AN ANALYSIS OF BIRD PELLETS FOUND ON LUNDY

by
ALAN ROWLAND
Mole Cottage, Chapel Close, Woodford, Morwenstow, Cornwall, EX23 9JR
e-mail: morwenstow@btinternet.com

ABSTRACT
Bird pellets are a potential source of information on food preferences and composition of local fauna. Sixteen pellets from three different bird taxa (raptors, gulls, corvids) were collected from Lundy over a period of two years and the contents subsequently analysed to identify prey and predator.

Keywords: *Lundy, bird pellets, raptors, gulls, corvids*

INTRODUCTION

Owl pellets, especially those of owls such as Barn Owl *(Tyto alba),* are a useful source of identifying mammal distribution as well as predation statistics. Owls swallow their prey whole and eject the indigestible remains. These remains can be teased apart to reveal the bird's choice of diet as well as the composition of the local small mammal, bird and invertebrate population.

Some species, like Barn Owl, have preferred perches where they regularly return to digest their food. These perches are often inside barns or other buildings, or within sheltered areas, so the ejected pellets can be easily found and suffer minimal damage from wind and rain. Such devotion to a perch means that pellets can usually be identified to species with some degree of certainty (RSPB, undated). The pellets of species other than owls are occasionally described. Witherby *et al.*, 1963, gives pellet sizes of Peregrines to be 40-45mm in length by 22-25mm in diameter though they can be much smaller and often taper at one end; Kestrel pellets are typically 30-35mm in length by 9-15mm in diameter and Sparrowhawk pellets 21-40mm long by 10-12mm in diameter.

Pellets of various types have been collected on Lundy but with few obvious perches and little shelter they can only survive with good fortune. They can be found almost anywhere about the island. However, their survival is limited as within a short time they can quickly be dissolved by rain or blown away by wind. An additional factor on Lundy is that, although birds of prey usually have regular perches on cliffs or other prominences where their pellets can be found, such locations on the island are almost totally inaccessible.

Bang and Dahlstrøm, 2009, gives a little more detail in that birds of prey pellets contain almost exclusively fur, small feathers and insect parts and describes Sparrowhawk pellets as 20-40mm long by 12-17mm in diameter and agrees with Witherby on Kestrel pellet sizes. Additional detail is given for some corvids which are stated to almost always contain small stones for grinding food in the gizzard with Crow pellets at 40-45mm long and 20mm in diameter.

METHOD

Over the period 2010-2012 I collected an assortment of pellets. Without being present when they were ejected, I could only assign them generally to types typical of bird families which is what I have done below. All pellets were photographed, weighed and measured and the results recorded (Table 1) before being dissected for analysis.

Broadly, there are three distinct types of pellet:

Type 1: Large, fibrous and mainly containing vegetable matter (Plate 1-L4) typical of corvids

Type 2: Smaller and slimmer, containing fur, insect cases and sometimes bone fragments (Plate 1-L9) typical of raptors

Type 3: White, and spread with no obvious fibrous matter to hold them together but containing many small bones of marine species (Plate 1-L12) typical of gulls.

Whilst searching the web I chanced on the Mammal Society website and found they had a National Owl Pellet Survey. The contact for this survey was Alasdair Love who was asking for owl pellets from individuals to supplement the findings of the national survey. He stated that all donors of pellets would receive an analysis of their contents.

I contacted Alasdair to see if he was interested in receiving and carrying out an analysis of pellets other than those from just owls and which originated from Lundy. His immediate response was to rise to the challenge and welcome receipt of my 16 Lundy pellets. Table 1 summarises the details of the pellets and Alasdair's analysis of the contents.

ANALYSES

Raptors tend to produce heavier, shorter and slimmer pellets than corvids, although colour and texture is the best guide. Typical raptor pellets (Type 2) are dark and hairy, while typical corvid pellets (Type 1) are lighter and straw coloured (Plate 1).

	Weight (gm)	Length (mm)	Diameter (mm)
Type 1	1.3-4.8	40-63	17-28
Type 2	1.3-6.9	38-58	18-24

From the analyses of pellets in Table 1 it can be seen that the Type 2 pellets indicate that they are subsisting mainly on beetles, with the occasional mammal or bird kill, whilst the producers of Type 1 pellets have a diet of plants and seeds. The solitary Type 3, gull, pellet is particularly interesting, showing an almost entirely marine diet, albeit with some bird down (Plate 1-L12).

There is a possibility that L5 and L10 in Table 1 are Peregrine Falcon *(Falco peregrinus)* pellets due to their proximity to carcasses that were identifiable as having been predated by this species. However they could have been produced by subsequent scavengers. The contents of these two pellets – Pygmy Shrew *(Sorex minutus)* and unidentified vertebrae – tends to support a raptor as the predator. L1 November 2010, L6 June 2011 and L9 July 2011 are also arguably from raptors (Peregrines or other birds of prey) that feed primarily on birds and mammals, although corvids and indeed gulls cannot be ruled out.

L4

L9

L12

L11

Plate 1: Pellet Types.
From top:
Type 1 (corvid)
Type 2 (raptor)
Type 3 (gull)
Type 4 (Peregrine)

Table 1: Pellets collected, their type, location and description

ID	Bird	Location	Grid	Date	Weight (g)	Length (mm)	Diameter (mm)	Matrix	Contents
L1	Type 2	Tibbetts Point	SS 13870 46235	6 Nov 10	1.3	49	17	Fibrous plant	Sacral vertebrae – adult rat size. Many beetle exoskeletons
L2	Type 1	Ackland's Moor Pond	SS 13251 44757	10 Nov 10	4.8	63	18	Fibre	Mainly fibre and seed husks. Also <10 sub-rounded pebbles 2-6mm
L3	Type 1	Central track – granite block	SS13639 45131	22 Apr 11	2.7	40	19	Fibre	Mainly fibre and seed husks. Also >10 sub-rounded pebbles 2-6mm
L4	Type 1	Quarter Wall Pond on grass	SS 1361 4493	22 Apr 11	4.2	47	20	Fibre	Mainly fibre and seed husks. Also >10 sub-rounded pebbles 2-6mm
L5	Type 2	Jenny's Cove	SS 13382 45782	26 Jun 11	3.6	Spread	Spread	Fur/ fibre	2 vertebrae, beetle exoskeletons and one Pygmy Shrew *(Sorex minutus)* lower incisor
L6	Type 2	Quarries	SS 13880 45300	25 Jun 11	3.9	55	28	Feather	Remains of 2 birds, 1 large and 1 small. Part bird humerus and other fragmented bird bones
L7	Type 2	East Side steps	SS 14064 44057	1 Jul 11	1.8	38	18	Fibrous	Entirely beetle exoskeletons
L8	Type 2	Gannets' Coombe peregrine kill site	SS 13527 47391	1 Jul 11	2.2	55	19	Feather/ fibre	Mainly beetle exoskeletons. Also partially digested soft tissue
L9	Type 2	Quarter Wall Pond	SS 13630 44948	4 Jul 11	3.9	55	28	Coarse fur	2 cranial fragments – squirrel sized. Unfortunately no teeth
L10	Type 2	Gannets' Coombe by shearwater head	SS 13577 47245	6 Jul 11	2.5	45	19	Fibre	Almost completely beetle exoskeletons. 2 small broken vertebrae
L11	Type 2	Halfway Wall Bay	SS 13801 46068	7 Jul 11	6.9	49	24	Feather/ fibre	Mainly beetle exoskeletons. A few fragments of bird bone. Sub-rounded small pebbles
L12	Type 3	Middle Park above Jenny's Cove	SS 13435 45970	7 Jul 11	2.1	58	24	Fine downy feather	Many vertebrae of small fish. Small part of coiled gastropod. 2 small crab exoskeleton fragments.
L13	Type 2	Ackland's Moor	SS 1322 4467	19 Mar 12	4.7	40-49	28	Feather	Fragmented bird bones
L14	Type 1	Marisco Castle area	SS 1413 4378	20 Mar 12	1.3	48	22	Plant fibre	Dense plant fibre and seed husk pellet
L15	Type 2	North of Quarter Wall Pond	SS 1367 4498	22 Mar 12	3.1	58	21	Plant fibre	Fibre and seed husks with many beetle exoskeleton fragments
L16	Type 2	North of Quarter Wall Pond	SS 1367 4498	22 Mar 12	1.3	38	20	Plant fibre	Fibre and seed husks with many beetle exoskeleton fragments

Whilst Witherby (Witherby *et al.*, 1963) states that Sparrowhawks feed almost exclusively on birds, they do take small mammals and insects, as do many of the gull family. Whilst looking for pellets, it was not unusual to find, within a couple of metres, plucking, carcase and pellet. The plucking is probably from a raptor, but the subsequent cleaning of the carcase and ejection of pellets could be from subsequent corvid or gull scavengers.

A search of the bird reports in the *Annual Reports of the Lundy Field Society* indicated that in November 2010 the following producers of pellets were seen on the island: Sparrowhawk (*Accipiter nisus)*, Kestrel (*Falco tinnunculus)*, Merlin (*Falco columbarius)* and Peregrine Falcon (Davis & Jones, 2011). Therefore pellet L1 could be from any of these species.

Between April and July 2011 the only raptors reported were Peregrine Falcons (Davis & Jones, 2012). In correspondence with Alasdair Love (pers. comm. 10/6/12) he expresses surprise that the pellets of Peregrines (arguably all of the raptor pellets) had a high proportion of beetle remains; see Plate 1-L11 (bottom). Peregrines are able to catch a wide range of birds and there appears to be no shortage of prey on Lundy; indeed there is evidence of predation by Peregrines on Puffin *(Fratercula arctica)* and Manx Shearwater *(Puffinus puffinus)* (Rowland, 2011). Alasdair's opinion was that the taking of prey, in this case beetles, with a much lower nutritional value suggested a lack of suitable bird prey. Alternatively, it could be indicative of subsequent scavenging by corvids and/or gulls.

Pellets L13, L15 and L16, all collected in March 2012, are similarly type 2 pellets. A Sparrowhawk was present from 1-4, 20-26 and 31 March, whilst Peregrines were reported during most of the month (Davis & Jones, in prep.).

During the whole period, Ravens and Crows were present, as were Herring Gulls and Great and Lesser Black-backed Gulls. Cramp *et al.*, 1980, describes the prey of all these species as very varied, comprising all forms of carrion, beetles and vegetable matter, with Great Black-backed Gulls having a varied diet almost 91% of which comprises animal matter.

Table 1 also shows two intriguing remains:

L1 'sacral vertebrae – adult rat size'; and

L9 'two cranial fragments – squirrel size'.

Alasdair was asked to analyse the pellets without any reference to Lundy, of which he has no personal knowledge. In the light of these two analyses, I asked him to review his findings, advising him that the only small mammals likely to be found on Lundy at the time the pellets were recovered were Pygmy Shrew and Rabbit *(Oryctolagus cuniculus)*, and that there were reportedly no rats and never have been any squirrels. His judgement is that while there is no doubt about the rat vertebrae, the pellet could have come from a visiting bird that fed earlier on the mainland. The cranial fragments from the other pellet (L9) he acknowledged could well be from a Rabbit (pers. comm. 25/8/2012). Pellets are known to be produced 12 to 20 hours after feeding (Darwin, 1937).

CONCLUSION

The results of the pellet analyses are quite uncertain. The type 1 pellets point to corvids and type 3 are almost certainly from gulls. Both families have a broad, omnivorous diet but on Lundy they take fibrous plant matter and seeds, and swallow small stones to grind the food up in their crop.

The diet revealed by the analysis of the single gull pellet is very interesting and more pellets could usefully be collected in future for comparison. Gulls tend to congregate in easily located grassy areas around Pondsbury and the south-western side of Threequarter wall. Observation to identify species and collect freshly ejected pellets would repay the effort with more information on this interesting gull diet on Lundy.

Raptor pellets are more difficult to collect and to assign to the species that eject them. Despite the numbers of small birds, Pygmy Shrews and dead Rabbits on the island, surprisingly their diet consists mainly of beetles. Observation of known kill sites, for example in Gannets' Coombe, and collection of intact pellets before they erode could help to identify species as well as diet.

The type 2 pellets provide evidence of both a restricted and a catholic diet; restricted in that some raptors produced pellets containing only invertebrate remains; and catholic in that other pellets included remains of mammals of various sizes, birds and invertebrates. However identification of bird families remains problematical. These pellets containing animal matter, bones and insects are difficult to attribute and could be from any of the three families of raptor, corvid or gull.

Table 2 gives a tabular representation of the species that were present around the time of the collection dates, as well as a list of prey derived from Cramp *et al.* (1980). The numbers under 'Prey' indicated order of preference, with 1 being high and 4 low. With the exception of Kestrel, the preferred prey is exclusively avian, although Cramp *et al.* (1980) state that Peregrines will take flying insects. It is interesting to note that Kestrels are quoted as having a particular liking for Dor Beetles (*Geotrupidae* spp.), which are abundant on Lundy, and that Sparrowhawks rarely take insects (*ibid*.).

Despite the abundance of insect remains in the majority of type 2 pellets, the Peregrine Falcon does remain the prime candidate for many of the pellets recovered and analysed for this study.

Table 2: Species present during study and prey types

Date	Raptors present	Prey				Pellet & contents
		Birds	Insects	Mammals	Carrion	
Nov 2010	Peregrine	1	2	3		L1 Mammal insect
	Sparrowhawk	1	3[1]	2		
	Kestrel	2	3[2]	1		
	Merlin	1	2	3	4	
Apr/Jul 2011	Peregrine	1	2	3		L5 - L11 mammal bird insect
Mar 2012	Peregrine	1	2	3		L13, L15, L16 bird insect plant
	Sparrowhawk	1	3[1]	2		

[1] Rarely
[2] Dor Beetles

ACKNOWLEDGEMENTS

My grateful thanks to Alasdair Love who accepted the challenge of accommodating the analysis of pellets from unknown species from an area with which he was unfamiliar, and thus for providing unique data for this paper. Also to Tim Davis and Tim Jones who gave me access to the 2012 logbook in advance of publication of the 2012 data.

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