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INSTITUTE OF TERRESTRIAL ECOLOGY
(NATURAL ENVIRONMENT RESEARCH COUNCIL)

NCC/NERC CONTRACT HF3/08/01
ITE PROJECT 181
Interim Report to Nature Conservancy Council

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BIRDS AND POLLUTION

Part 1 Monitoring
2 Sparrowhawk survey
3 Heron survey
4 Seabird eggs
5 Mersey bird mortalities
6 Puffins and PCBs
7 Incident investigations

I NEWTON, A A BELL, K R BULL, P FREESTONE, D J GORE, M B HAAS, J R HALL, H M HANSON, M P HARRIS, D V LEACH, D OSBORN & I WYLLIE

Monks Wood Experimental Station
Abbots Ripton
Huntingdon
Cambs. PE17 2LS

June 1985

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1 MONITORING

1.1 Organochlorines and metals in predatory birds

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. During 1984, the livers from 159 birds were analysed, including those from 49 kestrels, 63 sparrowhawks, 16 herons, 13 kingfishers and 18 others. The results from all these birds for DDE, HEOD, PCBs and Hg are given in Table 1, and the mean levels in Table 2. For the 5 main species, mean levels of these various pollutants did not in most cases differ significantly from those found in 1983 (Table 2). The only exception was the mean PCB levels in kestrels, which increased significantly from 1983 ($t_{93} = 2.25$, $P < 0.05$).

A kestrel with a particularly large burden of DDE (177 ppm in wet weight) and PCB (484 ppm) came from Northumbria. Sparrowhawks with high DDE levels (82, 65, 52 ppm) came from Worcestershire, Selkirk and Surrey respectively. The single peregrine obtained in 1984 had a high DDE level (66 ppm) and came from Perthshire. A heron from Kent had an unusually high mercury level (115 ppm), and a great crested grebe from East Lothian contained 59 ppm HCH.

1.2 Cadmium in little owls

In recent years, there has been growing concern about the amount of cadmium which is reaching farmland, from sewage sludge, fertilizers and industrial sources. Several soil animals are known to accumulate cadmium, particularly earthworms, and little owls feed extensively on earthworms. During the past year, the livers of 13 little owls from various parts of England were analysed for cadmium. In only 2 of these livers was cadmium detected, and then only at low level (Table 3). These results were similar to those obtained in previous years, and did not suggest widespread or heavy contamination of little owls. There is probably little point in attempting further cadmium analysis on this species.

1.3 Acknowledgments

We are grateful to all the contributors, too many to mention individually, who sent us specimens during the period concerned.

Table 1. Residues of organochlorine insecticides (ppm wet weight) and heavy metals (ppm dry weight) in the livers of birds of prey, results reported April 1984-March 1985.

Specimen number	Collection date	pp'-DDE	HEOD	PCBs	Hg
Kestrel (*Falco tinnunculus*)					
8065	May 80	0.55	1.22	3.79	ND
8066	Jan 81	0.11	0.08	1.72	3.11
8067	Jan 81	1.75	0.37	2.55	ND
8068	Jul 82	0.12	0.20	2.09	ND
8069	Jan 83	0.53	0.94	3.55	0.59
8070	Mar 83	0.19	0.57	1.38	-
8072	Mar 83	3.53	0.48	6.97	3.63
8073	Apr 83	176.89	2.80	483.98	1.59
8127	May 83	0.10	0.36	1.20	2.17
8074	Jul 83	0.24	0.46	7.12	0.87
8075	Aug 83	0.04	0.74	2.98	1.09
7942	Oct 83	0.34	0.75	6.45	2.82
8076	Nov 83	1.41	0.63	8.57	2.21
8077	Dec 83	0.13	0.12	5.56	0.18
7902	Jan 84	2.47	1.43	7.64	0.77
7903	Jan 84	2.81	0.12	1.60	1.32
7906	Jan 84	ND	0.45	2.90	0.89
7911	Feb 84	0.25	0.22	3.90	1.50
7912	Feb 84	0.71	1.18	5.18	1.07
7913	Feb 84	7.37	2.21	6.33	2.86
7916	Feb 84	0.08	0.38	1.52	1.13
7926	Mar 84	20.88	1.41	11.69	1.36
7932	Mar 84	ND	1.66	7.87	0.05
7934	Mar 84	0.87	0.56	5.06	0.37
7937	Mar 84	0.42	2.70	8.06	0.05
7939	Mar 84	4.44	0.78	8.64	3.11
7940	Mar 84	0.72	0.29	7.24	3.91
7941	Mar 84	1.12	2.61	9.57	0.08
7951	Apr 84	2.46	0.89	5.69	0.28
7960	Apr 84	0.09	0.30	3.10	0.13
7961	May 84	3.05	1.62	8.62	1.00
7964	May 84	3.62	0.95	8.95	1.35
7966	May 84	0.55	0.89	1.90	1.24
7978	Jul 84	0.24	2.73	8.35	0.73
7982	Jul 84	0.15	0.26	4.77	0.41
7983	Jul 84	0.34	0.80	4.50	0.09
7984	Aug 84	3.30	1.55	3.24	1.92
8026	Aug 84	3.73	0.55	2.97	2.03
8033	Oct 84	0.42	0.47	1.93	0.18
8036	Oct 84	0.61	0.78	4.21	0.75
8042	Oct 84	0.29	0.09	3.11	ND
8045	Oct 84	0.29	0.44	1.11	0.59
8103	Nov 84	0.31	0.28	4.83	0.62
8117	Nov 84	1.00	ND	29.11	0.13
8139	Nov 84	0.14	0.14	ND	ND
8107	Dec 84	0.26	0.25	ND	0.87

Table 1 (contd)

Specimen number	Collection date	*pp*'-DDE	HEOD	PCBs	Hg
Kestrel (contd)					
8109	Dec 84	0.34	0.22	7.59	0.37
8113	Dec 84	2.18	0.76	2.87	3.61
8114	Dec 84	0.23	0.13	2.84	3.20
8118	Dec 84	6.06	0.05	12.77	0.76
Sparrowhawk (*Accipiter nisus*)					
8090	Apr 78	0.78	0.23	4.88	1.45
8078	Feb 80	1.48	0.10	6.51	1.78
8079	Jul 80	5.63	0.55	4.25	2.13
8048	Aug 80	11.19	1.12	23.84	9.19
8080	Sep 80	4.52	1.20	9.83	7.82
8081	Sep 81	3.06	1.16	8.27	4.10
8099	Oct 81	1.21	1.06	9.85	2.63
8105	Nov 81	0.93	0.56	ND	1.89
8082	Dec 81	6.04	1.23	11.34	2.96
8083	Feb 82	1.39	1.27	8.04	1.00
7927	Mar 82	19.07	0.52	9.92	4.21
8096	Mar 82	25.67	1.82	99.32	14.39
8097	Mar 82	13.87	1.09	53.19	14.34
8084	Dec 82	0.25	0.41	4.96	1.82
8085	Feb 83	4.23	1.41	19.75	0.65
8086	Apr 83	12.10	1.10	2.74	4.45
8095	May 83	0.81	0.25	5.45	0.77
8087	Jul 83	0.19	0.30	4.06	0.38
8106	Jul 83	52.53	4.31	92.28	11.39
8089	Aug 83	1.19	0.21	7.20	3.28
7908	Sep 83	1.12	0.09	2.74	2.35
7999	Sep 83	1.87	0.60	5.32	1.96
8088	Sep 83	1.61	0.31	4.43	1.82
8129	Oct 83	2.01	0.83	2.95	1.12
7895	Jan 84	1.87	0.41	0.55	1.89
7898	Jan 84	1.29	0.52	2.26	1.81
7909	Feb 84	5.41	1.49	13.27	4.93
7915	Feb 84	8.51	0.38	13.43	11.72
7920	Feb 84	0.56	2.13	8.52	1.23
7928	Feb 84	0.28	0.02	4.00	4.81
7935	Feb 84	1.73	0.72	1.16	3.18
8098	Feb 84	1.16	0.57	11.67	6.54
7938	Mar 84	35.96	2.68	18.85	8.22
7953	Mar 84	0.99	0.11	3.15	3.11
7977	Mar 84	9.27	20.14	23.14	13.68
7943	Apr 84	22.71	1.99	23.69	5.85
7945	Apr 84	19.07	1.09	27.19	11.92
7946	Apr 84	2.10	0.35	4.78	4.15
7954	Apr 84	1.53	0.30	2.52	7.81
7956	Apr 84	3.38	0.28	3.75	2.47
7972	Apr 84	81.74	6.37	7.38	0.41
8100	Apr 84	65.16	0.44	14.98	13.71

Table 1 (contd)

Specimen number	Collection date	*pp*'-DDE	HEOD	PCBs	Hg
Sparrowhawk (contd)					
7963	May 84	1.18	1.34	5.60	5.43
7969	Jun 84	4.02	0.68	7.70	2.92
8101	Jul 84	0.72	0.76	3.54	1.04
7989	Aug 84	2.20	0.15	6.12	1.06
7991	Aug 84	0.08	0.03	0.78	0.88
7992	Aug 84	0.21	0.65	3.72	0.41
7996	Aug 84	0.50	0.50	7.17	0.33
7997	Aug 84	7.92	0.82	7.61	1.60
8018	Aug 84	0.09	0.50	2.41	1.88
8022	Sep 84	0.97	0.92	3.87	0.57
8024	Sep 84	0.73	0.09	8.41	0.45
8025	Sep 84	3.01	0.79	4.67	0.83
8027	Sep 84	0.24	0.18	5.71	0.65
8044	Oct 84	1.19	1.34	6.54	0.38
8102	Oct 84	0.43	0.20	2.09	1.29
8110	Oct 84	0.28	0.08	ND	0.45
8091	Nov 84	0.43	1.19	6.77	0.81
8115	Dec 84	0.44	0.19	ND	1.28
8116	Dec 84	14.96	1.32	13.61	1.48
8121	Dec 84	1.67	0.15	ND	0.48
8137	Dec 84	18.30	0.40	4.83	3.85
Golden eagle (*Aquila chrysaetos*)					
7914	Feb 84	1.47	0.13	11.79	4.38
Peregrine (*Falco peregrinus*)					
8134	1982	66.41	0.99	122.24	4.41
Merlin (*Falco columbarius*)					
7907	Sep 83	0.13	0.47	1.37	9.97
7931	Mar 84	7.70	0.28	14.04	-
7986a	Jun 84	0.29	0.09	0.88	0.76
7986b	Jun 84	0.77	0.45	1.38	0.56
7987	Jun 84	1.69	0.33	1.69	0.51
7988	Aug 84	0.78	0.40	2.29	1.48
Long-eared owl (*Asio otus*)					
8060	Sep 82	0.18	ND	2.15	0.47
8061	Feb 83	1.95	0.48	7.39	0.71
8062	Mar 83	1.50	0.37	10.74	1.23
8063	Aug 83	0.64	ND	1.31	0.31
8064	Oct 83	0.46	0.23	2.86	ND
7944	Apr 84	15.21	0.77	8.61	0.30

Table 1 (contd)

Specimen number	Collection date	pp'-DDE	HEOD	PCBs	Hg
Heron (*Ardea cinerea*)					
7980	May 83	3.37	0.58	21.55	18.47
7802	Jul 83	12.70	42.91	103.93	20.56
7910	Feb 84	1.05	0.43	2.86	38.91
7930	Mar 84	ND	52.11	468.50	11.37
7958	Apr 84	0.27	0.15	1.35	7.26
7970	May 84	0.15	1.10	4.65	7.10
8219	May 84	4.49	0.54	14.83	-
7981	Jul 84	1.49	0.22	3.62	4.25
7993	Aug 84	29.05	4.86	149.88	114.60
7994	Aug 84	ND	0.10	4.75	3.85
7995	Aug 84	0.17	1.30	3.58	4.90
8031	Sep 84	0.13	0.12	0.80	6.67
8038	Oct 84	2.58	ND	3.65	9.92
8040	Oct 84	3.83	0.24	3.87	26.78
8049	Nov 84	0.35	0.16	2.14	4.44
8138	Dec 84	17.74	1.52	12.05	15.81
Great crested grebe (*Podiceps cristatus*)					
7904	Jan 84	5.54	1.44	25.79	13.76 (59 ppm HCH)
7949	Apr 84	1.36	1.49	8.92	5.34
7950	Apr 84	1.90	1.89	7.39	9.85
8092	Nov 84	0.25	ND	0.76	7.16
Kingfisher (*Alcedo atthis*)					
8125	-	1.27	4.29	ND	3.60
8123	1976	0.13	1.17	ND	1.66
8124	Mar 83	2.32	0.41	ND	2.08
7975	Jun 84	3.37	2.65	11.95	-
8046	Jun 84	7.96	1.08	4.54	2.38
7979	Jul 84	3.15	1.95	5.03	0.22
8122	Jul 84	0.56	0.86	ND	1.22
8019	Sep 84	2.05	0.89	4.62	1.18
8020	Sep 84	1.94	1.20	7.65	0.87
8021	Sep 84	1.89	0.99	11.15	0.69
8030	Sep 84	0.84	2.06	6.88	3.36
8111	Nov 84	0.56	0.77	3.26	1.35
8112	Nov 84	0.68	0.88	1.72	1.94

Note: ND - None detected.

Table 2. Geometric mean levels of pollutants of birds listed individually in Table 1, but for 1984 specimens only.

	pp'-DDE	HEOD	PCBs	Hg
Kestrel				
Mean	0.56	0.46	3.44	0.52
SD	0.89	0.64	0.69	0.67
Range within 1 SE	0.40-0.79	0.36-0.59	2.64-4.49	0.40-0.67
Sparrowhawk				
Mean	1.93	0.51	3.44	1.93
SD	0.75	0.58	0.83	0.49
Range within 1 SE	1.46-2.54	0.41-0.63	2.53-4.68	1.61-2.32
Merlin				
Mean	1.18	0.27	2.31	0.75
SD	0.53	0.28	0.46	0.21
Range within 1 SE	0.68-2.03	0.20-0.36	1.43-3.72	0.59-0.96
Heron				
Mean	0.44	0.39	6.66	10.76
SD	1.34	1.05	0.76	0.44
Range within 1 SE	0.19-1.01	0.20-0.75	6.06-7.31	8.15-14.2
Great crested grebe				
Mean	1.38	0.25	5.91	8.48
SD	0.56	1.60	0.64	0.18
Range within 1 SE	0.72-2.61	0.04-1.60	2.86-12.6	6.92-10.4
Kingfisher				
Mean	1.61	1.21	2.90	1.17
SD	0.39	0.19	0.90	0.35
Range within 1 SE	1.22-2.14	1.06-1.40	1.50-5.58	0.89-1.52

Table 3. Residues of cadmium (Cd) found in the livers of little owls (*Athene noctua*) reported April 1984–March 1985.

Specimen number	Collection date	Cd ppm dry weight
8056	May 81	ND
8057	May 81	ND
7936	May 83	ND
8058	Jul 83	ND
8059	Sep 83	ND
7917	Feb 84	ND
7948	Apr 84	2.04
8017	Sep 84	ND
8023	Sep 84	ND
8034	Oct 84	3.15
8035	Oct 84	ND
8128	Jul 84	ND
8155	Aug 84	ND

Note: ND - None detected.

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BIRDS AND POLLUTION

Part 2 Sparrowhawk survey

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Monks Wood Experimental Station
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June 1985

2 SPARROWHAWK SURVEY

2.1 Introduction

The sparrowhawk suffered a marked population decline in the late 1950s, following the widespread introduction of cyclodiene pesticides in agriculture. Since 1964, in each of 7 study areas, potential territories have been checked periodically for occupation and breeding success. In this way it was hoped to find whether sparrowhawks were recovering in numbers, following successive restrictions in cyclodiene use. The Anglesey and East Midlands areas were surveyed in 1984, and the findings are summarized in Table 4.

2.2 Anglesey

A reduced number of territories was surveyed in this study area in 1984, but, following the apparently low occupancy recorded here recently, inconsistent with increases in other areas (Newton et al. 1982; Bell 1984), 4 new sites, with no previous history, were included for comparison. Searching was undertaken between April and August.

The sample consisted of 3 groups of territories, all in similar mixed farmland.

1. Four broadleaved sites (3 of which could be regarded as prime, and one marginal), which had been included in the survey from its inception in 1964, and all of which had held breeding sparrowhawks, though not continuously: here, a current nest located in one of the 2 sites holding old nests eventually carried a clutch of 4, and fledged 4 young.

2. Five coniferous sites first surveyed only recently, in 1983: an active nest with a brood of 3 was found.

3. Four new potential territories (one broadleaved, 3 coniferous), all forming ideal breeding habitat. The conifer woods were in close proximity, but 2 carried both old nests and breeding pairs: a clutch of 5 fledged 5 young, while a clutch of 3 was depleted to one broken egg.

Overall, about 30% of the 13 territories held new nests. Compared with a nil return in 1979, 10% occupation in 1981 and 12% in 1983, this continues the increase in the proportion found to be occupied since the resumption of surveying in this area in 1979, and approaches the level of occupancy recorded in the initial 1964-70 period. The mean occupation rate for breeding pairs then was 43.5%, but 41% of the nests failed to produce any young. Only one (17%) of the 6 observed nests failed in 1979-84. During the earlier period, the mean recorded size of 7 (depleted ?) clutches was 2.3 (Cooke et al. 1979), whereas in 1979-84 the mean of 8 clutches was 4.3, presumably because of reduced breakage. Mean brood-sizes were 2.7 (10 broods) and 4.4 (5 broods) respectively.

2.3 East Midlands

This was the third consecutive survey of this study area, following the first evidence of sparrowhawk re-occupation in 1982 and 1983. Searching was carried out from early May to late July.

Recolonization accelerated, with sparrowhawk presence now confirmed in 5 territories, all but one in extensive tracts of woodland, and all broadleaved sites. Successful breeding was proved when subsequent reports of fledged young led to the early discovery of a freshly vacated nest in one of these larger woods; in another, a second nest was located later by systematic searching. This also contained prey remains, consistent with young having fledged. It is expected that colonization will continue, with the re-occupation of further territories.

2.4 References

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Table 4. Occupation of sparrowhawk territories, 1984.

	Anglesey	East Midlands
Total territories checked	13	26
Number with successful nests	3	2
Number with failed nests	1	0
Number with no nest, but other signs	3	3
Number with no signs	6	21
Number of territories with old nests	7	0
Proportion of territories with old nests	0.53	0

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BIRDS AND POLLUTION

Part 3 Heron survey

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3 HERON SURVEY

3.1 Introduction

Since 1964, observations have been made annually at two Lincolnshire heronries, mainly to count the nests and to obtain eggs, broken shells and dead young for chemical analysis. The herons in these colonies had shown shell-thinning, apparently caused by DDE, but, unlike some birds of prey, had not suffered a marked population decline. In 1984, monitoring was confined to checking for nest occupation, recording evidence of egg breakage beneath a sample of nests, and the collection of dead young for chemical analysis. Observations were made between March and June.

3.2 Troy

Some 73 occupied nests were found, a slight reduction from the previous year's second highest peak of 80. Eleven of the nests had been constructed afresh during the season, and 9 existing nests remained unused.

Clutch- and brood-sizes were not checked, but surveillance of ground evidence beneath 27 nests showed that egg breakage occurred at 9 (33%). Unusually persistent egg-breaking activity probably accounted for abnormally large totals in 3 nests (6,6,8), but another clutch of 6 was incubated normally, producing 4 young. Two nests were unusual in losing young, re-laying, then breaking 5 and 2 eggs respectively, although it is possible that these had been re-occupied by late-breeding pairs. Fourteen dead young, from 11 nests, were recovered throughout the colony; none bore any of the lesions noted on some of the 1983 carcasses.

3.3 Willoughby

With 3 nests unoccupied, and 5 newly built, the number of pairs breeding at Willoughby was 20. This represented a 33% increase over the low of 1983, and checked the steady decline in this colony noted in the last report. Visits were made on 3 April and 2 May, and by the latter date presence of young had been confirmed at 12 nests. Egg breakage was not recorded, even though hatched eggshells were still evident beneath 7 nests, including some with large young.

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BIRDS AND POLLUTION

Part 4 Seabird eggs

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4 SEABIRD EGGS

4.1 Pollutants in gannet eggs

In 1984, gannet eggs were obtained from only one site: Grassholm Island, off south-west Wales. These eggs were analysed for residues of DDE, HEOD, PCBs and Hg (Table 5).

Levels were generally similar to those found in previous years in this species. The last year in which eggs were obtained from Grassholm was 1980. Comparing the mean residue levels in 1980 and 1984, a significant decline was found in DDE, and significant increases in PCB and Hg (Table 6).

4.2 Acknowledgments

We are grateful to the RSPB staff for organizing the collection of the eggs.

Table 5. Residues of organochlorine insecticides (ppm wet weight) and heavy metals (ppm dry weight) in the eggs of gannets (*Sula bassana*).

Specimen number	Shell index	*pp*'-DDE	HEOD	PCBs	Hg
Grassholm					
G611	3.03	1.15	0.14	15.65	3.14
G612	2.90	0.16	0.09	1.83	2.95
G613	3.13	0.31	0.19	6.15	3.45
G614	2.61	0.23	0.13	6.66	2.63
G615	2.65	0.38	0.15	9.93	2.23
G616	3.00	0.41	0.26	10.49	3.16
G617	3.21	0.12	0.09	2.68	2.55
G618	3.22	0.13	0.08	3.30	2.69
G619	2.75	0.55	0.18	11.74	3.67
G620	2.89	0.19	0.17	5.12	3.04
Mean*	2.94	0.28	0.14	6.04	2.92
SD	0.22	0.31	0.16	0.30	0.07
Range within 1 SE	2.87-3.01	0.23-0.35	0.12-0.16	4.85-7.54	2.79-3.06

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

Table 6. Comparison of geometric mean residue levels (log_{10} values) and arithmetic mean shell indices for gannet eggs from Grassholm in 1980 and 1984.

Shell index	t_{18} = 0.24	NS	I
DDE	t_{18} = −2.81	$P < 0.02$	D
PCBs	t_{18} = 4.22	$P < 0.001$	I
Hg	t_{13} = 6.24	$P < 0.001$	I

Note: I = increase from previous period; D = decrease.

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BIRDS AND POLLUTION

Part 5 Mersey bird mortalities

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June 1985

5 MERSEY BIRD MORTALITIES

5.1 Introduction

Work has again centred on: (i) measuring alkyl-lead levels in dead and sick birds to find whether the sickness or death could have been caused by alkyl-lead; and (ii) monitoring levels of alkyl-lead in the livers of teal.

Co-operation with the North West Water Authority has continued as before, with NWWA acting as a 'clearing house' for the birds, collected mainly by BASC members. All the analytical and post-mortem methods have been described previously.

5.2 Mortalities in 1984-85

For the first time since the main incident in 1979, no dead birds were sent to ITE for analysis during the period covered by this report.

5.3 Alkyl-lead levels in livers of Mersey teal (Anas crecca)

Figure 1 shows all the data, on a month by month basis. Discerning trends in the data is still difficult, but, generally, it seemed that a downward trend was emerging. Indeed, this would have been a firm conclusion were it not for the results for March 1984, which included many high values. Statistical analysis of the data will be given in the final report.

5.4 Post-mortem findings on Mersey teal

Birds collected in the monitoring scheme were given a brief post-mortem. No marked internal abnormalities were seen. This was true for the birds collected in March 1984, even though these were noted on dissection to be in 'relatively poor condition'. Birds possibly now experience 'high' concentrations of alkyl-lead for periods which are too short to cause the gross internal morphological changes previously seen in birds with < 0.5 ppm alkyl-lead in their tissues.

The birds examined in September-November 1984 were in better condition than any previous birds received from the Mersey, and almost every individual had abundant fat reserves.

5.5 Conclusions and recommendations

5.5.1 No birds were known to have died of alkyl-lead poisoning on the Mersey estuary this year.

5.5.2 Levels of alkyl-lead may now be declining. A general downward trend in residue levels in teal livers was broken by the relatively high values found in March 1984.

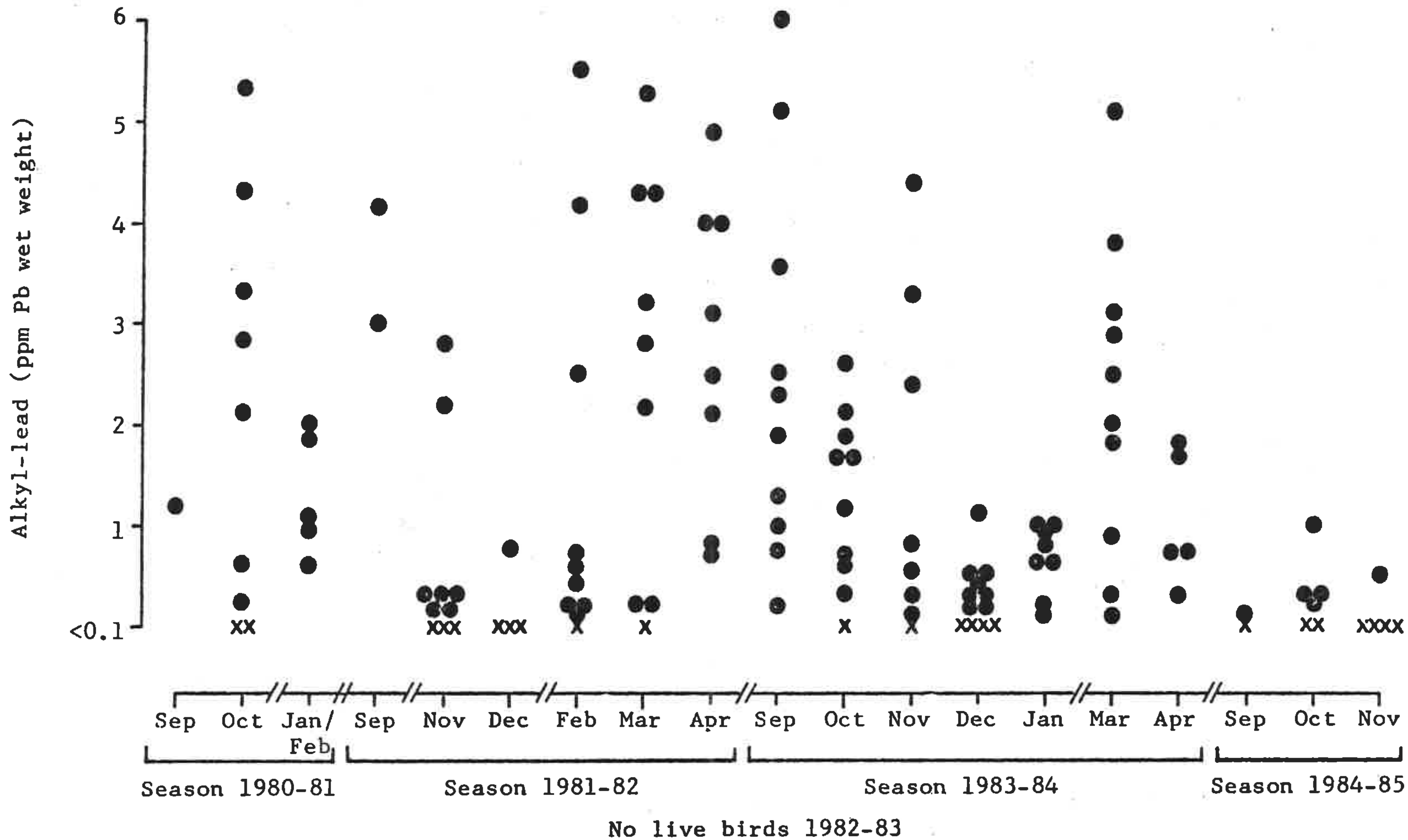
5.5.3 Further evidence emerged that the earlier clear association between alkyl-lead level and internal morphological abnormality had now disappeared.

5.5.4 We recommend that analysis of carcasses of birds found dead should continue, and that monitoring of live-caught birds should also continue, with samples being taken in October, December/January and March.

5.6 Acknowledgments

We are most grateful to Mr D. Jones of the Frodsham & District Wildfowlers' Club (BASC) who collected the teal for analysis, and to Dr K. Wilson of NWWA for storing birds.

Fig. 1. Alkyl-lead levels in teal livers, September 1980-November 1984.



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BIRDS AND POLLUTION

Part 6 Puffins and PCBs

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6 PUFFINS AND PCBs

In 1984, 7 dosed and 2 control puffins (Fratercula arctica) were collected on the Isle of May, in order to determine PCB residue levels in their tissues (Table 7). These measurements were taken 73 or 82 months after dosing. One bird had no mesenteric fat, so no fat sample could be analysed.

PCB residues were at measurable levels in all except 2 tissues examined. This result was similar to that for 1983, and the values obtained were higher than those for birds collected between months 48 and 58 after dosing.

If it is accepted that all the PCB given to dosed birds had been excreted by 48 months, then puffins may have been exposed to more PCB recently than in the earlier years of the experiment. Alternatively, as most of the recent data are from dosed birds (controls have proved difficult to find), physiological changes may have caused mobilization of PCBs from fat stores. A number of physiological/ biochemical changes could have caused this effect.

In addition to PCB, residues of DDE were present in the birds. Two individuals contained 24.2 and 13.8 ppm DDE in fat. These are the highest levels of DDE ever recorded in the fat of live puffins.

In view of the PCB values in the dosed puffins, we recommend that such birds are examined for at least one further year.

Table 7. Comparison of PCB levels (ppm in fresh weight) in dosed and control puffins from the Isle of May.

	Months after implantation	Fat	Liver	Kidney	Muscle	Brain
Dosed	65	47.0	0.9	2.6	0.9	0.7
	65	-	1.1	1.1	0.8	ND
	65	25.4	1.0	0.6	1.1	0.6
	72	9.4	3.1	3.3	0.4	6.4
	73	12.6	0.6	3.4	0.8	0.3
	73	17.8	1.3	1.0	0.6	1.0
	73	18.1	3.7	0.7	2.9	1.5
	73	22.5	17.3	1.4	3.1	10.8
	77	84.1	3.6	0.8	0.7	0.2
	77	-	0.6	0.8	0.8	0.2
Control	3	ND	ND	ND	ND	ND
	24	25.7	ND	ND	ND	ND
	24	69.9	1.3	1.9	1.0	1.4
	24	34.5	ND	ND	ND	ND
	26	49.4	ND	ND	ND	ND
	28	38.5	ND	ND	ND	ND
	34	57.0	ND	ND	ND	ND
	34	73.6	ND	ND	ND	ND
	34	28.7	ND	ND	ND	ND
	34	28.1	ND	ND	ND	ND
	48	0.4	ND	ND	ND	ND
	48	0.6	ND	ND	ND	ND
	48	0.3	ND	ND	ND	ND
	48	3.0	ND	ND	ND	ND
	60	14.1	ND	ND	ND	ND
	60	8.2	ND	ND	ND	ND
	82	1.0	3.5	1.8	0.5	ND
	82	-	2.3	0.6	ND	0.8

Note: ND - None detected (< 0.5 ppm); -, no fat present at sampling site.

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BIRDS AND POLLUTION

Part 7 Incident investigations

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7 INCIDENT INVESTIGATIONS

7.1 Introduction

There have, once again, been numerous requests for us to advise on, or investigate, wildlife mortality incidents. This year all the requests have involved birds, with 3 incidents near Southend, Essex. Incidents are described below in the order in which they came to our attention.

7.2 Stranraer gannets

SSPCA asked us to analyse some gannets which had been found sick and dead along the coast. Three corpses were received and analysed for organochlorines, which were implicated in earlier incidents. Residues (Table 8) were lower than those found in earlier incidents. As judged from post-mortem examinations, the birds had probably died from food shortage; one had very atrophied breast muscles.

7.3 Essex gulls (various species)

Considerable local concern was generated by deaths of gulls on the shore near Leigh-on-Sea. Several incidents were reported of groups of sick gulls (20 or more) washed ashore. When sick birds were taken into captivity, some recovered within a few days.

Counts of corpses organized by the local NCC Warden and local ornithologists (partly conducted by employees of a waste disposal company) are given in Table 9. Over 2000 birds were involved in total.

Some dead gulls collected in late March 1985 were examined externally. Of 12 birds involved, 9 had been in good condition before death and only one seemed to have starved. This finding is similar to that of 1983. It suggests that the birds died relatively rapidly.

No cause of the problem has yet been identified.

Botulism may be involved in these recurrent incidents. In future, we shall transfer any live sick gulls received to a suitable MAFF laboratory, where this possibility can be investigated.

7.4 Essex Brent geese

A number of Brent geese were received for analysis. All were collected in Essex, mostly near Foulness. They were analysed for toxic and essential metals (Table 10).

Five birds (Nos. 1,2,3,7 and 11) contained sufficient lead to have killed them, or at least to have contributed to their death. In these birds, zinc concentrations seemed elevated, compared to the 2 birds which contained no detectable lead, but copper levels were unchanged.

The liver:kidney ratio of lead concentrations in birds 1,2,3 and 7 (liver > kidney in each case) suggested that these birds had suffered a relatively acute exposure to lead. In chronic lead exposure, concentrations in kidney exceed those in liver.

Post-mortem examinations revealed that several birds with high lead levels had poor fat reserves and atrophied breast muscles. The gizzards of birds 1-3 contained substantial quantities of bright and dull metallic granules of various types. These were pooled and analysed for lead and cadmium (a metal frequently found in alloys). Lead was present in very high concentrations, up to 64% (Table 11). Presumably, the birds had picked up the granules as grit, rather as swans obtain fishing weights and shooting shot. They would then die as the lead-containing particles were ground down and the lead absorbed.

If this metallic sediment is widespread in the Foulness area, it could present a considerable hazard to ducks and geese feeding there. Accordingly, we recommend further studies of the problem. At present we await a response from another government department who hope to identify the source of the material obtained from the gizzards.

7.5 Bewick swan mortality

MAFF Veterinary Investigation Centre (Newcastle) sent a number of Bewick swan tissues for analysis. At least 5 birds had been found dead around the effluent settling lagoon of a metal plating works.

The effluent was high in chromium, and analysis of tissues dissected by MAFF indicated that chromium levels were, on average, > 100 ppm in all except brain (Table 12).

No 'control' data were available, and so various other tissues in the laboratory at the time were analysed for chromium. None could be detected in these other samples (limit of detection, = 5 ppm). The levels in the Newcastle swans seem, therefore, highly elevated.

We concluded that chromium may well have caused these mortalities. The possibility remains that other toxic agents may have contributed.

7.6 Grafham Water gulls

Dr A.S. Cooke (NCC, Peterborough) asked us to assist his investigations into causes of gull mortalities on Anglian Water's Grafham reservoir. He informed us that 29 sick and dead gulls were present on the shores of the reservoir on 29 January 1985. Eleven sick and 9 dead black-headed gulls were collected and taken to the MAFF Veterinary Investigation Centre (Cambridge). Type C botulism was identified as the likely cause of death.

This helps to establish that Type C botulism can occur in birds in winter, and is not restricted to warm summer months.

7.7 Agrochemicals

Several incidents which may have involved pesticides came to our notice in the past year. All were passed to MAFF in Cambridge or Tolworth. They found that the pesticide chlorphenvinphos may have caused several of the incidents which included pigeons.

7.8 Essex starlings

The unusual 'walking' starling incidents have again been reported from Essex. This year's report was made by an employee of a waste disposal company, who believes the phenomenon begins with the 'first frosts' of the winter. Arrangements have been made to collect a sample of birds for examination should this recur.

7.9 Worcestershire herons

Investigations are in progress into the mortality of several herons which occurred on the Avon in recent weeks. So far, 5 birds have been examined. Dieldrin (HEOD) was present in 4 of these at levels exceeding 10 ppm, the level usually taken to indicate death from dieldrin. More detailed results will be provided when analysis has been completed.

7.10 Acknowledgments

Our thanks are due to many people who assisted these investigations. We cannot list them all here but, in particular, we are grateful to: Robin Hamilton (NCC, Colchester), Reg Arthur (NCC Warden, Essex coast) and A.C.J. Gresham (MAFF VIC, Cambridge). Molly Drake and Joyce McConnell have frequently assisted our work on both the Essex Brent geese and gull mortalities.

Table 8. Mercury (ppm dry wt) and organochlorine levels (ppm wet wt) in livers of 3 Stranraer gannets (<u>Sula bassana</u>).

	Hg	PCB	pp'-DDE	HEOD
Bird 1	3.6	19.4	3.1	ND
Bird 2	2.8	10.0	1.1	0.6
Bird 3	3.5	13.0	1.5	1.3

Note: ND - None detected (limit of detection = 0.5 ppm).

Table 9. Dead and sick birds found between Shoebury and Leigh in 1984.

Limited pilot counts	
January	> 248
February	> 174
Improved counts	
March	137
April	62
May	11
June	16
July	139
August	142
September	144
October	233
November	331
December	496
	> 2130

Table 10. Metal levels in Brent geese (*Branta bernicla*) found in Essex.

Sample description/ Bird No.		Date found/ place	Pb	Cu	Cd	Zn
Liver	1	Nov 1984	764	61.3	1.7	304
Kidney	1	(Foulness)	442	52.7	3.5	123
Liver	2	Nov 1984	591	149	4.1	357
Kidney	2	(Foulness)	300	41.3	6.4	107
Liver	3	Nov 1984	791	109	2.6	239
Kidney	3	(Dengy SSSI)	412	22.1	4.4	93
Liver	4	Jan 1985	ND	85.7	0.5	154
Kidney	4	(Chalkwell)	ND	130	2.0	149
Liver	5	Jan 1985	ND	80.5	1.0	124
Kidney	5	(Foulness)	ND	17.8	3.1	96
Liver	6	Jan 1985	c.5	36.9	2.0	137
Kidney	6	(Foulness)	c.5	21.1	5.5	107
Liver	7	Feb 1985	538	340	ND	407
Kidney	7	(Chalkwell)	514	97.6	3.9	106
Liver	8	Mar 1985 (Walton)	ND	Cu, Cd, Zn not analysed		
Liver	9	Mar 1985 (Kirby-le-Soken)	ND			
Liver	10	Mar 1985 (Kirby-le-Soken)	ND			
Liver	11	1985 (Essex)	36.6			

Notes: ND - None detected (limits of detection, Pb = 5 ppm, Cd = 0.1 ppm).

All birds, except 9 and 10, were either found sick and died later or were found dead. Nos. 9 and 10 were 'control' birds which had been shot under a MAFF licence.

No significant concentrations of organochlorine contaminants were found in the first 7 livers (the other livers were not examined for these chemicals).

Table 11. Pb and Cd content (ppm dry wt) of metallic particles found in gizzards of Brent geese.

Sample description	Pb	Cd
Gold coloured metal	14,500	29.7
Bronze coloured metal	27,000	3.8
Mixture of types	20,000	18.7
Black sediment-like material	644,000	0.9

Table 12. Chromium (ppm dry wt) in tissues of Bewick swans (*Cygnus bewickii*).

Sample description	g	Mean
Gizzard contents	141	193
	182	
	257	
Intestine	157	165
	150	
	188	
Liver	158	150
	124	
	168	
Kidney	160	185
	192	
	203	
Brain	ND	< 8.5
	8.5	
	–	
	ND	
	ND	
Heart	132	111
	90.4	

Notes: –, No sample possible.
ND, None detected (limit of detection = 5 ppm).

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