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Vertebrates, except salmon and trout, associated with the River Dee

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1 Introduction

This paper gives an exploratory account of the wild vertebrates of the River Dee, its tributaries, lochs and associated marshes and other wetlands. We do not attempt a comprehensive survey as no such survey has been done, and most information is qualitative. More survey work would be useful, and the paper draws attention to some obvious gaps in knowledge. We also emphasize some of the requirements of the vertebrates, and indicate potential conflicts between their conservation and other interests.

2 Fauna

As mammals and birds, especially, are mobile, it is difficult to define those species clearly associated with the Dee and those not. In the case of waders and gulls, some of which nest on river shingles and nearby marshes, we also mention groups on nearby hills as these birds are part of the Dee populations. In general, the vertebrates associated with the Dee are not unusual or important. The main exceptions are the otter and the long-eared bat.

2.1 Fish

Small numbers of sea lampreys occur in the Dee. Adults migrating from the sea to spawning grounds in the lower reaches of the river are obvious in June and July. Sea lampreys are unlikely to occur in the tributaries but, although they have never been recorded, the young must occur in silty areas in the lower river. The river lamprey probably occurs in the Dee in small numbers, with a small run each autumn and spring. Adults run into both the Don to the north and the North Esk to the south.

In contrast, the brook lamprey appears to be common in the Dee, especially in the lower and middle reaches but also in many tributaries, including the *Girnock* and *Dinnet* Burns. In the *Dinnet*, W Irvine collected approximately one lamprey every 10 m when electro-fishing in 1967.

As in many other parts of Scotland, rainbow trout have been introduced to several lochs within the Dee catchment for sport fishing. No stocks became established and any fish occurring in the Dee can only be strays.

Pike are common in several Deeside lochs (eg Davan and Kinord (Treasurer 1983)), and occur in small numbers in slow-flowing parts of the lower reaches of the main river. They also occur in some smaller

tributaries of the Dee. In 1967, W Irvine found about one specimen every 120 m during electro-fishing.

Minnows are common, occasionally abundant, in the lower and middle reaches of the Dee and in many of its tributaries. Spawning occurs in May and June, and fry can be seen in large numbers along the edges of pools later in the year.

Because of its bottom-living habit, the stone loach is believed to be less abundant than it actually is. In fact, it is quite common in the lower and middle reaches of the main river and in some of its tributaries.

Eels are common in most parts of the Dee system which are accessible from the sea. Electro-fishing in the *Dinnet* in 1967 (W Irvine) revealed about one eel every 5 m. Jenkins and Harper (1980) showed that eels were a major item of the diet of otters in the area. Three-spined sticklebacks are found in some of the more slow-flowing parts of the Dee and its tributaries and in some lochs. Several lochs in the Dee valley contain populations of perch (see Treasurer 1983). This species also occurs in some numbers in the slow-flowing parts of the lower reaches of the River Dee.

Young flounders ascend from the sea to the lower and middle reaches of the Dee and may spend some time there before returning to the sea as young adults. However, flounders were uncommon in the Dee near Banchory in 1925-30 (W J M Menzies).

2.2 Amphibia and reptiles

Frogs and toads are widespread. At high altitudes, some tadpoles still occur in autumn and are unlikely to develop further over winter (A Watson), so either they metamorphose in their second year, or die. Large numbers of frogs and toads spawn at some ponds and lochs, eg at Glen Tanar and Loch Kinord. At Kinord, at least 18 common buzzards were counted preying on spawning amphibia in April 1983 (J Parkin).

Slow worms, viviparous lizards and adders are well distributed along the Dee in the valleys, glens, and lower moors, as well as on river banks (Taylor 1963). Taylor records the smooth newt from Braemar in 1950 and Morrone in 1956, but recent records, when checked, have turned out to be palmate newts (M Young). Taylor had no records of the great crested newt in Deeside. However, it is apparently not uncommon in the Moray basin, and it would be worthwhile to look for it in deep ponds over better

soils in Deeside. The palmate newt is common in pools and wet places along the Dee.

2.3 Birds

2.3.1 Waterfowl in mid-Deeside

The largest concentration of waterfowl in mid-Deeside occurs on Lochs Davan and Kinord at Dinnet. Data are available for 2 series of winters, 1955/56-1962/63 and 1981/82-1983/84 (Table 1). Apart from mallard, the numbers of which have remained roughly constant, all other species have increased. Mean monthly counts of wigeon, for example, in 1981-84 were 82-223 compared with 6-162 in 1955-63. Mean March numbers of tufted duck and goldeneye, in addition, are now over 60, compared with 15-20 only 21 years ago. Teal, pochard and goosander also now occur regularly in small numbers. These larger numbers in recent years following protection give encouragement to the efforts of wildlife conservation. In some years, whooper swans occur in large numbers for several days or weeks (over 110 in 1971 and 260 in 1972 (J A Forster)) and up to 87 were present in autumn 1983. Other duck species recorded at the Dinnet lochs include gadwall, pintail, shoveler, shelduck, scaup, long-tailed duck, common scoter, red-breasted merganser and smew. A few species nest each year, including mallard, teal, wigeon, tufted duck, and also coot and moorhen. Few young are reared, however, perhaps because of predation by pike. This predation has often been seen but its effect on the duck populations is unknown.

'Thriving breeding populations' of waterfowl were found till recently at the Loch of Aboyne (Nethersole-Thompson & Watson 1981), but, unlike the situation at protected Davan and Kinord, this is no longer the case at Aboyne, probably because of disturbance by recreation (see below).

Greylag geese started roosting at the Dinnet lochs in the early to mid-1970s and numbers have increased rapidly since. Numbers appeared to have stabilized at around 4000 by 1979, but in the last 2 winters peaks of 10000 and over 11000 have been recorded. Up to 1500 can be seen at Auchlossan throughout the winter, but in autumn most feed on arable fields towards Donside as far as Muir of Fowlis and Glenkindie, if not further. They usually leave when the

stubbles are snow-covered or frozen in late November-December and only small numbers occur in spring, favouring areas at Auchlossan/Ballogie, Torphins and the Howe of Tarland. Up to 1500 sometimes roost on river shingle at Ballogie in winter when the area is undisturbed.

Small numbers of pink-footed geese occur at these lochs and elsewhere, mainly in spring (eg 76 on 5 February 1977), and there is an exceptional record of 780 at Tarland in April 1979. Up to 6 barnacle geese, 4 Canada geese, 3 snow geese and 12 bean geese have been seen at Davan. Bean geese have also been recorded at Aboyne, and a white-fronted goose at least once at Auchlossan (1982) and once at Birse (1985).

Loch Davan is one of the northernmost sites for breeding great crested grebes in Britain. They successfully fledged young here in some years up to 1976 when 3 pairs were present, but there has been only one pair each summer since 1977. Nesting was attempted in some of the later years (not 1983 and 1984), but no young have fledged. They formerly bred at Auchlossan (per J Parkin) and Aboyne, and were regular at Kinord up to the early 1970s; however, nesting has not been recorded at Kinord since the 1940s (see Nethersole-Thompson & Watson 1981).

The Dinnet lochs are the centre for wigeon on Deeside; about 30 pairs breed between Ballater, Glen Tanar and Aboyne up to at least 220 m on the hills. Mute swans breed on both Davan (up to 4 pairs) and Kinord (up to 3 pairs, but none in the last 3 years). The only other sites with mute swans are the small lochs at Braeroddach and Aboyne. None breeds on the Dee compared with many pairs on lower Donside, probably because the Dee is too shallow, fast flowing and nutrient-poor to allow the growth of aquatic plants on which they depend.

The Dinnet lochs and the surrounding marshes also support a few pairs of water rails; the only other sites in Grampian to do so are Loch of Leys and Loch of Strathbeg. There are several sedge warblers at both lochs, and occasional grasshopper warblers. Waders include redshank, now scarce in Deeside due to drainage of wet places; dunlin sang at Kinord up to the early 1970s.

Table 1. Mean mid-monthly wildfowl counts at Lochs Davan and Kinord for the winters from 1955/56-1962/63 (in brackets) and 1981/82-1983/84, plus the maximum count for each species within each period. Coots were not counted in the earlier period

	Sept	Oct	Nov	Dec	Jan	Feb	March	Max
Mallard	301 (153)	309 (305)	318 (420)	425 (638)	130 (279)	317 (178)	66 (126)	680 (1870)
Teal	6 (0)	25 (0)	37 (0)	9 (0)	0 (0)	6 (0)	38 (0)	110
Wigeon	121 (6)	213 (85)	193 (162)	223 (141)	101 (103)	82 (57)	171 (38)	600 (650)
Tufted duck	53 (2)	88 (7)	67 (18)	39 (22)	6 (8)	47 (6)	69 (20)	116 (130)
Pochard	7 (0)	25 (0)	13 (0)	9 (0)	0 (0)	5 (0)	12 (0)	37
Goldeneye	1 (0)	25 (0)	30 (0)	20 (0)	6 (6)	25 (4)	67 (15)	78 (40)
Goosander	1 (2)	16 (0)	11 (2)	7 (2)	2 (2)	13 (4)	18 (2)	47 (15)
Mute swan	17 (4)	22 (5)	24 (4)	23 (3)	13 (1)	12 (2)	15 (2)	27 (16)
Coot	116	150	187	217	30	38	68	350

2.3.2 Gulls associated with the Dee

Colonies of black-headed gulls and common gulls associated with the Dee are shown in Figure 1. Most black-headed gulls are found on the agriculturally richer ground of middle and lower Deeside. They nest in marshes or marshy loch margins and their numbers may be limited by lack of suitable nesting habitat. The total Deeside population numbers about 3000 pairs, of which by far the largest colonies are at Dinnet (1000-1500 pairs) and at Leys (about 1000 pairs). Most of the population of 150-300 pairs of common gulls are found in upper Deeside where they nest on river shingle and nearby vegetation. There are 3 small hill colonies lower down the valley at Morven, Kerloch and Durriss, and a few scattered pairs elsewhere. In recent years, there has been a large increase in common gulls and black-headed gulls in the Braemar area, which is associated with an increase in tourists, as many gulls now feed in roadside lay-bys during the summer. In spring, there is a large roost of up to 10000 black-headed gulls on Loch Kinord. The herring gulls from the Aboyne rubbish tip and elsewhere roost on Kinord.

2.3.3 Birds of the hill streams and lochs

Loch Muick is little used by wildfowl. A few goosanders may be seen there, and there are common sandpipers and grey wagtails round the shore. Loch Callater has a small black-headed gull colony of about 50 pairs and a few common gulls and common sandpipers. Besides gulls, one can find mallard, teal, goosanders, common sandpipers, dippers and grey wagtails up tributary rivers, streams and lochans high into the hills. Dippers have been recorded at Loch Etchachan (900 m) on several occasions. Herons can also be found fishing in places like Glen Derry and Chest of Dee. Scattered pairs of greenshanks breed on the upper Dee or in association with small upper tributaries. Above Braemar, there were 4-7 pairs in 7-12 sites checked in 1969 and 1971-73. On the Dee, greenshanks are on the edge of their range, and not all known breeding sites were used in every year. In

about 40 breeding attempts, only 7 pairs produced one or 2 flying young and, overall, the average breeding success was about 0.6 young per pair per year (R Moss, in Nethersole-Thompson & Nethersole-Thompson 1979). In mid-Deeside, at least one pair reared young in some years in the period 1978-82.

2.3.4 Birds of the middle and lower Dee

Oystercatchers are confined to the river when they first come to Deeside in February and March, and at this time they roost on river shingles (over 2000 birds counted between Ballater and Peterculter), but most do not nest there. Other waders, including curlew, lapwing, redshank and greenshank, use the river as a migration route. In late autumn and winter, great black-backed and other gulls, herons and occasionally buzzards eat dead salmon (there may be as many as 5000 dead kelts on the river (W Irvine)), and many gulls follow the line of the river, flying to and from their roosts on the lochs. In autumn and winter, a variety of birds use the reed beds and marshes as roosts, the most notable being up to 14 hen harriers (including a bird wing-tagged in Orkney). Swallows, sand martins, pied wagtails and starlings also roost there at various times. Marsh harriers have been recorded at the Dinnet lochs and at Braeroddach.

Apart from about 5 nests near Braemar, known heronries are below Ballater. Herons frequently move their nesting sites if disturbed, but counts between 1971 and 1981 showed 10 colonies with 4-10 (average 6.4) nests per colony along the Dee. For some of these colonies, there are data for only 1-2 years, but the pattern (Figure 2) shows a relatively large number of small colonies, closely spaced below Durriss and progressively further apart upstream to Braemar. Two colonies in mid-Deeside had most nests (on average 10 each), but there was no obvious trend in average colony size in relation to the course of the main river. The birds feed mostly in tributaries and ditches, presumably mainly on eels and small salmonids (M Marquiss).

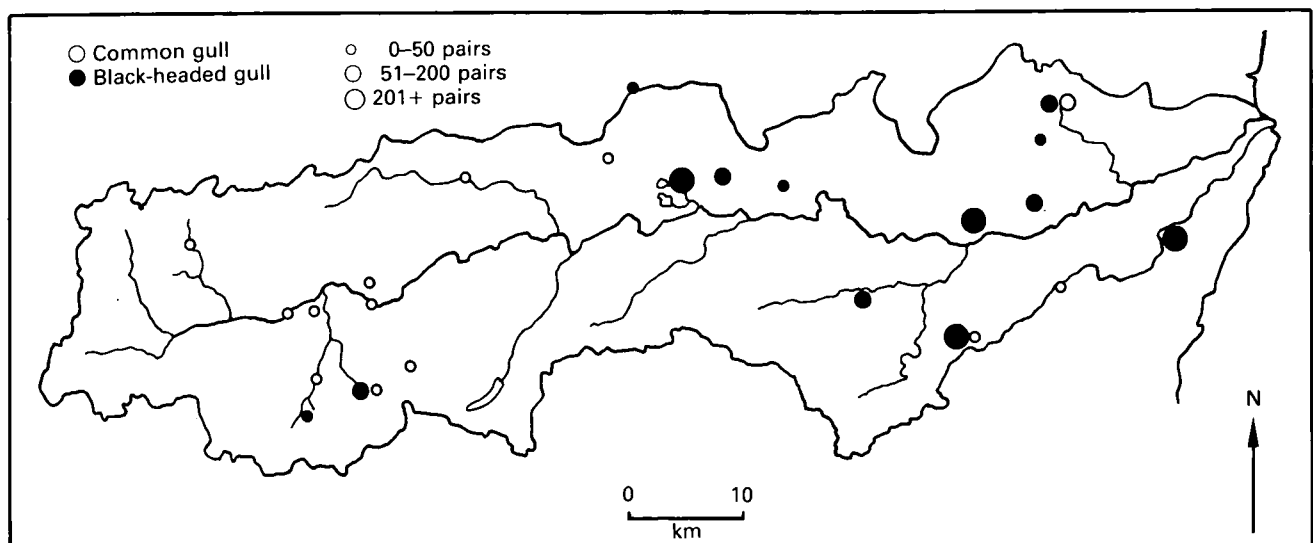


Figure 1. Gulleries associated with the River Dee in 1984

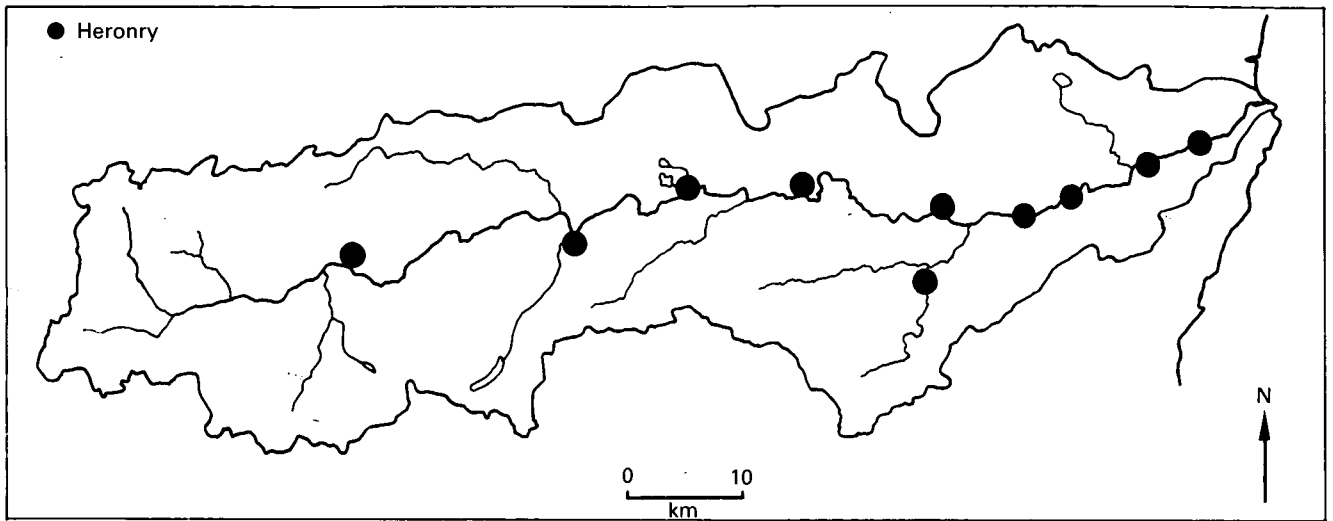


Figure 2. Heronries associated with the River Dee in 1980-84

Goosanders on the river were counted on 25 March 1984. Results were: Aberdeen-Banchory (c 29 km), 18 drakes, 16 ducks; Banchory-Chest of Dee (c 81 km), 20 drakes, 16 ducks, plus one unsexed. On the lower stretch, the density was 1.2 goosanders km^{-1} , compared with 0.46 birds km^{-1} on the upper stretch. One red-breasted merganser drake was seen between Aberdeen and Banchory. Individuals of this species, perhaps more commonly single drakes beyond Banchory, are seen throughout the length of the river, and nests have been recorded.

Special walks were done to count birds on the middle Dee between Invercauld and Banchory, and on the *Tanar*, *Muick* and *Gairn*, in late June-early July 1984 (Tables 2 & 3). Spring 1984 was unusually dry and the low water level in the river exposed more shingle than usual. The main feature of the data is the low density of birds. Even the most numerous, the common sandpiper, reached a maximum density of only 4.4 birds km^{-1} and averaged 1.8 over nearly 70 km. Common gull was next most numerous, averaging 1.1 km^{-1} , and the other species ranged between 0.2

Table 2. Densities of breeding birds 10 km^{-1} of the River Dee, Aberdeenshire, in June-July 1984

	Invercauld to Balmoral	Balmoral to Dalraddie	Dalraddie to Polhollick	Polhollick to Ballater	Ballater to Cambus	Cambus to Dinnet	Dinnet to Aboyne	Aboyne to Potarch	Potarch to Banchory	Totals		
										Distance	Adult birds seen	Birds 10 km^{-1}
Distance (km)	10.2	5.5	5.0	3.0	6.0	6.2	8.7	13.0	11.2	68.8		
Mallard ♀♀	0	0	0	3	0	0	1	0	1		11	1.6
Goosander ♀♀	2	0	0	3	2	5	3	3	2		17	2.5
Common sandpiper	6	44	18	23	27	19	19	21	5		125	18.2
Common gull	18	0	2	33	2	0	11	14	13		73	10.6
Common tern	0	0	0	0	0	0	2	7	1		12	1.7
Grey wagtail	5	20	24	7	10	10	3	5	11		64	9.3
Pied wagtail	1	13	4	0	3	6	0	1	7		25	3.6
Dipper												
February 1977	—	—	—	—	—	13	5	—	6*			
April 1977	—	—	—	0	—	—	5	—	—			
June	—	—	0	—	—	—	2	—	—			
June-July 1984	0	4	4	0	3	5	1	1	2		13	1.8

*5 km only

Table 3. Habitats occupied by birds on 3 tributaries of the River Dee in June 1984: *Tanar* (7.5 km), *Gairn* (9.5 km) and *Muick* (8.5 km)

	Open		
	Shingle	Rapids	Wooded
Mallard	6	0	1
Goosander	0	0	2
Common sandpiper	19	1	0
Grey wagtail	22	3	0
Pied wagtail	5	0	1
Dipper	3	6	0

km^{-1} and 0.9 km^{-1} . The highest densities of common sandpiper and pied wagtail were at Balmoral-Dalraddie, of common gulls at Polhollick-Ballater, and of grey wagtail at Balmoral-Polhollick. Overall, densities were similar on the short stretches walked on the tributaries, with common sandpiper and grey wagtail most numerous (0.8 km^{-1} and 1.0 km^{-1}). More dippers are seen on the Dee in winter than in summer, often singing on ice. Presumably they move down from the tributaries when these freeze in winter.

Table 4. Adult birds (%) seen in different habitats on 68.8 km of River Dee in June-July 1984, and trends* in preference or avoidance of these habitats

i. Habitats classified by vegetation on bank

		Open	Open/wooded	Wooded
Percentage of total		25	35	40
Species	n [†]			
Mallard	9	(0) ↓ ↓ ↓	(89) ↑ ↑	(11) ↓ ↓
Goosander	19	(21) NS	(42) NS	(37) NS
Common sandpiper	122	(57) ↑ ↑ ↑	(29) NS	(14) ↓ ↓ ↓
Common gull	9	(67) ↑	(22) NS	(11) ↓
Common tern	4	(75) (marginal)	(25) NS	(0) NS
Grey wagtail	58	(38) ↑ ↑ ↑	(43) ↑ (marginal)	(19) ↓ ↓
Pied wagtail	25	(40) ↑	(40) NS (marginal)	(20) ↓
Dipper	13	(54) ↑ ↑	(15) ↓	(31) NS

ii. Habitats classified by river characteristics

		Rocks/rapids	Extensive shingle	Open water from bank to bank
Percentage of total		10	65	25
Species	n [†]			
Mallard	9	(11) NS	(0) ↓ ↓ ↓	(89) ↑ ↑ ↑
Goosander	19	(10) NS	(21) ↓ ↓ ↓	(68) ↑ ↑ ↑
Common sandpiper	122	(7) NS	(57) NS	(36) NS
Common gull	9	(0) NS	(22) ↓ ↓ ↓	(78) ↑ ↑ ↑
Common tern	4	(0) NS	(0) ↓	(100) ↑ ↑
Grey wagtail	58	(10) NS	(29) ↓ ↓ ↓	(60) ↑ ↑ ↑
Pied wagtail	25	(8) NS	(20) ↓ ↓ ↓	(72) ↑ ↑ ↑
Dipper	13	(54) ↑ ↑ ↑	(15) ↓ ↓	(31) NS

* ↓ Trend towards avoidance
 ↑ Trends towards preference
 ↓ ↓ ↓, ↑ ↑ ↑ P < 0.001; ↓ ↓, ↑ ↑ P < 0.01; ↓, ↑ P < 0.05; NS = Not significant
 } cumulative binomial probabilities

[†] The units for analysis are individual birds; in the case of common tern and common gulls, there were loose flocks of 9 (tern) and 5, 10, 3, 15, 3, 10, 2, 5 (gull), each of which is treated here as 1.

In the walks done in June-July 1984, the river bank habitats were broadly classified as open (moor or fields), wooded, or half-open (ie one bank open, one bank wooded), with regard to the main habitat features at the point where each bird was seen. The proportions of these different habitats were measured over the whole stretch. The character of the river was further classified according to rate of flow as 'extensive shingle' or 'open water from bank to bank' or as 'rapids with large boulders in the bed of the river'. Some trends for preference or avoidance shown in Table 4 are statistically significant.

Common sandpipers, grey wagtails, dippers, common gulls, pied wagtails and probably common terns preferred open habitats; and common sandpipers, common terns, mallards, grey wagtails, common gulls and pied wagtails avoided wooded banks. Except for the dipper and common sandpiper, all species preferred stretches where there was open water from bank to bank, and all, except perhaps common sandpipers, avoided extensive shingle. Dippers preferred rapids. Common sandpipers showed no significant trends. Grey wagtails and pied wagtails were similar in their occupation of habitats, but grey wagtails showed a stronger trend than pied towards preference for open or half-open habitats and towards avoidance of woods. Twice as many grey wagtails were seen as pied, and it is interesting to speculate whether these 2 species may compete for the same riverine habitats, with the grey wagtail predominating. These preliminary data

suggest that a detailed comparison of the 2 wagtail species might be worthwhile.

The proportions of the different habitats on the tributaries (Table 3) were not recorded. However, the 2 most numerous species, common sandpiper and grey wagtail, were found more often in habitats registered as shingle than elsewhere; this apparent difference from Table 4 should be checked in a wetter spring when there may be less shingle on the tributaries. Dippers were again more numerous on the rapids than other species. On these tributaries, grey wagtails were nearly 5 times as common as pied wagtails.

No kingfisher was recorded in 1984, but they do occur rarely. Ospreys have been recorded regularly in the Dee river system since the mid-1970s and occasionally earlier, with at least 2 nesting attempts, both unsuccessful. Single birds have been seen from Crathes to Ballater, most frequently within a few km of Dinnit. The contrast between the Dee and Spey is notable. In Speyside, there are several successful nests each year, but none in Deeside.

Small numbers of goldeneyes and goosanders are regular inland on the Dee in winter. On the Dee in Aberdeen, the winter population of wildfowl includes 100-150 mallard, up to 25 goldeneyes and 10-20 goosanders. Small numbers of mute swans occur, together with occasional tufted ducks, pochards, long-tailed ducks, smew, mergansers and eiders. In

hard weather when the lochs freeze over, the unfrozen river at Aberdeen can be important for waterfowl, and in January 1979 it held up to 200 tufted ducks, 4 scaup, 88 pochards and 100 goldeneyes for a few weeks. Goosanders occasionally moult there in summer; it is unusual to find this shy species so close to people.

2.4 Mammals

Besides seals at the river mouth (excluded here), and bats (see below), only 4 species can properly be regarded as riparian, let alone aquatic. We exclude roe deer, which are often seen in reed beds, hares and rabbits. The 4 main species are water shrew, water vole, mink and otter.

2.4.1 *Insectivores and rodents*

The status of water shrew and water vole is uncertain. There are 4 records of water shrews for Deeside for 1964-69 at the Biological Records Centre, ITE, Monks Wood Experimental Station (H R Arnold). In addition, R Hewson and T Healing trapped a water shrew in 1976 at Blackhall, Banchory; R J Harper saw one at a marsh at Loch Davan in 1976 and 1977; and M P Harris saw one near the *Canny* in 1981. Corbet and Southern's (1977) description of the habitat used by water shrews is 'by clear, unpolluted streams wherever there is cover', and trapping by the Dee and its tributaries would probably show that the water shrew is more widespread than these few records suggest.

Sim (1903) stated that water voles were abundant in most streams in Deeside. The Biological Records Centre has 3 records for the middle Dee and another 2 from above Braemar. They are local but widespread along streams in the hills, though numbers fluctuate. J Oswald reports that water voles occur on the Tanar beat of Dee wherever there are patches of rushes, but no signs were found on the Dee by Jenkins' team in 1974-79 during work on otters. However, they were found on the *Dinnet* near its source in Loch Davan, and were also trapped there in 1977 by R Balharry. H Kolb trapped water voles in 1972-73 at Moss-side, Strachan. The distribution of water voles may be patchy, in dense vegetation and, perhaps especially, in places with over-hanging cover, small deep pools and areas with good grass on stream banks or ditches, rather than along rivers (R Hewson). Although widespread, signs of brown rats on stream banks in 1974-79 were mostly found near farms and houses.

2.4.2 *Carnivores*

The first records of wild mink breeding in Aberdeenshire were in the early 1960s (Cuthbert 1973). They are now widespread in north-east Scotland (Corbet & Southern 1977), occurring throughout the Dee valley up to at least 300 m, and have therefore become an integral, naturalized part of the fauna. Mink mainly frequent good cover on stream and loch banks, but they also use stone dykes and may be seen one km or more away from water.

On the Glen Tanar estate bank of the Dee (36 km), 39 were killed in 1971-83. J Oswald considered that there were no more than 1-2 families of mink on this stretch. Elsewhere, they have not been systematically trapped, presumably because numbers are low. Few signs of mink were found during walks of the river and its tributaries in 1976-78 during research on otters (Jenkins 1980). Indeed, places with mink signs were often several km apart. In 1977, no trace of mink was found on 9.5 km of the *Gairn* in January-June or on the upper *Gairn* in May-July, or on 7.5 km of the *Tanar* in March-November; only scattered signs were found on occasional visits to the *Feugh*, but they occurred up to at least 8 km from the Dee. However, on 5-6 km of river banks at Park, 54 mink were trapped in 1981-84, and 60 at the mouth of the *Dinnet* in 1972-75.

In April-November 1975, 23 mink were live-trapped, marked and released in the 8 km banks of the *Dinnet* lochs. Seven marked mink were recaptured (one 5 times) 1-31 days later, near where they were first caught. Adult males were caught in 8 different places, and there were at least 6 family parties. These observations suggest that, at least in 1975, mink may have been more numerous on these lochs than on much of the nearby main river and other tributaries. Few have been killed on the National Nature Reserve (NNR) at Muir of *Dinnet* subsequently (14 in 1982-84), not because they are scarcer than in 1975 so much as because less manpower is available for trapping them.

In 1969-70, mink scats from the *Sheeoch*, east of Banchory (Figure 1), contained mainly salmonid fish and eels, with no remains of game birds (Cuthbert 1979). In 1975-78, the main items in mink scats from mid-Deeside were mammalian, mainly rabbits, throughout the year (Jenkins & Harper 1980). In neither of these studies was there any suggestion that mink predation was important to human interests, and trapping them on an NNR may cause more disturbance than the animals' predation warrants. The main conclusion is that mink are probably widespread but relatively scarce on most parts of the middle Dee and its tributaries and, though a potential nuisance, are unlikely to be a major problem to landowners or nature conservationists.

Jenkins (1980) and his colleagues studied the distribution of otter families in 1974-79 on the Dee above Aboyne. About 9 otter families were thought to have been reared in 1977-78 on 26 km of river plus 124 ha of lochs near *Dinnet*. In 1974-79, 1.4 young were reared, on average, per successful family, so that about 13 otters may have been reared on this stretch in 1977-78. Otter families were also seen on the *Tanar* and *Feugh*, and Jenkins was told of otter families on 4 other tributaries. Most signs of otters were found where the bankside vegetation provided good cover (Jenkins & Burrows 1980; Bas *et al.* 1984); and the national decline in otters is attributed partly to loss of such cover, partly to increased disturbance due to

increased riverside recreation, including angling and pleasure boating, and partly to the greater use of agro- and other chemicals which later get into river systems (O'Connor *et al.* 1977). Aboyne-Polhollick may be the best stretch of the Dee for otters. Signs of them were scarcer further upriver, and the agricultural and populated stretches of the lower river would not be expected to provide suitable habitat for them.

The Dinnet lochs were important rearing areas for otters, with up to 2-3 families at once, staying for 7-12 months. The young then moved to the nearby river. In 1984, otters should probably be regarded as the most important wild vertebrates on the Dee, with the Dinnet area vital for their conservation.

Their main food was eels in the Dinnet lochs, and eels and salmonids in the rivers (Jenkins & Harper 1980). Most eels and salmonids taken were small (eels mostly 23-32 cm, salmonids mostly <13 cm). On the tributaries, more spraints in autumn were associated with a higher proportion of undigested remains of salmonids. Presumably more otters were in the tributaries in autumn than at other seasons, perhaps because they followed spawning fish. However, otters occurred in the *Feugh* in January 1982, when one killed a moorhen. Care should be taken when interpreting evidence from numbers of faeces because otters may use spraints for marking their ranges, and may vary this practice seasonally, so a reduction in the number of spraints found may not necessarily indicate a change in the number of otters present.

One to 3 otters were found dead in Deeside each year from 1978-84, in addition to the families of young which disappeared (see Jenkins 1980). Eight of 11 known deaths were due to road accidents, though at least one animal was ill beforehand. Most deaths were in January-June. Otters are not now known to be deliberately killed by man on the Dee.

2.4.3 Bats

The pipistrelle bat, Daubenton's bat and brown long-eared bat are common north of Perth in the summer (Racey & Swift 1982), the noctule and parti-coloured bat are rare vagrants, and Natterer's bat occurs occasionally. The 3 common species are frequently found roosting close to rivers or standing water, where they can easily find food. Long-eared bats may be unusually common in the mid-Dee valley because of the abundance of Lepidoptera which are gleaned from riverside trees by hovering bats (Swift & Racey 1983). Daubenton's bats, which hunt over rivers and open water (Swift & Racey 1983), were found in a single roost near the Dinnet lochs; they depend on chironomids, caddis flies and other insect fauna associated with these areas of water.

Most (>95%) reported bat roosts in Deeside are in occupied dwelling houses within 4 km of the river system (Figure 3). Few roosts have been reported upstream of Ballater, but, of 21 nursery roosts reported downstream in summer 1984, 13 were of long-eared bats, one of Daubenton's bats, and 7 of pipistrelle bats. No roosts of long-eared bats have been recorded downstream of Banchory. Above Banchory, roosts of this species outnumber all others (Figure 3). Numbers of roost occupants fluctuate in summer but no movement of bats between roosts has been recorded, so that the proportion of known roosts may be low. A single instance of long-eared bats roosting in a tree has been reported in Deeside (B Mitchell).

It is conservatively estimated that in summer the Dee valley (downstream of Ballater) contains 1000-10000 adult female pipistrelle bats, 100-1000 adult female long-eared bats, and 10-100 adult female Daubenton's bats. Solitary adult males are encountered only infrequently and are impossible to census. Without the river and its associated trees, the density of bats would probably be much lower.

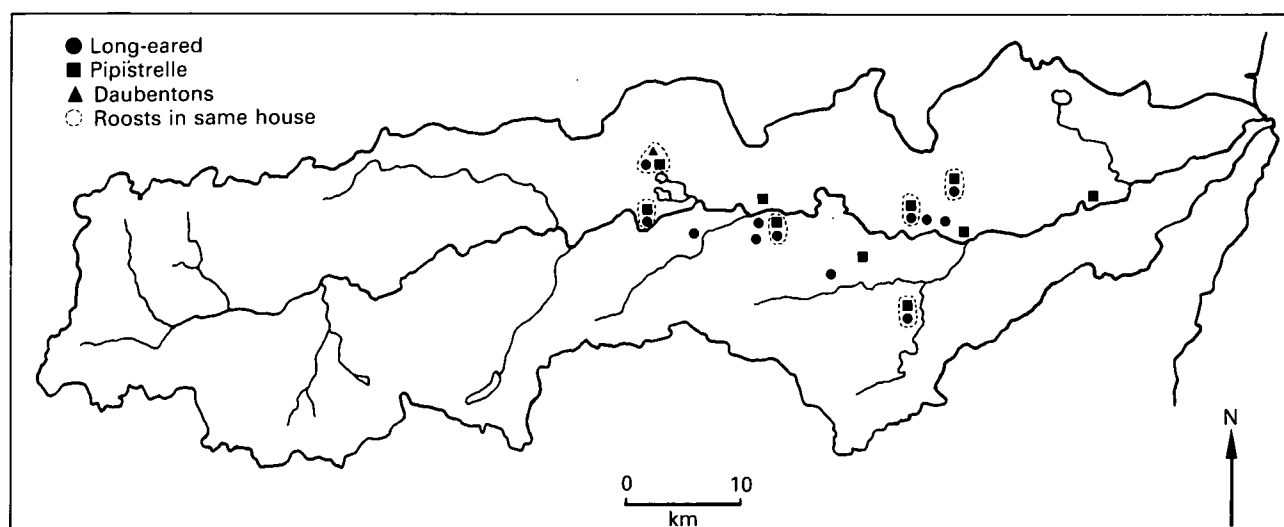


Figure 3. Known roosts of bats in Deeside in 1984

The pipistrelle bat is evenly distributed along the valley, where it forages among riparian trees. These bats may travel up to 5 km from the roost each night (Racey & Swift 1985), and eat mainly caddis flies and Nematocera (Swift *et al.* 1985).

Virtually nothing is known of the wintering populations of these bats, mainly because of their reduced activity. Most Scottish bats may migrate south in winter (Racey & Swift 1982).

3 Conservation of the vertebrates

Few if any of the species described here are at risk at the moment. However, a species which is apparently secure now may become vulnerable to potential threats (eg from recreation) in the future. The security of the vertebrates of the river depends partly on the interest, tolerance and goodwill of the landowners, and partly on active voluntary and statutory conservation.

The continuing increase of wintering and moulting waterfowl at Muir of Dinnet NNR following protection is associated with a new freedom from disturbance. This protection has led to increased opportunities for local bird-watchers.

Other recreational uses of the Dee system include angling, canoeing, water ski-ing, walking and picnicking on the river bank, and casual and organized camping on stream bank and lochside. Wind-surfing has recently begun on the Loch of Loirston, which is near the Dee though hardly a part of the river system. It is nonetheless a good example of a potential threat; the regular winter duck population of this loch includes not only mallards, wigeon and tufted ducks, but also a roost of up to 100 goldeneyes and 20 goosanders, and a flock of up to 41 whooper swans. In 1982/83 and 1983/84, these swans were driven off by wind-surfers.

The present wildlife of the Dee has co-existed with angling, agriculture and forestry for a long time. However, trends are changing with the income from angling now setting off losses from other game, and with perhaps less money available for the maintenance of river banks. This maintenance sometimes involves powerful machinery, including not only bulldozers which quickly convert drains into canals but also power-saws and a risk of the removal of whole trees, instead of branches as previously with a hand-saw. On some tributaries especially, river bank fences are decaying and not always being replaced, and this leads to grazing on the tributary bank and fewer trees regenerating. This situation may be offset on the Dee by a decrease in the number of smallholders, resulting in less intensive grazing on the river bank (J Oswald). Our problem is not only that few of these changes have been measured, but that different conservation interests require different land uses.

For wildlife, the Dee is of prime importance for otters which should feature prominently in any plans for

wildlife conservation. Otters require good cover for shelter on river banks, especially near pools with muddy bottoms where there are eels. These pools may be good for angling, requiring some tree clearances to make room for casting. Grassy banks may be also preferred by botanists because short cover may favour flowers. A new suggestion is that conifer trees should not be planted up to the river's edge because of accentuating problems of acidity in the river from acid rain, yet one of the best places for seeing young otters above Aboyne is where the trees come right to the river's edge with the path set well back into the forest. This place is interesting because, despite the trees, it is good for angling, with small areas cleared of trees so that casting is easy in the best places for catching fish. There is little shingle, so there is no conflict between the needs of otters and riverside birds, and it is a good example of the development of forestry, angling and otter conservation to the benefit of all three. Other places could be developed actively to foster several interests, perhaps, for example, angling, picnic sites, access for canoeists and drinking places for domestic stock.

Apart from the loss of riverside trees on which the food of long-eared bats in particular depends, the most immediate threats to bats near the Dee valley are incidental destruction of bat roosts during house improvements, remedial timber treatments to kill wood-boring beetles, and deliberate attempts by householders to remove bats. A more long-term threat to bats would be greater use of agricultural insecticides on new farm crops, which would reduce their insect prey as well as resulting in the accumulation of such insecticides by the bats. Insecticides have been inferred as important in reducing bat populations in western Europe (Stebbing 1982), and it is important to recognize this potential area of conflict between agriculture and wildlife conservation. Because such insecticides are seldom used in north-east Scotland and the local bat populations are apparently healthy, Scottish river valleys such as the Dee with large areas of riverside trees may represent sites of national importance for bats, and Deeside farmers should be aware of this fact.

In addition to the situation at the Loch of Loirston, recreation and wildlife on the Dee are also in conflict at the Loch of Aboyne. In the case of the Loch of Loirston, it is to be hoped that wind-surfers could be diverted elsewhere. Water ski-ing at the Loch of Aboyne has led to the loss there of most breeding ducks and coots, though mute swans still breed, and an otter was seen there at night in August 1984. At Aboyne, recreation would seem to be a reasonable priority, and the loss of the waterfowl presumably has to be tolerated by bird-watchers. On the river, canoeing at present mostly occurs near bridges, where other disturbance is likely anyway. As canoeists extend their activities, however, it is to be hoped that they will not land on islands or in otter havens (see below), and

agreement is desirable on the optimum use of each section of the river system.

Despite the apparent lack of serious conflict so far, there is still a need for conscious management for wildlife conservation as a major use of the river system. The main threats to all wildlife are likely to arise from loss of habitat, and the dangers of disturbance, if cover is removed, should not be underestimated. Wildlife conservation at the Dinnet lochs is ensured by a statutory NNR, managed jointly by the Nature Conservancy Council and the landowner. This NNR includes both lochs but very little of their associated waterways and none of the Dee itself. Only a small part of the watershed of the lochs and none of their outlets are included in the protected area. Marren (1984) describes the importance of the purity of the water of Loch Kinord, thereby emphasizing the desirability of careful control of the management of the whole watershed.

Other Sites of Special Scientific Interest (SSSIs) in the Dee system include parts of streams in Glen Tanar, within the conserved forest system, but with neither the source nor much length of the streams formally protected. Quithel Wood at Ballogie and Crathie Wood near Braemar are other SSSIs on the main river bank, together with the drained Loch of Park nearby. The Loch of Skene is also an SSSI.

However, apart from the montane Cairngorms NNR, which includes the source of the river, and 3800 m of both banks at Potarch, mostly treeless and chosen for its interesting flora, no part of the Dee is included within an SSSI for its intrinsic interest as part of the river system.

The Department of Planning in Grampian Regional Council has gone to much trouble in defining 'Sites of Interest to Natural Sciences'; these SINS carry a pre-emption for natural history use in planning, but have no statutory weight if there is a conflict. Another recent development is an otter haven of 7.25 km of one bank of the middle Dee. This is an important initiative between the landowner and the Scottish Wildlife Trust, embodying a formal commitment to maintain existing bankside vegetation, to fence off other areas at present without trees, and to plant native species in order to help preserve or increase habitat suitable for the Dee's most important wild animal. A similar agreement on a tributary between another landowner and the Friends of the Earth seems to be in abeyance, though the landowner has erected a new fence to exclude stock from a stretch of river bank. These initiatives are much to be encouraged, and it is hoped they will be followed elsewhere.

4 Discussion

The relatively sparse fauna of the Dee might be regarded as typical of a nutrient-poor, short, fast-flowing, shallow river rising in granite mountains. In its

upper reaches, it runs mostly over acid rocks, and, though it sometimes flows slowly with a lesser fall, it is inhospitable because it often freezes in winter. It flows over richer rocks in the Dinnet stretch and is further enriched by nutrient runoff from agricultural land below Banchory. A poorer fauna above Ballater might be expected to become progressively richer or more numerous towards the sea, but this simple picture is complicated by loss of natural habitats, by disturbance, and perhaps by the effects of sewage pollution and eutrophication, fortunately slight at present.

In view of the importance of the Dee as a salmonid fishery and in scientific terms, it is surprising that so little is known about its fish. Other than salmon and trout, basic knowledge on the status and distribution of fish in most parts of the system is almost entirely absent. It is possible, for instance, that several species may occur in the area but have not been mentioned here. The arctic charr is known to occur in lochs to the west, north and south of the Dee catchment, and several lochs in the upper Dee valley (eg Loch Etchachan, Lochan Uaine) would seem suitable for this species. One of the urgent scientific requirements, therefore, is a thorough survey of fish populations in the area, as is equally true of several other important river systems in Scotland (Maitland 1972). The gap in knowledge is also relevant to some important applied areas, as well as preventing further scientific understanding of the river system. It has been shown (Maitland 1977) that several fish species (some of them previously absent from Scotland) are gradually moving northward in distribution (eg dace and ruffe). Some of these may cause problems in salmonid nursery streams in the future, but it will be impossible to make any assessment of their impact there or to develop control measures, unless we have basic information on the fish communities which are present now.

Acid precipitation is a topical and relatively new form of pollution which appears to be affecting fish populations in some Scottish lochs. Because of the extensive areas of granite within the Dee catchment, and the fact that much of the rainfall there is fairly acid, it is likely that some sensitive fish (eg arctic charr) have already been affected. However, because of our ignorance of the status of this and other species, we may never know if this has been the case.

For other wild vertebrates, most conservation interest focuses on the otter and on bats, both of which are rare in most agricultural habitats but which still occur in natural or semi-natural habitats on the Dee, and for which the main requirements are absence of disturbance and the preservation of riverside vegetation. In the case of birds, the main conflicts arise from the destruction of habitats through drainage (eg one of the hen harrier roosts at Dinnet is at risk), or disturbance, including actual killing by gamekeepers (eg shooting

goosanders or poisoning birds of prey), and by bird-watchers. There is a risk that publicity for rare birds can result in over-exposure; this risk must usually be faced openly as one of the grounds for wildlife conservation is for people to enjoy seeing wildlife.

An aim of this conference is to identify areas of actual or potential conflict. Naturalists, anglers and canoeists, for example, should discuss whether there are parts of the Dee where bankside vegetation should be preserved and recreation limited, and other parts where wildlife is less at risk, where other interests should have priority, and where recreational activities can flourish. In principle, the middle section of the Dee may be the best for the wildlife at present, at least in comparison with places where the Dee flows through farmland. However, if riverside woods of birch, willow and alder could be re-established on the upper Dee, the vertebrate fauna there would probably be richer than it is now, especially on the flatter stretches where carr might develop and encourage more waterfowl to stay in summer.

The need for safeguards in management of the river system as a whole has apparently not registered strongly in the NCC's scientific appraisal of the wildlife resource of Grampian Region, which is surprising in view of the loss of the Lochs of Auchlossan, Leys and Park. Even on the NNR at Dinnet, both eastern and western parts of the Muir have recently been drained, and it is surprising that such a small part of the habitats known to be used by otters has official protection. The Dee is important nationally for the conservation of otters. Organized camping on the edge of Loch Kinord in the middle of the NNR also seems incongruous to conservationists. It is a potential cause of disturbance and should be stopped. Other possible active steps by the NCC include the consideration of parts of the river as SSSIs.

The symposium highlights the desirability not only of an agreed code of conduct between users of the river and its banks, but also of a re-assessment of aspects of the conservation of vertebrates of the Dee and their habitats, and of the responsibilities of the Nature Conservancy Council.

5 Summary

This paper describes some wild vertebrates which are associated with the river system of the Dee, including not only the main river but also its tributaries, lochs and associated marshes.

Little is known about the non-salmonid fish of the Dee, and it will be impossible to assess their impact without basic information on the fish communities which are there now.

Vertebrates sensitive to environmental pressures include otters and bats. The Dee is an important river for

the conservation of otters, while long-eared bats are especially characteristic of the middle Dee. Birds nesting on the Dee characteristically occur at low densities, reflecting the low productivity and fast rate of flow of the river. The most numerous of the breeding river birds are common sandpipers and grey wagtails, reaching densities of about $2-4 \text{ km}^{-1}$ but mostly less. Non-breeding waterfowl are much more abundant, with lochs and river shingles important as roosts for geese and oystercatchers. Most duck species wintering at the Dinnet lochs are increasing.

The main features identified as affecting vertebrates in the Dee include: (i) the low productivity and fast flow of the upper river (poor for wildlife); (ii) bare banks, especially on the upper stretches of both main river and tributaries (often in association with heavy grazing) and in the richer agricultural stretches (poor for wildlife); (iii) conifer woods above Aboyne and deciduous woods and fringes between Banchory and Ballater, providing shelter on the river bank, with the birches and alders probably good for Lepidoptera as food for bats; (iv) the pure Loch Kinord and rather richer Loch Davan, and their important outlets and associated marshland. The middle parts of the river system are richest for vertebrates at present. This situation could change with management aimed specifically to improve habitats for vertebrates. There is also a need to integrate wildlife conservation with pressures from recreation (water skiing, canoeists, wind-surfers, campers, picknickers) on lochs and elsewhere, and to integrate the requirements of fishermen and of farmers with the scientific aims of wildlife conservation and with satisfying the pleasure that people get from watching wild animals in semi-natural habitats.

There are at present few conflicts on the Dee, and this may make it especially easy to have discussions on a code of conduct for river users, including farmers, foresters, anglers, and naturalists, as well as those seeking recreation. Formal conservation of the river by the Nature Conservancy Council is minimal, and we suggest that a scientific appraisal of conservation needs for the whole river system would be timely in order to identify sensitive areas and avoid conflict in the future.

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