Institute of Terrestrial Ecology

BIRDS AND POLLUTION

Natural Environment Research Council

INSTITUTE OF TERRESTRIAL ECOLOGY
(NATURAL ENVIRONMENT RESEARCH COUNCIL)

NCC/NERC CONTRACT HF3/08/01
ITE PROJECT T07061f5
Annual report to Nature Conservancy Council

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Part 1 Organochlorines and mercury in predatory birds, 1990-91

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6 Rodenticides in barn owls

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J WRIGHT & I WYLLIE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

C O N T E N T S

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1 ORGANOCHLORINES AND MERCURY IN PREDATORY BIRDS, 1990-91

1.1 Introduction

The main objective of this work was to analyse the carcasses of predatory birds, supplied by members of the public, in order to continue the monitoring of organochlorine and metal residues in livers. The chemicals of interest included DDE (from the insecticide DDT), HEOD (from the insecticides aldrin and dieldrin), PCBs (poly-chlorinated biphenyls from industrial products) and Hg (mercury from agricultural and industrial sources). Throughout this section the levels of organochlorines are given as ppm in wet weight and of mercury as ppm in dry weight.

The main species involved included the sparrowhawk and kestrel, representing the terrestrial environment, and the fish-eating heron, kingfisher and great-crested grebe, representing the aquatic environment. The findings from various other species received during the year are also included.

1.2 Results

During the past year, the livers from 201 birds were analysed, including those from 42 kestrels, 95 sparrowhawks, 34 herons, 8 kingfishers, 3 great-crested grebes and 30 others. These totals included some birds which had died in earlier years, but which were analysed in 1990. The results from all these birds are listed in Table 1, and the geometric means for each chemical from the main species (1990 specimens only) are given in Table 2.

Birds of note include two kestrels (both from eastern counties) which contained more than 10 ppm DDE, nine sparrowhawks (mostly from eastern counties) which contained more than 20 ppm DDE, and a sparrowhawk from Powys which contained more than 9 ppm HEOD. The four merlins (from Orkney and the northern Scottish mainland) contained high levels of mercury (including a record 27 ppm), as did a peregrine from Orkney.

Eight significant differences in geometric mean values were found between the 1990 and 1989 results, out of 20 comparisons (Table 3). These included a decrease in PCB levels in all species and an increase in Hg levels in three species. It is impossible to say whether these differences reflected real changes in exposure but the increase in Hg in merlin is probably due to the northerly bias to the current years sample.

Table 1. Levels of organochlorines (ppm in wet weight) and mercury (ppm in dry weight) in the livers of predatory birds analysed between April 1990 and March 1991. ND=none detected.

Spec. no.	Date found	County	Age	Sex	pp'-DDE	HEOD	PCBs	Hg
Kestrel (*Falco tinnunculus*)								
10073	Nov 85	Argyll	J	F	0.22	0.20	3.09	0.99
10074	Nov 85	Argyll	A	M	0.23	0.47	7.55	0.82
10072	Dec 87	Argyll	J	M	0.02	ND	0.58	0.28
10146	Apr 89	Caithness	-	M	0.25	0.35	1.50	4.73
10075	Jul 89	Aberdeens	J	F	0.32	0.10	1.14	0.79
10010	Nov 89	Dorset	J	F	0.02	0.03	0.60	0.21
9885	Feb 90	Humberside	J	M	0.06	ND	0.69	ND
9909	Feb 90	-	A	M	0.42	0.03	1.45	0.26
9912	Feb 90	Cambs	J	M	0.93	ND	10.16	0.35
9916	Feb 90	Aberdeen	J	F	0.54	0.06	1.60	0.27
10231	Mar 90	Inverness	J	M	0.09	ND	0.47	1.14
9956	Apr 90	Orkney	J	F	4.03	1.91	12.99	3.49
9973	Apr 90	Lincs	A	M	0.39	0.18	3.49	0.42
9978	Apr 90	Norfolk	A	M	0.29	0.02	0.73	0.14
9984	May 90	Lincoln	J	M	0.16	0.05	2.22	0.16
9985	May 90	Beds	J	M	10.17	0.16	3.03	0.67
10002	Jun 90	Sussex	A	F	0.02	ND	0.18	0.20
10078	Jun 90	Norfolk	A	M	0.13	0.08	1.85	0.56
10079	Jul 90	Norfolk	J	M	0.41	0.05	1.35	0.33
10016	Jul 90	Surrey	J	M	0.68	0.20	4.40	0.27
10017	Jul 90	Devon	J	M	0.79	0.04	0.78	0.25
10020	Jul 90	Warwicks	J	F	0.05	0.03	1.70	ND
10036	Jul 90	-	J	F	2.34	0.22	5.19	1.27
10030	Aug 90	Aberdeens	J	F	0.20	0.04	1.20	0.30
10031	Aug 90	Aberdeens	J	F	0.12	0.04	3.87	1.51
10042	Aug 90	Lincs	J	F	6.79	0.36	6.40	0.23
10053	Aug 90	York	J	F	0.11	0.21	2.75	0.16
10098	Oct 90	Surrey	J	F	0.01	ND	0.36	0.34
10152	Oct 90	Gwynedd	J	F	0.04	ND	0.33	1.93
10147	Nov 90	Northants	J	M	ND	0.15	0.36	0.47
10162	Nov 90	Cambs	J	M	1.43	0.10	2.41	0.69
10178	Nov 90	Essex	J	M	0.64	0.24	18.73	ND
10190	Dec 90	Herts	J	M	0.59	0.03	0.87	0.38
10195	Dec 90	Essex	J	M	0.61	0.46	2.41	1.83
10196	Dec 90	Essex	J	M	1.26	0.18	2.45	1.93
10208	Dec 90	Westmorland	J	M	0.03	0.05	1.38	1.26
10211	Dec 90	Lincs	A	M	1.03	0.63	0.51	0.46
10210	Jan 91	Galloway	A	F	0.05	0.04	2.25	0.74
10214	Jan 91	Ayrshire	J	M	0.15	0.76	2.32	3.53
10216	Jan 91	Argyll	J	F	0.27	0.16	1.75	3.06
10237	Jan 91	Northants	J	M	0.28	0.35	1.70	2.37
10275	Feb 91	Suffolk	J	F	13.35	1.63	2.93	1.60

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Sparrowhawk (<u>Accipiter nisus</u>)

10069	Apr	85	Argyll	J	M	1.45	0.15	2.62	5.39
10071	Sep	86	Argyll	J	M	0.46	0.11	95.73	5.88
10070	Sep	88	N'berland	J	M	0.06	0.01	0.32	2.63
10077	Nov	88	Norfolk	J	M	16.92	0.22	3.37	4.45
10018		89	Gwynedd	A	M	0.78	0.11	1.14	4.28
9888	Apr	89	Midlothian	J	M	2.68	ND	9.13	1.80
9887	Sep	89	Fife	J	F	0.37	ND	ND	0.93
9889	Sep	89	Midlothian	J	M	0.84	ND	ND	2.21
9950		90	Kirkcuds	J	F	2.25	0.09	0.47	8.83
9987		90	Somerset	A	F	9.57	1.76	9.91	9.07
10226	Jan	90	Ross & Crom	J	F	0.17	ND	0.18	1.46
9919	Feb	90	Bucks	J	M	0.93	0.19	1.40	3.33
9920	Feb	90	Herefords	J	F	10.02	0.47	0.44	2.06
10179	Feb	90	Cambs	J	F	20.92	0.36	74.68	1.05
10229	Feb	90	E. Ross	J	M	0.39	0.03	1.02	4.63
9925	Mar	90	Devon	A	M	0.61	0.27	0.56	5.59
9932	Mar	90	Northants	A	F	0.76	0.17	2.77	2.68
9933	Mar	90	Northants	A	F	1.46	0.09	0.29	2.44
9944	Mar	90	Norfolk	J	M	2.97	1.12	0.63	2.80
9945	Mar	90	E. Lothian	J	F	22.17	2.65	5.05	3.79
9962	Mar	90	Herts	J	F	1.19	0.17	0.07	3.32
9964	Mar	90	Sutherland	J	M	0.68	0.16	2.79	6.36
9976	Mar	90	Grampian	J	F	6.90	0.22	3.54	5.01
9992	Mar	90	Kent	J	M	25.55	0.64	2.88	3.60
9994	Mar	90	-	A	F	81.10	2.25	13.84	2.48
9966	Apr	90	Derbyshire	J	M	0.19	0.09	0.52	2.60
9971	Apr	90	Powys	A	F	31.51	9.10	13.32	7.65
9979	Apr	90	Hants	A	F	0.28	0.09	1.33	4.86
10138	Apr	90	Dumfries	A	M	30.68	1.11	25.32	11.79
9996	May	90	Herefords	A	M	5.33	0.66	2.93	1.49
10057	May	90	Midlothian	J	F	0.16	0.04	1.92	2.04
10158	May	90	Northants	A	F	0.35	0.06	0.20	1.43
10160	May	90	Northants	A	F	0.80	0.27	0.68	1.38
10046	Jun	90	Glos	J	M	0.45	0.07	0.49	5.36
10029	Jul	90	Gwynedd	A	F	7.40	0.31	6.40	7.44
10032	Aug	90	Cambs	J	F	0.22	0.05	1.26	0.94
10040	Aug	90	Sussex	J	F	0.17	0.04	0.20	ND
10041	Aug	90	Yorks	J	F	0.05	0.04	0.02	0.26
10043	Aug	90	Norfolk	J	M	0.10	0.08	0.13	0.36
10047	Aug	90	Herts	J	F	0.05	0.02	1.49	1.07
10049	Aug	90	Leics	J	M	0.22	0.02	0.45	0.76
10050	Aug	90	Lincs	J	F	0.15	ND	0.69	1.01
10065	Aug	90	Argyll	A	F	3.87	0.52	5.78	3.45
10066	Aug	90	Argyll	J	F	1.34	0.21	3.54	4.30
10067	Aug	90	Argyll	J	F	0.05	0.09	1.42	3.59
10086	Aug	90	-	J	F	0.12	0.03	0.64	2.07
10107	Aug	90	Gwynedd	J	F	0.05	0.02	0.34	2.16
10227	Aug	90	Inverness	J	F	0.16	0.03	0.71	2.20

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10228	Aug 90	E. Ross	J	F	0.09	ND	0.20	2.14
10076	Sep 90	Lancs	J	F	0.07	0.02	1.54	2.93
10082	Sep 90	Leics	J	F	0.29	0.02	1.25	1.06
10084	Sep 90	Bucks	J	F	0.76	0.10	7.49	0.81
10088	Sep 90	Yorks	J	M	0.41	0.13	1.15	3.38
10094	Sep 90	Glos	J	F	0.10	0.02	0.58	0.69
10096	Sep 90	Surrey	J	F	0.29	0.02	0.55	1.53
10115	Sep 90	Northants	J	F	0.37	0.01	0.43	1.10
10130	Sep 90	Norfolk	-	M	14.29	0.75	2.74	2.38
10175	Sep 90	Argyll	J	F	0.09	0.03	1.10	3.49
10103	Oct 90	Somerset	J	M	0.27	0.02	0.47	0.89
10109	Oct 90	Berks	J	F	0.68	0.12	5.51	0.65
10110	Oct 90	Essex	J	F	3.75	0.17	3.08	0.89
10112	Oct 90	N'berland	J	F	0.47	0.13	2.21	2.34
10113	Oct 90	Lincs	A	M	21.53	0.73	22.76	13.35
10139	Oct 90	Surrey	J	M	9.31	0.93	14.18	4.08
10143	Oct 90	Ayrshire	J	F	0.21	ND	6.75	3.53
10238	Oct 90	Leics	A	M	5.63	0.31	8.86	0.75
10137	Nov 90	Yorks	J	F	2.44	0.55	10.66	1.42
10155	Nov 90	Aberdeen	J	F	0.18	ND	2.50	ND
10156	Nov 90	Glos	J	M	1.89	0.13	2.64	2.94
10161	Nov 90	Lincs	J	M	0.91	0.55	0.11	0.53
10166	Nov 90	Northants	A	F	8.65	1.33	9.21	0.39
10169	Nov 90	Northants	J	M	0.20	ND	0.32	1.15
10177	Nov 90	Dumbartons	A	M	0.59	0.07	2.69	0.53
10184	Nov 90	Essex	J	F	26.63	0.38	9.53	3.01
10188	Nov 90	Northants	J	F	3.59	0.15	4.01	0.92
10182	Dec 90	Bucks	J	M	4.44	0.24	6.81	1.94
10186	Dec 90	Cambs	J	M	0.58	0.13	0.41	0.45
10218	Dec 90	Aberdeens	J	F	5.73	0.14	0.73	3.71
10239	Dec 90	Worcs	J	F	6.29	0.10	2.11	1.88
10245	Dec 90	Herts	J	M	0.26	0.04	0.64	0.73
10203	Jan 91	Yorks	J	F	0.15	0.09	0.69	0.59
10215	Jan 91	Lincs	A	F	10.88	1.00	7.22	7.87
10221	Jan 91	Berks	A	F	2.91	0.20	6.66	0.35
10236	Jan 91	Lincs	A	F	4.44	0.08	1.42	2.06
10240	Jan 91	Peebles	J	M	10.23	0.34	6.26	3.49
10242	Jan 91	Lancs	J	M	0.27	0.06	1.67	1.84
10255	Jan 91	Oxon	A	M	1.46	0.05	1.23	0.33
10259	Jan 91	Inverness	-	F	2.22	0.14	2.12	3.65
10257	Feb 91	Perth	J	F	0.19	ND	0.29	2.24
10258	Feb 91	Lincs	A	F	12.34	0.41	27.23	4.44
10272	Feb 91	Kent	A	F	26.80	0.44	33.55	2.53
10282	Feb 91	Worcs	J	M	0.75	0.06	0.89	3.00
10285	Mar 91	Stirling	J	M	1.04	0.11	4.17	ND
10286	Mar 91	Glos	J	F	5.10	0.14	1.46	0.73
10288	Mar 91	Yorks	J	M	10.25	0.99	32.74	9.52

Continued...........4

Peregrine Falcon (<u>Falco peregrinus</u>)

10009	Mar 90	Shetland	J	M	0.67	0.28	2.41	7.55
10284	Jan 91	Orkney	J	M	4.84	2.12	19.48	14.00
10261	Feb 91	Ayrshire	J	M	0.60	0.08	1.09	3.82

Merlin (<u>Falco columbarius</u>)

9917	Feb 90	Orkney	A	F	9.41	0.13	5.95	27.41
10063	Aug 90	Inverness	J	F	0.09	0.03	0.21	8.79
10087	Sep 90	Orkney	J	F	0.39	0.06	4.60	9.56
10225	Sep 90	W. Ross	J	M	0.43	0.07	0.97	11.26

Hobby (<u>Falco subbuteo</u>)

9907	Sep 89	Kent	J	M	0.95	0.03	0.50	1.21
10024	Jul 90	Northants	J	F	0.06	ND	0.35	0.60
10224	Aug 90	Inverness	A	F	0.95	0.30	3.44	3.72

Goshawk (<u>Accipiter gentilis</u>)

9997	Apr 90	-	A	F	0.14	ND	0.05	ND

Golden Eagle (<u>Aquila chrysaetos</u>)

10170	Nov 90	Bute	J	F	ND	ND	0.04	0.52

Long-eared Owl (<u>Asio otus</u>)

9948	90	N. Ireland	J	M	7.62	1.23	19.44	4.21
9878	Jan 90	Ayrshire	A	F	ND	ND	0.47	0.09
10230	Feb 90	Ross-shire	A	F	0.26	0.03	1.02	0.60
10035	May 90	Norfolk	A	M	0.81	0.04	1.58	0.77
10108	Sep 90	N. Ireland	J	M	0.12	ND	0.52	0.33
10276	Nov 90	N. Ireland	J	F	0.54	0.08	1.02	0.59
10183	Dec 90	Norfolk	J	F	0.18	0.05	0.35	0.85
10193	Dec 90	Dorset	A	F	0.08	0.02	0.94	0.56
10198	Dec 90	Kirkcuds.	J	F	ND	ND	0.27	0.06
10241	Jan 91	Sussex	J	F	7.48	1.12	6.76	1.61
10248	Jan 91	Angus	J	M	0.08	ND	0.71	0.32

Short-eared Owl (<u>Asio flammeus</u>)

9921	Feb 90	Cheshire	J	M	0.02	ND	0.64	0.62
9955	Mar 90	Devon	J	F	4.57	0.64	6.88	1.82
10059	Aug 90	Berwick	J	F	0.31	ND	5.63	ND

Little Owl (<u>Athene noctua</u>)

9986	May 90	Middx	A	M	0.04	0.04	0.60	0.63
10014	Jul 90	Sussex	A	F	0.26	ND	0.26	0.27
10148	Nov 90	Cambs	A	M	0.11	0.03	0.16	0.66
10220	Jan 91	Worcs	A	M	3.43	ND	0.39	0.32

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Heron (<u>Ardea cinerea</u>)

9990	90	Lincs	J	F	0.16	0.05	1.74	2.49
9906	Feb 90	Surrey	A	M	ND	ND	0.20	7.78
9942	Feb 90	Aberdeens	A	F	0.29	NS	0.03	2.88
9941	Mar 90	Dyfed	J	F	0.19	0.12	0.84	9.63
9969	Apr 90	Dyfed	J	M	0.61	0.02	3.00	16.06
9970	Apr 90	Cambs	A	M	0.87	0.08	1.63	10.54
10007	May 90	Worcs	A	F	8.76	4.67	23.96	37.14
10001	Jun 90	Carmarthens	J	F	0.81	0.09	4.62	19.82
10004	Jun 90	Lincs	A	M	0.68	0.34	1.27	7.86
10006	Jun 90	Dyfed	A	M	0.02	0.02	0.20	12.51
10012	Jul 90	Middx	J	M	0.75	0.27	5.57	60.12
10023	Jul 90	Warwicks	J	M	0.06	0.07	0.77	8.72
10038	Aug 90	Dyfed	J	F	0.06	ND	ND	1.82
10055	Aug 90	Norfolk	A	M	8.41	0.24	16.76	44.12
10060	Aug 90	Dyfed	J	M	0.08	0.02	0.11	4.39
10085	Sep 90	Cambs	J	F	1.03	0.25	1.38	14.45
10089	Sep 90	Powys	J	M	1.10	0.33	3.71	11.23
10123	Oct 90	Huntingdons	J	F	0.11	0.04	0.16	10.63
10168	Nov 90	Lincs	J	M	0.03	ND	ND	11.06
10217	Dec 90	Aberdeens	A	F	11.46	0.31	12.31	39.84
10199	Jan 91	Cambs	J	M	0.04	0.06	0.05	4.06
10200	Jan 91	Cambs	J	F	0.08	0.11	0.26	8.95
10209	Jan 91	Dyfed	J	M	ND	ND	ND	3.01
10213	Jan 91	Ayrshire	J	F	1.50	0.08	0.42	28.20
10234	Jan 91	Ross-shire	J	F	7.58	0.31	15.62	43.55
10235	Jan 91	Herts	A	M	0.10	0.05	0.37	15.94
10264	Feb 91	Gwynedd	J	F	1.23	0.09	1.04	4.01
10266	Feb 91	Cambs	J	M	0.09	0.06	0.03	6.60
10267	Feb 91	Worcs	J	M	11.22	0.79	3.81	46.17
10273	Feb 91	Co Durham	J	F	3.94	0.18	15.26	45.94
10274	Feb 91	Ayrshire	J	F	0.24	0.12	0.57	5.92
10279	Feb 91	Glamorgans	J	M	0.88	0.12	1.16	10.25
10281	Feb 91	Yorkshire	J	F	0.78	0.47	9.67	10.33
10287	Mar 91	Lincs	A	M	3.46	2.25	78.71	12.11

Great Crested Grebe (<u>Podiceps cristatus</u>)

9946	Mar 90	Notts	J	M	0.05	ND	0.04	3.02
9951	Mar 90	Lancs	J	M	0.42	0.08	1.79	14.66
9999	Jun 90	Wilts	A	M	ND	ND	2.62	1.61

Kingfisher (<u>Alcedo atthis</u>)

10022	Jul 90	Somerset	J	F	0.12	0.89	0.50	1.80
10111	Sep 90	Powys	J	M	0.10	ND	ND	1.06
10116	Oct 90	Staffs	J	M	0.21	0.35	0.37	1.33
10117	Oct 90	Staffs	A	F	0.90	0.61	0.78	0.52
10176	Nov 90	Argyll	A	F	0.14	0.52	0.40	2.76
10268	Feb 91	Sussex	A	F	4.50	3.86	15.88	5.52
10269	Feb 91	Cambs	A	M	6.73	0.33	1.30	1.76
10270	Feb 91	Northants	A	M	2.24	0.52	7.44	4.46

Table 2. Geometric mean levels of pollutants in the various species in Table 1, for 1990 specimens only.

	pp'-DDE	HEOD	PCBs	Hg
Kestrel				
Mean	0.30	0.07	1.70	0.35
N	31	31	31	31
Range within 1 SE	0.22 - 0.41	0.05 - 0.08	1.39 - 2.08	0.27 - 0.45
Sparrowhawk				
Mean	0.99	0.12	1.49	1.75
N	72	72	72	72
Range within 1 SE	0.79 - 1.24	0.10 - 0.14	1.24 - 1.79	0.51 - 2.02
Merlin				
Mean	0.61	0.07	1.54	12.69
N	4	4	4	4
Range within 1 SE	0.23 - 1.63	0.05 - 0.09	0.71 - 3.34	9.77 - 16.49
Heron				
Mean	0.34	0.07	0.79	11.18
N	20	20	20	20
Range within 1 SE	0.22 - 0.53	0.05 - 0.11	0.47 - 1.33	9.05 - 13.80
Kingfisher				
Mean	0.20	0.25	0.23	1.28
N	5	5	5	5
Range within 1 SE	0.13 - 0.30	0.11 - 0.57	0.10 - 0.50	0.98 - 1.71
Great-crested Grebe				
Mean	0.06	0.02	0.57	4.15
N	3	3	3	3
Range within 1 SE	0.02 - 0.18	0.01 - 0.04	0.15 - 2.18	2.15 - 8.00

Table 3. Comparison of geometric mean residue levels (log values) from birds collected in 1989 and 1990; t-values are shown. Minus values indicate a decrease from 1989.

	pp'-DDE	HEOD	PCBs	Hg
Kestrel	t_{85}=0.57	t_{85}=-0.56	t_{85}=-7.39***	t_{85}=1.69
Sparrowhawk	t_{147}=-1.13	t_{147}=0.004	t_{147}=-6.59***	t_{147}=14.42***
Merlin	t_{10}=-0.73	t_{10}=-0.01	t_{10}=-8.42***	t_{10}=31.76***
Kingfisher	t_{9}=-0.20	t_{9}=0.10	t_{9}=-15.29***	t_{9}=1.74
Heron	t_{35}=0.39	t_{35}=0.13	t_{35}=-3.98***	t_{35}=25.63***

Notes: Zero values were taken as 0.01 for all residues.

Significance values * = P<0.05 ** = P<0.01 *** = P<0.001

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BIRDS AND POLLUTION

Part 2 Organochlorines and mercury in peregrine eggs, 1990

I NEWTON, A ASHER, P FREESTONE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

2 ORGANOCHLORINES AND MERCURY IN PEREGRINE EGGS, 1990

2.1 Introduction

The findings from all peregrine eggs analysed between 1961 and 1986 have recently been summarised in Newton et al (1989); those from eggs analysed in 1987 and 1989 are given in previous reports in this series, and those from eggs analysed in 1990 are given in Table 4. Other peregrine eggs from these years are awaiting analysis at the Glasgow University Veterinary School, and are outwith our programme.

2.2 Results

Perhaps as a result of the warm dry weather, it seems to have been an exceptionally good year for Peregrine breeding in 1990, and eggs from only four clutches were received at Monks Wood. All contained only low levels of contaminants (Table 4). HEOD was detected in only one.

2.3 Reference

NEWTON, I., BOGAN, J.A. & HAAS, M.B. 1989. Organochlorines and mercury in British Peregrine eggs. Ibis 131; 355-376.

Table 4. Residue levels (organochlorine ppm wet weight; mercury ppm dry weight) and shell-indices for Peregrine eggs analysed in 1990. ND=none detected.

Egg No.	Year	County	Shell index	pp'-DDE	HEOD	PCBs	Hg
NORTHERN ENGLAND							
E4430	1990	Lancs	1.78	0.20	ND	0.07	0.38
E4444		Cumbria	1.64	1.09	0.03	0.30	0.33
CENTRAL AND EASTERN HIGHLANDS							
E4393	1990	Argyll	1.84	ND	ND	ND	3.16
E4411		Grampian	2.08	0.20	ND	0.58	0.49

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BIRDS AND POLLUTION

Part 3 Organochlorines and mercury in merlin eggs, 1990

I NEWTON, A ASHER, P FREESTONE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

3 ORGANOCHLORINES AND MERCURY IN MERLIN EGGS, 1990

3.1 Introduction

The findings from most previous analyses of merlin eggs were given in Newton & Haas (1988), those from 1987-1989 in previous reports in this series, while those from 1990 are summarised in Table 5.

3.2 Results

The results from these additional 29 merlin eggs serve to confirm a continuing high contamination of British merlins with organochlorines and mercury. PCBs were present at more than 20 ppm (wet weight) in several eggs and, as in previous years, Hg was present at high level (3.9-13.7 ppm in dry weight) in eggs from the Northern Isles.

3.3 Reference

NEWTON, I. & HAAS, M.B. 1988. Pollutants in Merlin eggs and their effects on breeding. Brit. Birds 81: 258-269.

Table 5. Residue levels and shell indices for Merlin eggs analysed in 1990. Organochlorines expressed as ppm in wet weight (and in lipid); mercury as ppm in dry weight.

C=clutch size; B=brood size; ND=non detected

County	C	B	Shell Index	pp'-DDE	HEOD	PCBs	Hg
NORTHERN ENGLAND							
1990							
Derbyshire	3	0	1.20	1.46(26.11)	0.30(5.30)	3.92(70.32)	0.98
Durham	-	-	1.22	4.69(60.28)	0.54(6.89)	5.65(72.56)	4.95
Durham	5	0	0.97	7.14(89.79)	0.66(8.31)	7.25(91.28)	2.22
Durham	4	1	1.14	6.36(88.31)	0.77(10.69)	35.06(486.65)	2.07
Durham	5	2	1.04	5.74(105.60)	0.29(5.27)	2.78(51.16)	3.02
Durham	4	1	1.11	2.04(70.42)	0.92(31.88)	7.17(247.47)	3.49
Durham	4	1	1.18	3.45(51.16)	0.48(7.06)	3.94(58.34)	2.00
Durham	-	-	1.10	3.47(69.24)	0.41(8.14)	23.58(471.05)	2.54
Durham	-	-	1.10	3.55(79.39)	0.44(9.77)	4.82(107.63)	2.01
Durham	-	-	1.24	5.76(94.95)	0.37(6.02)	3.02(49.80)	2.92
Yorkshire	-	-	-	1.64(19.16)	0.24(2.82)	52.59(615.59)	0.63
Yorkshire	5	4	-	2.88(82.17)	0.27(7.71)	22.65(646.60)	1.70
GALLOWAY AND SOUTHERN UPLANDS							
1990							
Lothians	5	4	1.16	7.12(141.42)	0.46(9.17)	16.82(333.97)	2.29
Lothians	4	2	1.15	6.09(85.68)	0.42(5.91)	11.94(167.99)	1.39
D & G	-	-	1.22	5.82(69.91)	1.46(17.58)	11.21(134.62)	3.41
D & G	-	-	1.18	13.96(77.41)	3.36(18.61)	28.83(159.85)	1.06
D & G	-	-	1.04	4.91(63.57)	1.12(14.53)	17.55(227.25)	2.33
D & G	-	-	1.20	6.60(107.13)	0.80(12.93)	5.66(91.75)	2.14
NORTHERN ISLES							
1989							
Shetland	4	2	1.08	1.90(55.72)	0.24(7.13)	2.44(71.40)	5.16
Shetland	-	-	1.17	2.11(50.50)	0.28(6.78)	2.34(55.84)	3.87
Shetland	-	-	1.11	1.95(36.62)	0.33(6.27)	7.58(142.38)	8.76
Shetland	-	-	1.34	1.68(34.33)	0.24(4.80)	1.93(39.39)	6.29
1990							
Orkney	-	-	-	1.09(18.43)	0.23(3.96)	1.49(25.16)	9.63
Orkney	-	-	1.11	1.27(19.53)	0.17(2.57)	0.99(15.15)	4.50
Orkney	-	-	1.09	0.92(16.99)	0.20(3.64)	1.26(23.27)	13.73
Shetland	-	-	1.19	1.15(22.12)	0.43(8.18)	23.31(504.34)	8.16
Shetland	-	-	1.10	1.22(10.03)	0.22(1.80)	5.14(42.16)	5.73
Shetland	-	-	1.06	0.73(16.58)	0.15(3.44)	1.89(42.90)	7.27
Shetland	-	-	1.17	2.08(36.23)	0.41(7.11)	2.36(41.26)	6.14

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BIRDS AND POLLUTION

Part 4 Organochlorines and mercury in golden eagle eggs, 1990

I NEWTON, A ASHER, I WYLLIE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

4 ORGANOCHLORINES AND MERCURY IN GOLDEN EAGLE EGGS, 1990

4.1 Introduction

The findings from earlier analyses of golden eagle eggs were given in the previous report in this series, and in published form in Newton & Galbraith (1991). The results for eggs analysed subsequently (1987-90) are summarised in Table 6.

4.2 Results

Recent analyses serve to confirm the low levels of contamination found in recent years in eagle eggs from inland districts (Table 6). All results were well within the range of previous values. Unfortunately, despite continuing requests, no coastal eggs were obtained in 1990.

4.3 Reference

Newton I. & Galbraith, A.E. 1991. Organochlorines and mercury in the eggs of Golden Eagles *Aquila chrysaetos* from Scotland. Ibis 133: 115-120.

Table 6. Residue levels (organochlorine ppm wet weight; mercury ppm dry weight) and shell-indices for Golden Eagle eggs 1987-1990. All the eggs received were from inland sites.

County	Shell index	HEOD	DDE	PCBs	Hg
1987					
Angus	.	0.19	ND	0.47	ND
1988					
D. & G.	.	0.14	0.11	0.49	ND
D. & G.	.	0.13	ND	0.87	ND
Northern England	2.90	0.22	0.11	0.49	ND
Northern England	3.53	0.22	ND	0.49	ND
1989					
Northern England	3.40	0.15	0.12	1.91	ND
Northern England	3.14	0.14	0.30	2.92	0.07
1990					
Northern England	2.82	0.13	0.20	1.74	0.81
Northern England	3.21	0.12	0.87	2.64	0.32

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BIRDS AND POLLUTION

Part 5 Organochlorines and mercury in gannet eggs, 1990

I NEWTON, A ASHER, P FREESTONE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

5 ORGANOCHLORINES AND MERCURY IN GANNET EGGS, 1990

5.1 Introduction

The findings from all gannet eggs collected during the period 1971-87 were summarised in Newton et al (1989), while those from ten further eggs from Ailsa Craig (1989) were given in our report of last year. The findings for eggs from three colonies sampled in 1990 are summarised in Table 7.

5.2 Results

At all three colonies the levels of all contaminants were generally low, but high PCB levels (>10 ppm in wet weight) were found in single eggs from Bass Rock and St Kilda. The geometric mean levels of PCBs and mercury differed significantly between all three colonies, with PCBs highest at Bass Rock and lowest at St Kilda and mean Hg highest at St Kilda and lowest at Bass Rock (Table 7).

Compared with previous samples from the same colonies, the geometic mean level of DDE had increased significantly at Bass Rock (1987 v. 1990); the geometic mean Hg level had increased at Ailsa Craig (1987 v. 1990 and 1989 v. 1990) and decreased at Bass Rock (1987 v. 1990) and St Kilda (1987 v. 1990); while the mean shell-index had declined at Ailsa Craig (1987 v. 1990 and 1989 v. 1990) and Bass Rock (1987 v. 1990), and increased at St Kilda (1987 v. 1990). It is hard to know what biological significance to attach to these year-to-year changes based on small samples.

5.3 Reference

NEWTON, I., HAAS, M.B. & FREESTONE, P. 1990. Trends in organochlorine and mercury levels in gannet eggs. Environ. Pollut. 63: 1-12.

Table 7. Residues of organochlorines (ppm wet weight) and mercury (ppm dry weight) in the eggs of Gannets (Sula bassana), 1990. ND=None detected.

Colony	Shell-index	pp'-DDE	HEOD	PCBs	Hg
AILSA CRAIG					
	3.17	0.08	0.18	2.32	1.94
	2.73	0.19	0.41	7.89	1.45
	-	0.19	0.29	4.22	1.61
	2.77	0.07	0.18	1.67	2.28
	2.89	0.08	0.17	1.89	4.48
	3.23	0.06	0.12	1.03	1.97
	2.92	0.07	0.17	1.58	2.09
	2.97	0.05	0.10	0.66	1.52
	3.25	0.27	0.35	3.54	2.47
	2.92	0.06	0.14	2.25	1.97
Mean*	2.98	0.09	0.19	2.15	2.06
SD	0.19	0.26	0.20	0.31	0.14
Range within 1 SE	2.92-3.05	0.08-0.11	0.17-0.22	1.72-2.69	1.87-2.29
BASS ROCK					
	3.03	0.24	0.34	3.65	1.61
	3.02	0.12	0.23	2.52	1.25
	3.43	0.13	0.17	3.56	1.08
	2.79	0.16	0.36	3.51	2.09
	3.14	0.14	0.39	19.42	2.15
	3.15	0.14	0.25	2.36	1.41
	2.91	0.11	0.26	1.74	1.19
	2.99	0.14	0.47	4.68	1.53
	2.98	0.12	0.22	3.12	1.02
	3.26	0.09	0.20	3.15	1.19
Mean*	3.07	0.13	0.28	3.65	1.41
SD	0.18	0.11	0.14	0.28	0.11
Range within 1 SE	3.01-3.13	0.12-0.15	0.25-0.31	2.97-4.48	1.30-1.53
ST. KILDA					
	2.69	0.02	ND	11.41	3.09
	2.76	0.02	0.04	0.21	2.79
	2.96	ND	ND	0.13	2.55
	3.07	0.11	0.08	0.44	2.85
	2.93	0.14	ND	0.95	3.08
	3.05	0.05	0.04	0.60	3.92
	3.05	0.03	ND	0.13	2.62
	2.83	0.04	0.04	0.16	2.23
	3.25	ND	ND	ND	5.68
	3.14	0.11	0.11	1.03	2.32
Mean*	2.97	0.04	0.02	0.33	3.00
SD	0.17	0.42	0.42	0.79	0.12
Range within 1 SE	2.92-3.03	0.03-0.05	0.02-0.03	0.19-0.59	2.75-3.27

*Means: arithmetic for shell-index; geometric otherwise.

Zero values (ND) were taken as 0.01 for all residues

Differences in PCB and mercury levels between sites were significant in all cases $P<0.001$.

	PCBs	Hg
Ailsa Craig v. Bass Rock	$t_{18}=11.41$	$t_{18}=11.59$
Ailsa Craig v. St. Kilda	$t_{18}=6.74$	$t_{18}=15.99$
Bass Rock v. St.Kilda	$t_{18}=12.46$	$t_{18}=30.51$

Table 8. Changes in geometric mean residue levels (log values) and shell index (arithmetic mean) in 1990 gannet eggs compared with previous eggs from the same sites (1987 for all sites, plus 1989 for Ailsa Craig).
+ = increase; - = decline.
*P<0.05 **P<0.01 ***P<0.001

	DDE	HEOD	PCBs	Hg	Shell Index
Ailsa Craig (1987 v. 1990)	t_{17}= +1.17	t_{18}= -1.70	t_{18}= +0.26	t_{18}= +6.20***	t_{18}=-14.39***
Ailsa Craig (1989 v. 1990)	t_{17}= +0.58	t_{18}= +0.29	t_{18}= +0.72	t_{18}= +6.25***	t_{18}=-12.30***
Bass Rock (1987 v. 1990)	t_{18}= +3.48**	t_{18}= -1.81	t_{18}= +0.95	t_{18}= -4.88***	t_{18}=-14.31***
St. Kilda (1987 v. 1990)	t_{16}= +0.30	t_{16}= -1.04	t_{16}= -4.52***	t_{16}=-15.67***	t_{16}=+19.18***

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BIRDS AND POLLUTION

Part 6 Rodenticides in barn owls

I NEWTON, A ASHER, I WYLLIE, P FREESTONE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs PE17 2LS

August 1991

6 RODENTICIDES IN BARN OWLS

6.1 Introduction

The aim of this work was to screen barn owl carcasses for residues of 'second generation' rodenticides. The carcasses were supplied by members of the public, and included birds which had died from various causes, mainly accidents. The chemicals of interest included difenacoum, bromadiolone, brodifacoum and flocoumafen. Results from 145 birds obtained from March 1984 to March 1989 were given in our report of 1988, (later published as Newton *et al.* 1990); and results from 30 additional birds were given in our report for last year, while those from 50 analysed since then are summarised in Table 9.

6.2 Results

Residues were detected in 14 of the 50 birds examined, more than twice the frequency found in previous specimens. However, this apparent increase is probably in part the result of improved sensitivity of analysis. A change of detector from a Varian Spectrofluometer to a Shimadzu spectrofluorophotometer has enabled us to detect levels a half of previous limits. In earlier samples the lowest limit of detection was about 0.005 μg for difenacoum, 0.008 μg for brodifacoum, 0.01 for flocoumafen, and 0.02 μg for bromadiolone (a mass of 0.01 μg was equivalent to a concentration of 0.01-0.02 μg^{-1}, depending on sample weight). On the new machine, the limits have fallen to around 0.0025, 0.004, 0.005 and 0.01 μg for the four compounds respectively.

On the previous limits, at least 5 of the 9 current birds containing difenacoum or brodifacoum would have been detected, and only 2-4 of the 9 birds containing bromadiolone. It was surprising that bromadiolone was not detected in any of the earlier birds, considering that it is the most commonly-used of the four chemicals involved. We have no explanation for this anomaly. None of the birds contained brodifacoum or difenacoum at a level close to lethal, but comparable information on the levels of bromadiolone associated with fatalities is not yet available. The absence of flocoumafen is consistent with previous findings, and may reflect the relatively recent introduction of this chemical.

6.3 Reference

NEWTON, I., HAAS, M.B. & FREESTONE, P. 1990. Trends in organochlorine and mercury levels in gannet eggs. Environ. Pollut. 63: 1-12.

Table 9. Levels of rodenticides (ppm in wet wt) in the livers of 50 Barn Owls (Tyto alba) analysed in 1990. ND=None detected.

J=juvenile in first year; A=adult, other than first year; M=male; F=female; brod=brodifacoum; difen=difenacoum; brom=bromadialone; floc=flocoumafen.

No.	Date found	County	Age	Sex	brod	difen	brom	floc
9619	Jun 89	Suffolk	A	M	ND	ND	ND	ND
9703	Sep 89	Suffolk	J	M	ND	ND	ND	ND
9704	Sep 89	Suffolk	J	M	ND	ND	ND	ND
9751	Oct 89	Northants	J	F	ND	ND	ND	ND
9770	Oct 89	Sussex	A	F	ND	ND	ND	ND
9771	Oct 89	Yorks	J	M	ND	ND	ND	ND
9773	Nov 89	Salop	J	M	ND	ND	ND	ND
9777	Nov 89	Norfolk	J	F	ND	ND	ND	ND
9778	Nov 89	Norfolk	J	M	ND	ND	ND	ND
9787	Nov 89	Cambs	A	M	ND	ND	ND	ND
9790	Nov 89	Sussex	J	F	ND	ND	ND	ND
9796	Oct 89	Dyfed	J	M	ND	ND	ND	ND
9805	Nov 89	IOM	J	M	ND	0.0315	ND	ND
9807	Nov 89	Lancs	J	F	ND	ND	ND	ND
9809	Oct 89	Cheshire	J	M	ND	ND	ND	ND
9821	Dec 89	Suffolk	A	F	ND	ND	ND	ND
9823	Nov 89	Norfolk	A	D	ND	ND	ND	ND
9824	Dec 89	Cardigans	J	M	ND	ND	ND	ND
9828	Dec 89	Bucks	J	F	ND	ND	ND	ND
9830	Dec 89	Oxon	A	F	ND	ND	ND	ND
9831	Dec 89	Cardigans	J	M	ND	ND	ND	ND
9841	Sep 89	Norfolk	J	M	ND	ND	ND	ND
9842	Sep 89	Norfolk	J	F	ND	ND	ND	ND
9851	Nov 89	D. & G.	J	M	ND	ND	ND	ND
9861	Jan 90	Selkirk	J	M	ND	ND	0.0064	ND
9863	Jan 90	Ayrshire	J	M	ND	ND	0.0139	ND
9867	Dec 88	Devon	J	F	ND	ND	0.0144	ND
9868	-	Devon	J	M	ND	ND	ND	ND
9875	Jan 90	Dorset	J	F	ND	0.0068	0.0172	ND
9882	Feb 90	Lincs	A	F	ND	ND	ND	ND
9890	Feb 90	E. Lothian	J	F	ND	ND	ND	ND
9892	89	Jersey	A	F	ND	0.0310	0.0194	ND
9910	Feb 90	Humberside	J	F	ND	ND	ND	ND
9911	Feb 90	Humberside	J	F	ND	0.0197	0.0465	ND
9913	Feb 90	Guernsey	A	M	ND	ND	0.2436	ND
9914	Feb 90	Hants	J	M	0.0147	0.0122	0.0413	ND
9918	Feb 90	Powys	A	F	ND	ND	ND	ND
9922	Feb 90	Gwynedd	J	M	ND	ND	ND	ND
9923	Feb 90	Lincs	J	M	ND	0.0111	ND	ND
9924	Mar 90	Kent	A	M	ND	ND	ND	ND
9926	Nov 89	Norfolk	J	F	ND	0.0135	ND	ND
9927	Mar 90	Gwynedd	J	M	ND	0.0292	ND	ND
9928	Mar 90	Powys	J	M	ND	ND	ND	ND
9930	Mar 90	Kent	J	M	ND	ND	ND	ND
9931	Feb 90	Norfolk	A	F	ND	0.0123	ND	ND
9934	Mar 90	Dorset	A	F	ND	ND	0.1515	ND
9935	Mar 90	Oxon	A	F	ND	ND	ND	ND
9936	Mar 90	Herefords	J	F	ND	ND	ND	ND
9943	Mar 90	Aberdeens	J	F	ND	ND	ND	ND
9947	Mar 90	Oxon	J	M	ND	ND	ND	ND

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ITE NORTH

Edinburgh Research Station
(Admin HQ for ITE North)
Bush Estate
Penicuik
Midlothian EH26 0QB
Tel: 031 445 4343; Telex 72579
Fax: 031 445 3943

Banchory Research Station
Hill of Brathens
Glassel
Banchory
Kincardineshire AB31 4BY
Tel: 033 02 3434
Fax: 033 02 3303

Merlewood Research Station
Grange-over-Sands
Cumbria LA11 6JU
Tel: 05395 32264; Telex 65102
Fax: 05395 34705

ITE SOUTH

Monks Wood Experimental Station
(Admin HQ for ITE South)
Abbots Ripton
Huntingdon
Cambs PE17 2LS
Tel: 048 73 381; Telex 32416
Fax: 048 73 467

Bangor Research Unit
University College of North Wales
Deiniol Road
Bangor
Gwynedd LL57 2UP
Tel: 0248 370045; Telex 61224
Fax: 0248 355365

Furzebrook Research Station
Wareham
Dorset BH20 5AS
Tel: 0929 551518
Fax: 0929 551087

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