemagro 2635	8003461	+ 100(a)	-0.100	—	-0.077	+ 100(a)	—
Cinnamon oil	8007805	+ 1000	+1.00	—	—	—	—
Ditran	8015541	+ 100(a,e)	—	—	—	+ 100(a,e)	—
Veratrine	8051023	17.8	0.178	13.7	0.770	—	—
Lignosulfonic acid sodium	8061516	+ 100	+1.00	+76.9	—	—	—
Buñcarb	8065369	4.22(c)	+1.00	+76.9	+18.3	75.0(c)	42.2-56.2(c)
Demeton	8065483	2.37-22.0(a,b,c)	—	—	—	13.3-+39.0(a,c)	13.3(c)
Calcium nitrate	10124375	(99.0)	+1.00	—	—	—	—
BES	10191181	+ 100	+1.00	—	—	—	+ 316(m)
Naringin	10236472	+ 100	+1.00	—	—	—	—
Resmethrin	10453868	+ 75.0	+1.00	+76.9	+ 1.03	—	—
Propineb	12071839	+ 100	—	—	—	—	—
Zineb	12122677	+ 100(a)	+1.00-2.55	196	—	+ 100	—
Maneb	12427382	+ 100	+100	—	—	—	—

Table 2. (cont'd)

Name	Registry number (CAS)	LD ₅₀ (mg/kg) (1,2,5)	Redwinged blackbird R ₅₀ (%) (5)	R ₅₀ (mg/kg) (3)	Hazard factor (4)	Starting LD ₅₀ (mg/kg)	Coturnix LD ₅₀ (mg/kg)
GC 5942	12707607	+ 100(a)	0.200	15.4	- 0.154	100(a)	-
Phillips 2605	12712286	2.37(a)	0.178	13.7	5.78	17.8(a)	-
Micoluteina destacina	12764475	2.37(a)	0.150	11.5	4.77	2.37-3.16(a)	-
(1-Adamantyl)urea	13072690	+ 100	+1.00	-	-	-	+ 100
5-Anilino-1,2,3,4-thiaziazole	13078303	+ 100	0.453	34.8	- 0.348	-	+ 316(m)
ENT 27318	13194484	4.22(c)	-	-	-	7.50(c)	7.50(c)
SD 14114	13356086	+ 100	+1.00	-	-	+ 100	-
Titanium dioxide	13463677	+ 100	+1.00	+76.0	+ 0.769	+ 100(a,e)	-
Wy 5244	13822054	100-+100(a,e)	+1.00	+76.9	+ 0.769	-	-
Fenchyl acetate	13851111	+ 316	+1.00	-	-	-	-
Aminomethanesulfonic acid	13881919	+ 100	+1.00	-	-	-	+1000(f)
Fenpiramide HCl	14007535	+ 100	+1.00	-	-	-	-
Trimethidinium methosulfate	14149430	-	0.282	-	-	-	-
ACD 7029	14285439	+ 100(a,e)	+1.00	30.8	0.974	+ 100(a,e)	-
SD 3450	14458958	31.6(a,e)	0.400	-	-	+ 100(a)	-
Ba 33215	14548460	(25.0)(a)	-1.00	-	-	-	-
Bis(1,2,2-trichloroethyl)sulfoxide	14788977	+ 100	+1.00	-	-	-	-
Phoxim	14816183	+ 100	+1.00	+76.9	+ 7.69	23.7(c)	23.7(c)
Bay 78172	14816207	+ 100	-	-	-	-	-
beta-Ionone	14901076	+ 562	+1.00	-	-	-	-
Cryolite	15096523	+ 100(a)	+1.00	-	-	+ 100(a)	-
2-Chloroethane sulfonic acid Na salt	15484443	+ 100	+1.00	-	-	-	+1000(f)
Triphenyllead phenyl sulfide	15590779	(100)	+1.00	-	-	-	-
Ryania	15662336	+ 1.78(c)	0.133	10.2	5.75	3.16(c)	13.3(c)
Cyrazepam	15687077	+ 100(a,e)	0.900	69.2	- 0.692	+ 100(a,e)	-
alpha-Chloralose	15879933	31.6(a,e)	+1.00	+76.9	2.43	75.0(a,e)	31.6
RE 5454	15942480	9.00(a,d,e)	0.316	24.3	2.70	16.0(a,d,e)	-
2,3,4-Trichlorophenol	15950660	+ 100	+1.00	-	-	-	-
EPPS	16052065	+ 100	+1.00	-	-	-	+ 316(m)
3-Amino-5-mercapto-1,2,4-triazole	16691433	+ 100	+1.00	17.2	1.72	13.3-42.2(a,c,e)	+ 316(m)
Methomyl	16752775	10.0(a,c,e)	0.224	-	-	+ 316	+ 316
4'-Acetamidopropiophenone	16960499	+ 316	-	-	-	-	-
Edinphenos	17109498	+ 100	+1.00	-	-	-	-
Xanthiol HCl	17162322	+ 100(a,e)	0.650	50.0	- 0.500	+ 100(a,e)	-
2,2,2-Trichloroethylchloroformate	17341934	+ 100	+1.00	-	-	-	-
Tomatine	17406450	+ 100	+1.00	-	-	-	-
5-Amino-3-phenyl-1,2,4-thiadiazole	17467151	56.2-+100	0.422	32.5	0.577	-	75.0(m)
3-Amino-5,6-dimethyl-1,2,4-triazine	17584122	+ 100	+1.00	-	-	-	+ 316(m)
1,2,4-triazine	17623415	(104)	+1.00	-	-	-	-
Dodecylamine picrate	17804352	100-+100(a)	+1.00	+76.9	+ 0.769	+ 100(a)	-
Benomyl	18181801	+ 100	+1.00	-	-	-	-
Bromopropylate	19645422	(113)	+1.00	-	-	-	-
Bay 69047	20408973	+ 100	+1.00	-	-	-	+ 316(m)
Thioglucose	20548543	-	+1.00	-	-	-	-
Calcium sulfide	20762601	17.8	+1.00	+76.9	+ 4.32	-	-
Potassium azide	20856579	+ 100	+1.00	-	-	-	-
Chloranformethan	21087649	+ 100	+1.00	-	-	-	-
Metribuzin	21198185	+ 100	0.299	23.0	- 0.230	-	+ 316
4-Cyclohexylthiosemicarbazide							

Tin oxide	21651194	+	(103)	+1.00	---	---	---	---	---	---	---	---	---
Cyanazine	21725462	---	---	0.133	---	---	---	---	---	---	---	---	---
Bay 9015	21832257	---	13.3(a)	+0.100	+ 7.69	+	0.587	---	---	---	---	---	---
Phimiphos-ethyl	23505411	---	7.50	0.604	46.4	+	6.19	---	---	---	13.3(a)	---	---
Bay 93820	24353615	---	0.562(b)	0.024	1.85	+	3.52	---	---	---	+ 100	---	---
Rescinnamine	24815245	+	100(a,e)	---	---	---	---	---	---	---	---	---	---
Bay 91273	25205087	---	---	0.042	---	---	---	---	---	---	---	---	---
Propioproazine	25333839	+	316	0.465	35.8	---	0.113	---	---	---	316	+	316
Sodium azide	26628228	+	23.7	+1.00	+76.9	+	3.24	---	---	---	---	---	---
Pyridyl disulfonic acid-1,2,4-triazine	28048331	+	100	+1.00	---	---	---	---	---	---	---	---	---
Tartar emetic	28300745	+	100	0.133	---	---	0.102	---	---	---	---	+	316(m)
Thiocarbonyl	29118874	+	4.22	0.147	11.3	---	2.69	---	---	---	---	---	---
Cyanopyridine	29386661	+	100	+1.00	---	---	---	---	---	---	---	---	---
Bay 79845	32575807	+	3.16(g)	0.056	4.31	---	1.35	---	---	---	7.50(a)	---	---
Bay 88991	32575818	---	---	+1.00	---	---	---	---	---	---	---	---	---
Tributyltin chloroacetate	33550220	+	(39.0)	0.316	24.3	---	0.623	---	---	---	---	---	---
Chemagro 5461	34491128	+	10.0(a)	0.562	43.2	---	4.32	---	---	---	+ 10.0(a)	---	---
Dimethyldinitro carbaniide	34594473	+	100	0.824	63.4	---	0.634	---	---	---	---	---	---
Bay HOL 0574	35335605	+	2.37(b)	0.480	36.9	---	15.6	---	---	---	13.3	---	---
3-Iodo-p-toluidine	35944640	---	1.78-2.37(a)	0.150	11.5	---	6.48	---	---	---	23.7	---	---
Phillips 2133	35944731	---	1.78-2.10(a)	0.080	6.15	---	3.46	---	---	---	1.33(a)	---	---
Metomidate HCl	35944742	---	56.2(a,e)	0.667	53.1	---	0.913	---	---	---	+ 100(a,e)	---	---
Dowco 211	35944797	---	75.0(a,e)	+1.00	+76.9	+	1.03	---	---	---	+ 100(a,e)	---	---
Dowco 160	35944822	---	10.0(a,e)	0.500	38.5	---	3.85	---	---	---	+ 100(a,e)	---	---
Dowco 133	35944833	---	7.50(a)	0.500	38.5	---	5.13	---	---	---	+ 100(a)	---	---
GC 4276	35944866	---	10.0(a)	---	---	---	---	---	---	---	178(a)	---	---
Dowco 161	36031660	---	23.7(a,e)	0.500	38.5	---	1.62	---	---	---	13.3(a,e)	---	---
Ziram cyclohexylamine complex	36530231	---	31.6(a)	0.621	47.8	---	1.51	---	---	---	---	---	---
Propoquad HT1/12	37234621	---	---	+1.00	---	---	---	---	---	---	---	---	---
Phostex	37333407	+	500	+1.00	---	---	---	---	---	---	+ 500	---	---
SKF 10812A	37841331	+	178(e)	+1.00	+76.9	+	0.432	---	---	---	316-+316(e)	---	---
2-Methyl-p-aminobenzoic acid	38667559	+	316	+1.00	---	---	---	---	---	---	+ 316	---	+1000
Guazatine	39202396	+	100	+1.00	---	---	---	---	---	---	---	---	---
Bay COE 3664	39457244	---	2.37(b)	0.562	43.2	---	18.2	---	---	---	13.3	---	---
Bay COE 3675	39457255	---	1.33(b)	0.562	43.2	---	32.5	---	---	---	4.22	---	---
U 5092	42062395	+	(113)	+1.00	---	---	---	---	---	---	---	---	---
Ethyl-1-(hydroxymethyl)propylcarbamate	51170480	+	100(a)	+1.00	---	---	---	---	---	---	+ 100(a)	---	---
Crotulin	52964428	+	(104)	+1.00	---	---	---	---	---	---	---	---	---
4-Pyridineethanesulfonic acid	53054765	+	100	+1.00	---	---	---	---	---	---	---	---	---
2,5-Bis(4-pyridyl)-1,3,4-thiadiazole	54010218	+	100	0.422	---	---	---	---	---	---	---	---	---
U 12171	61164098	+	75.0(c,h)	0.091-0.178(*)	32.5	---	0.325	---	---	---	100(c)	+	100(m)
Alecan yellow	61968761	+	178	+1.00	13.7	---	0.183	---	---	---	---	+	178-316(f)
Sirmate	62046371	---	---	+1.00	---	---	---	---	---	---	---	---	---
1-(2-Naphthalenylcarbonyl)aziridine	63021454	+	100	+1.00	---	---	---	---	---	---	---	---	---
Mercaptoacetamide carbamate	64046588	+	100(a)	0.680	---	---	---	---	---	---	+ 100(a)	---	---
VC 3-759	66869330	---	---	+0.100	---	---	---	---	---	---	---	---	---
Tergitol 15-S-9	68131408	+	1000	---	---	---	---	---	---	---	---	---	---

(1) Letters in () indicate previously published sources for data presented as follows: (a) Schafer 1972; (b) Schafer *et al.* 1973b; (c) Schafer *et al.* 1979; (d) Schafer *et al.* 1967; (e) Schafer *et al.* 1972; (f) Schafer *et al.* 1976; (g) Schafer *et al.* 1977; (h) Schafer *et al.* 1971; (i) Frank *et al.* 1970; (j) DeCino *et al.* 1966; (k) Schafer *et al.* 1969; (l) Schafer *et al.* 1973a; (m) Schafer *et al.* 1982; (n) Shefte *et al.* 1982.

(2) Numbers in () indicate an estimated LD₅₀ based on food consumption data over a 18 hour period. In Tables 2, 3, and 4, the + signs = >, and the - signs = <.

(3) Calculated assuming 50% consumption of an average food intake during one feeding session (1.00g) and an average body weight of 65 g.

(4) Calculated by the following formula: R₅₀ (mg/kg) (maximum value)/LD₅₀ (mg/kg) (minimum value) = Hazard Factor

(5) Additional references deleted from table because of space limitations are denoted by an (*), as follows: 504245-Redwinged blackbird-LD50(e,l); 671045-Redwinged blackbird-LD50(d,e); 2032657-Redwinged blackbird-LD50(c,d,e,h); 61164098-Redwinged blackbird-R50(c,h).

(6) LC₅₀ (inhalation) in ppm.

Table 3. Acute oral toxicity of 186 chemicals to 7 other bird species

Registry Number (CAS)	HSPA	CGRA	CPIG	LD ₅₀ (mg/kg)(1,2,3) HFIN	MALD	RNPH	YHBB
51285	+ 9.00	—	—	—	—	—	—
52437	178(e)	—	—	42.2(e)	75.0(e)	+ 100(e)	133—+133(e)
55221	+1000	—	—	—	—	—	—
55389	2.37—5.62(a,b,c)	—	—	—	—	—	—
56382	1.33(b,c)	4.22—7.50(c)	—	13.3	—	—	2.37
56724	10.0(b,c)	5.62(c)	—	2.37	—	—	—
57330	75.0(a,e)	3.16—4.22(c)	—	2.37	—	—	—
58366	100(a)	178(a,e)	133(a,e)	100—133(a,e)	75.0(a,e)	+ 100(a,e)	100(a,e)
58899	56.2(a)	+ 100(a)	—	—	—	—	—
59676	+1000	—	—	—	—	—	—
60413	—	—	—	5.62(a)	—	—	—
60571	13.3(c)	42.2(c)	23.7(c)	—	—	—	—
62533	562	—	—	—	—	—	—
62737	17.8(c)	13.3(c)	23.7(c)	—	—	—	—
62748	1.00	7.50	—	—	—	—	—
63252	+ 100	—	—	—	—	—	—
65305	+ 100(a,e,h)	+ 31.6—+100(a,e,h)	75.0(a,e)	—	75.0(a,e)	+ 100(a,e,h)	42.2(a,e)
66251	+ (240)	+ 100	—	—	—	—	—
71272	+ 100	—	—	—	—	—	—
71738	100(e)	—	—	—	—	—	—
72208	1.78(a,c,k)	—	—	—	—	—	—
77269	100(a,e)	0.316—5.62(a,c)	—	—	—	—	—
77281	+ 100(e)	—	—	—	—	—	—
79936	+ 100(e)	+ 100(e)	—	—	—	—	—
80002	+ 100	—	—	—	—	—	—
84651	+ 100	—	—	—	—	—	—
88686	+ 1000	—	—	—	—	—	—
88744	750	—	—	—	—	—	—
90040	421	—	—	—	—	—	—
94246	+ 100	+ 100	+ 100	133	+ 100	+ 100	+ 100
95534	750	—	—	—	—	—	—
95545	100	—	—	—	—	—	—
95556	316	—	—	—	—	—	—
95749	316(a,k)	—	—	—	—	—	—
97176	56.2(c)	75.0(c)	13.3(a,k)	—	42.2	—	—
97778	+ (244)	—	75.0(c)	—	—	—	—
98986	178	—	—	—	—	—	—
99058	+1000	—	—	—	—	—	—
99092	+1000	—	—	—	—	—	—
100550	+1000	—	—	—	—	—	—
101019	+ 100	—	—	—	—	—	—
102067	+ 100	—	—	—	—	—	—
104961	316—562	—	—	—	—	—	—
106229	+ (240)	—	—	—	—	—	—
106478	100	—	—	—	—	—	—
106490	237	—	—	—	—	—	—
106503	422	—	—	—	—	—	—
106514	+ (240)	—	—	—	—	—	—
108429	178	—	—	—	—	—	—
108452	+1000	—	—	—	—	—	—
108894	1000	—	—	—	—	—	—
108996	1000	—	—	—	—	—	—
109002	1000	—	—	—	—	—	—
109068	+1000	—	—	—	—	—	—

Table 3. (cont'd)

Registry Number (CAS)	HSPA	CGRA	CPIG	LD ₅₀ (mg/kg)(1,2,3) HFIN	MALD	RNPH	YHBB
873745	56.2						
931191	+1000						
944229	13.3(c)	17.8(c)	13.3(c)				
947024	2.37(b,c)	2.37(c)	2.37(c)				
956901	133(a,e)	133(a,e)	133-237(a,e)	75.0(a,e)	75.0(a,e)	133(a,e)	23.7(a,e)
1003674	+1000						
1003732	+1000						
1079330	23.7(c)	17.8(c)	56.2(c)				
1121604	1000						
1122549	1000						
1122629	+1000						
1193028	56.2						
1305620	+ 56.2						
1314416	+ (195)						
1328536	+ (278)						
1329868	+ 316	+ 100	+ 100	+ 100	+ 100	+ 100	+ 100
1371391	+ (100)						
1461229	+ 100						
1563662	1.33(b,c)	1.33-3.16(c)	1.33(c)	0.750			
1783819	562						
1885296	+1000						
2032657	17.8(a,b,c,d,e,h)	10.0(a,c,e,h)	13.3(27.3(a,*))	2.37-3.00(a,d,e)	13.3(a,e)	13.3-1000(a,*)	3.16(a,e)
2104645	2.37(c)	4.22(c)	4.22(c)				
2237301	562						
2835689	1000						
2835952	562						
2864611	56.2(a)	56.2(a,e)	+ 316	75.0(a)	75.0-100(a,e)	+ 100(a)	+ 100(a)
2865705	100(a)						
2921882	10.0(a,c,h)	5.62-13.3(a,h)	10.0(c)			8.40(h)	
2987533	1000						
3383968	31.6			56.2			
3544249	+1000						
3731519	+1000						
3731520	+1000						
3731531	1000						
4104147							
5377208	31.6(a,e)	56.2(a,e)	15.9	56.2(a,e)	133(a,e)	+ 100(a,e)	75.0(a)
5392405	+ (240)						
5902523	+ 100						
6012926	+ 100						
6923224	1.33(b,c)	4.22(c)	4.22(c)				
7149793							
7379353	+1000						
7429905	+ (250)						
7682908	3.16(b)	10.0	4.22	5.62			
7745893	316-448(a,j,k)	1.00	17.8(a,j,k)	+ 225(a)	17.8(a,j)	17.8	2.37
7780338	+ 100					10.0(a,j)	
7786347	1.78(c)	4.22(c)	4.22(c)				
8065369	23.7(c)	42.2(c)	23.7(c)	+ 3.16(c)			
8065483	5.62(b,c)	1.78(c)	13.3(c)				
10453868	+ 100					15.3	
12712286							
13194484	4.21(c)	10.0(c)	13.3(c)				
14285439	31.6(a,e)	100(a,e)	13.3(a,e)	1.78(a,e)	7.50(a,e)	+ 100(a,e)	13.3(a,e)
14816183	5.62(c)	75.0(c)	23.7(c)				

14816207	+ 100	—	—	—	—	—	—	+ 100	—	—
15590779	+ 100	—	—	—	—	—	—	—	—	—
15662336	2.37(c)	—	—	2.37(c)	—	—	—	—	—	—
15879933	42.2(a,e)	1.78(c)	—	178(a,e)	—	—	—	—	—	—
16752775	13.3–31.6(c)	75.0(a,e)	—	10.0(c)	—	—	—	—	—	—
20856579	+ 100	13.3–23.7(c)	—	—	—	—	—	—	—	—
21087649	+ 100	+ 100	—	—	—	—	—	—	—	—
24353615	1.00(b)	+ 100	—	—	—	—	—	—	—	—
32575807	1.78	—	—	2.37	—	—	—	—	—	—
35335605	3.16(b)	7.50	—	7.50	—	—	—	—	—	—
35944731	—	—	—	—	—	—	—	—	—	—
35944742	31.6(e)	—	—	56.2(e)	—	—	—	—	—	—
35944822	5.62(a)	—	—	—	—	—	—	—	—	—
36031660	7.50(a,e)	—	—	—	—	—	—	—	—	—
37841331	+ 100(e)	7.50–23.7(a,e)	—	75.0(a,e)	—	—	—	—	—	—
39457244	5.62(b)	+ 100(e)	—	10.0	—	—	—	—	—	—
39457255	1.78(b)	5.62	—	10.0	—	—	—	—	—	—
61164098	+ 100(h,i)	2.37	—	7.50	—	—	—	—	—	—
		+ 100(h,i)	—	—	—	—	—	—	—	—

(1). Species codes are identified in Table 1.
(2). Letters in () indicate previously published sources for data presented as follows: (a) Schafer *et al.* 1973b; (c) Schafer *et al.* 1979; (d) Schafer *et al.* 1967; (e) Schafer *et al.* 1972; (f) Schafer *et al.* 1976; (g) Schafer *et al.* 1977; (h) Schafer *et al.* 1971; (i) Frank, *et al.* 1970; (j) DeCino *et al.* 1966; (k) Schafer *et al.* 1969; (l) Schafer *et al.* 1973a; (m) Schafer *et al.* 1982; (n) Shefte *et al.* 1982.
(3). Additional references deleted from table because of space limitations are denoted by an (*), as follows: 2032657-Common pigeon-(c,d,e); 2032657-Ring-necked pheasant-(d,e,h)

Table 4. Acute oral toxicity and repellency of 91 chemicals to 58 other bird species

Registry Number (CAS)	Other species	LD ₅₀ (mg/kg)(1,2)		HSPA	R ₅₀ (%)	
		Other species	Other species		Other species	Other species
51285	—	—	—	0.600	—	—
55389	akes	1.00–1.33(a)	—	—	—	—
	mdov	2.37	4.22–5.62(a)	7.50	—	—
56382	bhcb	1.33	1.33(b)	5.62	—	—
	bhcb	+ 100(a)	1.78(b)	1.78	—	—
56724	bhcb	1.00	3.16(b)	—	—	—
58082	—	—	—	—	—	—
58366	—	—	—	+1.00	0.430	—
58899	ccro	+ 100(a)	—	0.220	0.121	—
60413	robi	+ 10.0(a)	—	—	—	+1.00
63252	bhcb	—	—	0.316	—	—
65305	bhcb	31.6(a,e)	42.2(a,e)	0.562(h)	—	—
66251	—	—	—	+1.00	0.176(h)	0.422(h)
70699	bbmp	178	178	—	—	—
72208	akes	1.50(k)	2.10	—	—	—
80002	—	—	—	0.316–0.562	—	—
84651	—	—	—	0.650	—	—
95749	akes	422(a,k)	31.6	—	—	—
	robi	–3.16(a)	2.37	—	—	—
97778	—	—	—	+1.00	—	—
99923	bbmp	178	178	—	—	—
101019	—	—	—	0.650	—	—
102067	—	—	—	0.824	—	—
106229	—	—	—	+1.00	—	—
106514	—	—	—	+1.00	—	—

Table 4. (cont'd)

Registry Number (CAS)	Other species	LD ₅₀ (mg/kg)(1,2)	Other species	HSPA	R ₅₀ (%)	Other species
114261	bhcb	10.0(a)	budg			
	ccro	13.3(a,d,e)				
	rbqu	0.237(b)				
115902				+1.00		
118752				+1.00		
120127				0.824		
130154				0.824		
133062	ccro	+100		0.562		colq
137268						0.365 0.085 +1.00 0.083
137304				0.650		
141662	rbqu	1.33(b)		0.650		
149155						
298022						
298044						
330643				0.487(h)		
438415	bhcb	56.2				
439145	ccro	+100				
440175						
470906	bhcb	13.3		0.382		0.562
480224				0.708		
500287				0.294		
504245	akes	5.62(1)				
	bhcb	4.22(a,1)				
	btpa	10.0(1)				
	dicl	10.0(1)				
	gija	-10.0(1)				
	mwea	4.22-4.87(n)				
	rbqu	5.62(b,1)				
	robi	4.22(1)				
	tebb	4.22(1)				
	wwdo	13.3(a,1)				
629505				+1.00		
671045	ccro	7.50(a)				
672060				0.650(h)		
814915				+1.00		
947024	rbqu	1.78(b)				
956901	bigr	5.62(a)				
	mdov	56.2-75.0(a,e)		0.200		
1305620				0.200		
1314416				+1.00		
1314847	tebb	75.0-237				
1328536						
1329868	ccro	+100				
1371391						
1461229				0.681		
1563662	bhcb	1.33		0.180		
	bhcb	7.50(a,d,h)				
	bwqu	19.6-24.0(a)				
	edov	3.16				
	hlar	4.22				
	mwea	4.87-7.50(n)				
	rbqu	4.22-7.50(a,b,d)				
2032657						
	bhcb	1.33				
	bhcb	7.50(a,d,h)				
	bwqu	19.6-24.0(a)				
	edov	3.16				
	hlar	4.22				
	mwea	4.87-7.50(n)				
	rbqu	4.22-7.50(a,b,d)				
	bigr	10.0(a)				
	ccro	7.50(a,d)				
	gosp	3.16				
	idov	4.22(a)				
	wwdo	10.0(a)				
	shcr	23.7				
	bigr	4.22(a)				
	ccro	7.50(a,d)				
	gosp	3.16				
	idov	4.22(a)				
	wwdo	10.0(a)				
	shcr	23.7				
	budg	1.33				
	cwax	5.62				
	gosp	5.62(n)				
	mdov	10.0(a)				
	rbis	5.62-7.50(n)				
	tebb	5.62(h)				
	rbqu	0.422-0.562				
	bhcb	0.316(h)				
	cgra	0.056(h)				
	gosp	0.178(n)				
	mwea	0.076(n)				
	rbqu	0.015				
	star	0.288				
	bwqu	+1.00				
	cwax	0.012				
	mdov	-0.500				
	rbis	0.133(n)				
	rbqu	0.422(h)				
	tebb	0.022				

	valq	24.0(h)	vwea	7.50(m)	wcsp	4.22	valq	0.562(h)	vwea	0.063(m)
2104645	bhcb	5.62								
2240144	btgr	4.22								
2921882	ccro	+ 31.6(a)	mdov	5.62	wvdo	10.0	cgra	-1.00(h)	mph	+1.00(h)
5221421	btgr	17.8(a)	mdov	23.7(a)						
5377208	budg	178	ccro	+ 100(a)	mdov	133				
5392405	wcsp	56.2(a,e)								
5902523										
6012926										
6923224	rbqu	1.33(b)								
7149793	bwqu	1.78								
7429905										
7682908	rbqu	+ 2.37(b)								
7704349										
7745893	akes	+ 316(j,k)	bbmp	10.0	bjay	10.0(j)				
	bowl	4.22	budg	237	brth	3.16				
	btgr	1.00	bwqu	4.22	bwre	31.6				
	cbth	3.16	ccro	1.33-1.78(j)	cfm	+ 100				
	chac	42.2	chaw	562(j)	crav	5.62				
	gdov	4.22	geag	+ 100	gosp	287-316(n)				
	grja	5.62	mdov	3.16-7.50(j)	mwea	+ 316(m)				
	pinl	+ 31.6(i)	rbis	215-237(n)	rbqu	31.6				
	recb	5.62	robi	3.16	scj	1.78				
	tcbb	2.74	turk	5.62	valq	10.0				
	vwea	+ 316(m)	wcsp	+ 320	wfdo	+ 5.62				
	wwdo	4.22								
7780338										
8001852										
8065483	rbqu	1.33(b)								
10124375										
12712286	btgr	10.0(a)	mdov	7.50(a)	wfdo	4.21(a)				
14007535	wwdo	4.21(a)								
14285439	robi	+ 17.8(a)								
14816207	bhcb	+ 100	bwqu	100	robi	100	bhcb	0.178	bwqu	+1.00
							cgra	+1.00	mph	0.316
15590779										
15879933	ccro	42.2(a,e)	mdov	42.2(a,e)	rbqu	42.2				
	wcsp	56.2(a,e)								
20856579	bhcb	+ 100								
21087649	bhcb	+ 100								
24353615	rbqu	0.750								
32575807	ccro	- 10.0	budg	23.7	robi	1.55				
	scj	- 10.0								
35335605	bhcb	10.0	bwqu	1.33	rbqu	5.62(b)				
35944731	bwqu	3.16	ccro	4.22	mdov	1.78				
	mpar	6.35								
36530231										
37841331	mdov	+ 100								
39457244	bhcb	2.37	bwqu	5.62	rbqu	2.37(b)				
39457255	bhcb	2.37	bwqu	13.3	rbqu	0.750(b)				
61164098	bhcb	+ 100(h)	ccro	+ 100(i)	tcbb	+ 100(f)	bhcb	0.350(h)	cgra	0.056(h,i)
	valq	+ 100(h)					mph	0.178(h,i)	tcbb	0.032(h,i)
							valq	0.178(h,i)		

(1). Species codes are identified in Table 1.
 (2). Letters in () indicate previously published sources for data presented as follows: (a) Schafer 1972; (b) Schafer et al. 1973b; (c) Schafer et al. 1979; (d) Schafer et al. 1967; (e) Schafer et al. 1972; (f) Schafer et al. 1976; (g) Schafer et al. 1977; (h) Schafer et al. 1971; (i) Frank et al. 1970; (j) DeCino et al. 1966; (k) Schafer et al. 1969; (l) Schafer et al. 1973a; (m) Schafer et al. 1982; (n) Shefte et al. 1982.

Acknowledgments. The authors wish to thank the following individuals for assistance in collecting, typing, and editing the data contained in this publication; Trudie Abendroth, Lore Burbach, Donald Cunningham, Patrick Funderburg, Janet Garcia, Thomas Hall, David Hayes, Glenn Hood, Cecelia Nelson, and Barbara Recktenwald. The preparation and compilation of this data was supported, in part, through Interagency Agreement #14-16-0009-81-957 which was funded by the U.S. Environmental Protection Agency.

References

- DeCino, T. J., D. J. Cunningham, and E. W. Schafer: Toxicity of DRC-1339 to starlings. *J. Wildl. Manage.* **30**, 249 (1966).
- Frank, F. R., E. W. Schafer, Jr., and J. L. Guarino: Laboratory and field studies with an avian repellent for sprouting seeds. *Proc. Bird Control Seminar* **5**, 86 (1970).
- Friedman, M.: The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *J. Amer. Stat. Assoc.* **32**, 675 (1937).
- Litchfield, J. T., and E. W. Wilcoxon: A simplified method of evaluating dose-effect experiments. *J. Pharmacol. Exptl. Therap.* **96**, 99 (1949).
- Schafer, E. W., Jr.: The acute oral toxicity of 369 pesticidal, pharmaceutical and other chemicals to wild birds. *Toxicol. Appl. Pharmacol.* **21**, 315 (1972).
- Schafer, E. W., Jr., and R. B. Brunton: Chemicals as bird repellents—two promising agents. *J. Wildl. Manage.* **35**, 569 (1971).
- Schafer, E. W., Jr., and D. J. Cunningham: An evaluation of 146 compounds as avian immobilizing agents. *USDI Spec. Sci. Rept. Wildl.* **150**, Washington, DC (1972).
- Schafer, E. W., Jr., R. B. Brunton, and D. J. Cunningham: A summary of the acute toxicity of 4-aminopyridine to birds and mammals. *Toxicol Appl. Pharmacol.* **26**, 532 (1973a).
- Schafer, E. W., Jr., R. B. Brunton, and N. F. Lockyer: Evaluation of 45 chemicals as chemosterilants in adult male coturnix. *J. Reprod. Fert.* **48**, 371 (1976).
- Schafer, E. W., Jr., R. B. Brunton, and N. F. Lockyer: Indicator bird species for toxicity determinations: Is the technique useful in test method development? *Vertebrate Pest Control and Management Materials. ASTM STP 680* J. R. Beck (ed.). American Society for Testing and Materials, 157. Philadelphia, PA (1979).
- Schafer, E. W. Jr., J. L. Guarino, and R. B. Brunton: Use of male coturnix quail in the laboratory development of avian chemosterilants. *Vertebrate Pest Control and Management Materials. ASTM STP 625* W. B. Jackson and R. E. Marsh (eds.). American Society for Testing and Materials, 225. Philadelphia, PA (1977).
- Schafer, E. W., Jr., R. R., West, and D. J. Cunningham: DRC-1347-A new starling contact toxicant. *Pest Control* **37**, 22 (1969).
- Schafer, E. W., Jr., R. B. Brunton, N. F. Lockyer, and J. W. DeGrazio: Comparative toxicity of 17 pesticides to the quail, house sparrow and red-winged blackbird. *Toxicol. Appl. Pharmacol.* **21**, 154 (1973b).
- Schafer, E. W. Jr., R. B. Brunton, E. C. Schafer, and J. Chevez: Effects of 77 chemicals on reproduction in male and female coturnix quail. *Ecotoxicol. Environm. Safety* **6**, 149 (1982).
- Schafer, E. W., Jr., R. I. Starr, D. J. Cunningham, and T. J. DeCino: Substituted phenyl *N*-methylcarbamates as temporary immobilizing agents for birds. *J. Agric. Food Chem.* **15**, 287 (1967).
- Shefte, N., R. L. Bruggers, and E. W. Schafer, Jr.: Repellency and toxicity of three bird control chemicals to four species of African grain-eating birds. *J. Wildl. Manage.* **41**, 453 (1982).
- Snedecor, G. W., and W. G. Cochran: *Statistical methods*. 6 ed. Iowa State Univ. Press Ames, Iowa: (1971).
- Starr, R. I., J. F. Besser, and R. B. Brunton: A laboratory method for evaluating chemicals as bird repellents. *J. Agric. Food Chem.* **12**, 342 (1964).
- Thompson, W. R.: Use of moving averages and interpolation to estimate median effective dose. *Bacteriol. Rev.* **11**, 115 (1948).
- Thompson, W. R., and C. S. Weil: On the construction of tables for moving average interpolation. *Biometrics* **8**, 51 (1952).
- Weil, C. S.: Tables for convenient calculation of median effective dose (LD₅₀ or ED₅₀) and instructions in their use. *Biometrics* **8**, 249 (1952).

Manuscript received for publication July 10, 1982 and in revised form November 1, 1982.