An Introduction to the Literature of the Effects of Biocides on Wildlife and Fish: A Select Bibliography

Note on cover of typescript: "This is the last copy. "(Copies of this Bibliography may be obtained from: The Department of Biology, University of Alberta at Calgary, Calgary, Alberta, Canada.)"
AN INTRODUCTION TO THE LITERATURE OF
THE EFFECTS OF BIOCIDES ON WILDLIFE AND FISH:

A Select Bibliography

September, 1964

(Copies of this Bibliography may be obtained from: The Department of Biology, University of Alberta at Calgary, Calgary, Alberta, Canada.)
Introduction.

Toxic chemicals (commonly called pesticides, insecticides or, more recently and broadly, biocides) are now widely used in Canada in attempts to control insects which prevent the achievement of maximum production in agriculture or that are damaging to forest trees. This compilation is a Select Bibliography of publications reporting the effects that these chemicals are having upon populations of wild animals, particularly fish and birds.

It is intended chiefly to be of assistance to wildlife and fishery biologists, who may not have appreciated the extent of the studies already published, but it should also be of interest to many members of the Canadian general public. To a considerable extent the reader will be able to assess for himself, while glancing down the list of titles, the extent of the effects that toxic chemicals have already been shown to have upon fish and wildlife. It is hoped that the Bibliography will enable the person who wishes to study the problem further to obtain the original reports through his local departmental or public library, or through the nearest university library, and that he will then be able to read the detailed facts for himself.

Most of the research reports so far published have emanated from the United States and Great Britain. Only a few estimates have so far been made in Canada and only a small amount of research is currently being done here, though more is anticipated in the near future. It is very necessary that the existing lack of knowledge of the residues-load being carried by the environment (soil and water) and by the living creatures of this country be remedied immediately. The establishment of the National Biocide Residues Registry by the Canadian Wildlife Service in Ottawa will be a major contribution to improved communication between scientists in the fields of agriculture, forestry, health, fisheries and wildlife. It may also result in an improved public understanding of, and responsibility towards, the hazard now existing for human, as well as animal, life.

It was decided, with regret, to omit references to the literature from countries other than Canada, Great Britain and the United States for lack of space. An index, or list of contents, follows on the next page. In the case of the Canadian provinces the provisional titles of some research in progress or not yet published, or of papers of which the references have not been fully ascertained, are included, the titles being in square brackets. For the information quoted on these titles I am indebted to Dr. John L. George of the United States and Dr. F. Graham Cooch of the Canadian Wildlife Service.

Abbreviations:—

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>WR</td>
<td>Wildlife Review (U.S.Fish &amp; Wildlife Service, Patuxent Wildlife Research Center, Laurel, Maryland)</td>
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<td>JW4</td>
<td>Journal of Wildlife Management (The Wildlife Society)</td>
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<td>TNAWC</td>
<td>Transactions, North American Wildlife Conferences (The Wildlife Society)</td>
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<tr>
<td>TAFS</td>
<td>Transactions, American Fisheries Society</td>
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<tr>
<td>PACSEAGFC</td>
<td>Proceedings, Annual Conferences South Eastern Association of Game &amp; Fish Commissioners</td>
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<td>USFS</td>
<td>U.S. Fish &amp; Wildlife Service</td>
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<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<td>USPHS</td>
<td>U.S. Public Health Service</td>
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<tr>
<td>CSWFB</td>
<td>Canadian Society of Wildlife &amp; Fishery Biologists</td>
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[At the right hand end of the last line of many citations may be found a bracket-enclosed cross-reference to a brief abstract of the paper which may be located in Wildlife Review, Ibis, Auk, Pesticide Progress (see page 2), or etc. E.g.: (WR 87: 15)]

M.T. Myres
A. Major Surveys of the Toxicity of Pesticides

B. Reports of the Effects of Biocides upon Fish & Wildlife

1. CANADA
   - General
   - British Columbia
   - Alberta
   - Saskatchewan
   - Manitoba
   - Ontario
   - Quebec
   - New Brunswick
   - Nova Scotia

2. GREAT BRITAIN

3. UNITED STATES (and United Nations Agencies)
   - General Reviews
   - General Effects
   - Aquatic Invertebrates (including shellfish and the food of fishes)
   - Fish
   - Birds (General; mainly Songbirds)
   - Waterfowl
   - Upland Game Birds
   - Birds of Prey
   - Mammals, including Big Game, Livestock & Man

C. Insect Resistance, Biological Control etc.

Also available:

THE WIDESPREAD POLLUTION OF SOIL, WATER AND LIVING THINGS BY TOXIC CHEMICALS USED IN INSECT CONTROL PROGRAMMES: An Introduction to the Subject through Direct Quotations from Published Reports.

[This, 57 page, compilation—quotations from the published literature, and covering acute poisoning and chronic effects, pollution of the soil and natural waters; controls, legislation and research; resistance integrated control and biological control—is also available from the same address: The Department of Biology, University of Alberta at Calgary, Calgary, Alberta].
A. MAJOR SURVEYS OF THE TOXICITY OF PESTICIDES


1956. Rudd, R.L. & Gonolly, R.E. Pesticides: their Use and Toxicity in relation to Wildlife. California Department of Fish & Game, Game Bulletin No. 7 (209 pp.) (Obtainable from Department of Fish and Game, 722 Capitol Avenue, Sacramento 14, California).


1959. The Fire Ant Eradication Program and how it affects Wildlife. A Symposium, Proceedings of the 12th Annual Conference of the South Eastern Association of Game and Fish Commissioners. (34 pp.) (Published by the South Eastern Association of Game & Fish Commissioners, Box 360, Columbia, South Carolina). (WR 95:14-18).


[Sections include: Effects on Wildlife; Effects on Sport Fisheries; Effects on Commercial Fisheries; Recommendations for Minimizing Dangers of Pesticides to Fish and Wildlife.]
(WR 106:7)


[Sections include: Commercial Fisheries Investigations; Wildlife Studies, Denver Wildlife Research Center; Wildlife Studies, Patuxent Wildlife Research Center; Pesticide-Wildlife Studies by State, Provincial, or University Personnel, and by Cooperative Wildlife Research Units; Recommendations for Minimizing Dangers of Pest Control and Pesticides to Fish and Wildlife.]
(WR 111:5)

(The Recommendations listed are reprinted in PESTICIDE PROGRESS (Ottawa) 2(4):161-165).


B. REPORTS OF THE EFFECTS OF BIOCIDES UPON FISH & WILDLIFE.

1. CANADA.

General:

[ See also Papers by R.P. Bairne, A.W.A. Brown and A.D. Pickett under individual Provinces and under the Section on Insect Resistance, Biological Control etc. (Section C ) ]


1963-64. Canada. House of Commons, 1st Session—26th Parliament. Special Committee on Food & Drugs (Chairman Mr. Harry Harley), Minutes of Proceedings and Evidence, No. 1-16. [ See especially No. 8—evidence by Mr. W.J. Mair of the Canadian Wildlife Service, and No. 16— The Second Report to the House, and Statements of Rachel Carson ]


[See Pesticide Research Report (Ottawa) 1963: 247]

British Columbia:


[1962]. Stringer, G.E. [The Use of toxaphene as a Fish Eradicator; a Study of the Effects of toxaphene at different concentrations to Fish and other Aquatic life, in Relation to its Use as a Fish Eradicator]

[See CSWFB Directory of Fish & Wildlife Research in Canada—Project 10-2-7]


1964. Anon. Farmers will be able to Test for Residues & Allocate $25,000 to Test Food for Chemical Residues. Country Life (British Columbia), June 1964.

[?]. Lorz, H.W. [Spraying of the Cameron River with DDT for the pine butterfly and its Effect on the Indigenous Fish Populations] (British Columbia, Department of Recreation & Conservation) (Details not known).
Alberta:

[1962]. Brown, J.H. et. al. [ Screening for Pesticides and Antibiotics in Milk and Milk Production as a Public Health Measure ] [ See CSWFB Directory of Fish & Wildlife Research in Canada—Project 9-5-8 ].

[1962]. Paterson, R.J. [ Use of Toxics for the Eradication of Fish Populations in Small Lakes and Reservoirs in Alberta ] [ CSWFB Directory of Fish & Wildlife Research in Canada—Project 9-2-19 ].


1964. Myres, M.T. An Introduction to the Literature of the Effects of Bioxide on Wildlife and Fish; A Select Bibliography. ( University of Alberta at Calgary, Department of Biology. Mimeographed, 21 pp. ).

1964. Myres, M.T. (Compiler). The Widespread Pollution of Soil, Water and Living Things by Toxic Chemicals used in Insect Control Programmes; An Introduction to the Subject through Direct Quotations from Published Reports. ( University of Alberta at Calgary, Department of Biology. Mimeographed, 54 pp. )

Saskatchewan:


[1960?]. Chambers, K.J. 1960 Follow-up on Dieldrin Investigations in Saskatchewan. Wildlife Branch, Department of Natural Resources, Regina. (Mimeographed, 4 pp. ).


[1962]. Doyle, J.P. [ Carp Control: Materials and Methods for Selective Poisoning of Carp Fry ] [ CSWFB Directory of Fish & Wildlife Research in Canada—Project 8-2-10 ].


**Manitoba:**


**Ontario:**

[ Other Papers by A.V.A.Brown on Insect Resistance and by B.P.Bolme on Integrated and Biological Control may be found in Section G: Insect Resistance, Biological Control etc. ]


[1962]. Battle, H.I. [Comparative Cytological and Histological Effects of the Lampricide TFM on the larval Sea lamprey and Bony Fish]. [CSWFB Directory of Fish & Wildlife Research in Canada—Project 6-6-1].

[? ]. Kennedy, W.A. [The Lamprey Control Experiment] [Fisheries Research Board of Canada; Reference not ascertained].


Quebec:


[1962]. Courtmanche, A. [Reconditionnement de lacs dans le parc du Mont Tremblant avec le toxaphène, l'endrine etc.] [CSWFB Directory of Fish & Wildlife Research in Canada—Project 5-5-3].

[1962]. Vincent, B. [Effet de deux herbicides E 470-20E et HM weed Miap-20, sur les plantes aquatiques & Inventaires biologiques de lacs avant et après les empoissemements pour connaître les organismes affectés par les différents produits toxiques employés] [CSWFB Directory of Fish & Wildlife Research in Canada—Projects 5-4-1 and 5-4-2].

New Brunswick:


1957. Ide, F.P. Effects of Forest Spraying with DDT on Aquatic Insects of Salmon Streams, TAFS 86: 208-219. (WR 93:16)


[1962]. Wright, B.S. [ Woodcock: Effect of DDT Spray on Reproduction & Woodcock: Pressure of Pesticide Poisons brought into the Area from other Sections of Annual Range ]. [ See CSWFB Directory of Fish & Wildlife Research in Canada—Projects 4-2-4 and 4-2-6 ].


[1963]. Ogilvie, D.M. [ DDT-induced Changes in the Response of Atlantic Salmon Parr to Temperature ]. (University of New Brunswick; Details not known).


1964. Elson, P.F. Insecticide Spraying of New Brunswick Forests and associated abundance of young Atlantic Salmon. Canadian Committee on Freshwater Fisheries Research, 17th Meeting, Ottawa, January 1964. [ Same title was given to the American Institute of Biological Sciences, Session on Pesticide Pollution in Freshwater Ecosystems, Boulder, Colorado, August 1964 ].

Nova Scotia:

[ Other papers by A.D. Fickett on Biological Control may be found in the sections Canada; General and Insect Resistance, Biological Control etc. ]


3. UNITED STATES

( and United Nations Agencies).

General Reviews:


1959. World Health Organization. Bibliography of Pesticides Toxicity and Accidental Poisoning. WHO/Insecticides/90 (9 pp.)


General Effects:


1949. Adams, L. et. al. The Effects on Fish, Birds, and Mammals of DDT used in the Control of Forest Insects in Idaho and Wyoming. JWM 13:245—


1951. Stickel, L.F. Wood Mouse and Box Turtle Populations in an Area Treated Annually with DDT for Five Years. JWM 15: 161—


1952. Hanson, W.R. Effects of some Herbicides and Insecticides on Biota of North Dakota Marshes. JWM 16: 299-308.


Aquatic Invertebrates (including Shellfish and the Food of Fishes):

[ Other references to aquatic invertebrates will be found in the next section, under Fish ]


1960. Davis, H.C. Effects of some Pesticides on Eggs and Larvae of Oysters (Crassostrea virginica) and Clams (Venus mercenaria). Proceedings, National Shellfisheries Association 51:


1960. Ukeles, R. The Effect of several Toxicants on Five Genera of Marine Phytoplankton. Proceedings, National Shellfisheries Association 51:

Fish

[ For Canadian studies see especially under New Brunswick pp 9-19, and British Columbia pp. 4-5 ]


1948. Prévost, G. et. al. Effect of volume on the determination of DDT or rotenone toxicity of fish. JWM 12:241—


1957. Tarzwell, C.M. & Henderson, C. Toxicity of dieldrin to Fish. TAFS 86: 245-257. (WR 93:17)


1958. Graham, R.J. & Scott, D.O. Effects of Forest Insect Spraying on Trout and Aquatic Insects in some Montana Streams, Montana Fish & Game Department, Final Report PR Project F-21-R. (50 pp.) (WR 94:12)


**Amphibia & Reptilia:**

1957. Fashingbauer, B.A. The Effects of Aerial Spraying with DDT on Wood Frogs. Flicker 29(4):160 (WR 91:15)

[See also Stickel (1951) on p. 15]

**Birds (General; mainly Songbirds):**


1952. Post, G. The Effects of aldrin on Birds. JWM 16: 492—

1953. Mitchell, R.T. et al. The Effects of DDT upon the Survival and Growth of Nestling Songbirds. JWM 17: 45—


Waterfowl:

It is curious that almost nothing has been published independently, i.e. outside of more general reports, on the effects of biocides on ducks, geese, swans, shorebirds and other waterfowl. These groups demand immediate study. Canadian examples are mentioned in Pesticide-Wildlife Studies (1963) on p. 2, and in Charnetski (1964) on p. 5 of this compilation.


Upland Game Birds:

In addition to American studies, there is considerable information on the effects of biocides on pheasants under Great Britain (pp. 10-11).


1951. Post, G. Effects of toxaphene and chlordane on certain Game Birds. JWM 15: 381.


1959. Rosene, W. Whistling-cook Counts of Bobwhite Quail on Areas treated with Insecticides and on Untreated Areas, DeSoto County, Georgia. PACSEAQFC 12: 240-244 (or 14-16).


Birds of Prey:

[The literature on the effects of biocides on Birds of Prey is even more extensive for Great Britain (pp. 10-11) and for Europe (see especially the Dutch item below) than it is for North America, where it is of a scattered nature and is devoted almost exclusively to the decline of the Bald Eagle. The significance of the decline in Birds of Prey and of the high infertility, abnormal behaviour and high residue levels in Birds of Prey cannot be over-emphasised. It indicates what is happening at the end of one major Food Chain. The Dutch reference follows:


(The entire issue of June 1963 of Het Vogeljare is devoted to the decrease of Birds of Prey. See item B 52 (on p. 21) of "The Widespread Pollution.... An Introduction to the Subject through Direct Quotations from Published Reports" (Myres, 1964), the companion to this Bibliography.)


Mammals, including Big Game, Livestock & Math:


1961. Pillmore, R.E. Insecticide Residues in Big Game Animals. USFWS, Denver, Colorado, Mimeographed. (10 pp.).


1963. Pillmore, R.E. & Finley, R.E. Residues in Game Animals resulting from Forest and Range Insecticide Applications. TNAWC 28: 409-422. (WR 112:7)


[One most important reference was cited in another section, but is repeated here;]


In addition to this, references to effects of biocides on mammals do occur both in the General Reviews and General Effects sections and also in other sections where the main noticeable effect was on some other group, e.g. birds. In general it seems that mammals are more resistant to the effects of biocides, but so long as a certain dosage or residue is affecting another group than the mammals the effects on the former must be considered serious enough in themselves to warrant action.
C. INSECT RESISTANCE, BIOLOGICAL CONTROL ETC...
(All Countries)


1963. Anon. To Reduce Gnat Population, Chemical and Biological Control to be combined at Clear Lake, California. Agric. Chem. 28(9): 37, 189. (WR 1126).


[ Additional Canadian references may be found under Canada (General) on pp. 3-4. Another important source is Kuenen (1961) listed on p.2 ]