

(249)

REPORT OF THE LITTLE OWL INQUIRY.
1936-37.

(ORGANISED BY THE BRITISH TRUST FOR
ORNITHOLOGY.)

BY

ALICE HIBBERT WARE, M.B.O.U. (Analyst).

(Concluded from page 229.)

(Plates 5 to 10.)

THE INSECT FOOD OF THE LITTLE OWL.

The Insect Section of the Report has necessarily to be lengthy because the Inquiry has shown that the Little Owl is a feeder on insects at all stages of growth, at all times of year and in every type of country. Individual Little Owls may differ in *degree* in this matter, according to the nature of the food most readily procured, but they do not normally differ in the *habit* of insect feeding. Five nestlings from three localities, varying from one to three weeks in age, all had beetles in their gizzards. Every nest clearance has revealed many insects in its debris. The pellets of juvenile birds are remarkable for their copious insect contents. It is rare to find a pellet of an adult that does not contain at least traces of beetles and the majority of their pellets are made up of beetles. Hence, one of the main features of the Inquiry is the great prominence of insects in the food material of the Little Owl.

Five insects stand out beyond all the rest on account of their enormous abundance in the pellets. These are: *Tipula* sp. (daddy-longlegs or crane-fly), *Forficula auricularia* (common earwig), *Pterostichus madidus* (a carabid beetle), *Geotrupes stercorarius* (dung beetle) and *Melolontha vulgaris* (cockchafer).

Other species (all beetles) that are outstanding for the same reason but to a rather less degree are:—

Carabus violaceus, *C. nemoralis*, *Nebria brevicollis*, *Harpalus æneus*, *Pterostichus vulgaris*, *Abaxater*, *Cyrtanotus apricaria*, *Staphylinus olens*, *S. æneocephalus*, *Byrrhus pilula*, *Geotrupes typhæus*, *Aphodius* sp., *Amphimallus solstitialis*, *Agriotes lineatus*, *Lacon murinus*, *Barynotus obscurus*, *Phytonomus punctatus*, *Sitona* sp. The rest of the species of beetles on the list can be grouped as either occasional or rare in the pellets. There is a great drop in numbers between the frequent and the occasional. Hence the species grouped as "very frequent" and "frequent" may be taken to represent the normal insect food of the Little Owl.

The occasional species are mostly those that are either found in moderate numbers locally (*e.g.*, *Leucanus cervus* in Surrey) or that occur anywhere provided that conditions of life are suitable (*e.g.*, *Necrophorus humator*, where carrion is obtainable). The species marked as "rarely found" are undoubtedly picked up, as it were by chance (*e.g.*, *Cicindela campestris*). In this way a few really rare species have been identified (*e.g.*, *Procas armillatus* and *Meloë rugosus*). The latter had not been found in Britain for many years till the Little Owl picked it up. The Little Owl is certainly a good entomologist.

TABLE 9.

CONTENTS OF SOME LITTLE OWL PELLETS.

A. Single typical pellets.	
B. Single pellets specially rich in insects.	
SPRING.	SUMMER.
A. Bricket Wood, Herts.	A. Longstanton, Cambs.
8 <i>Pterostichus madidus</i> .	8 <i>Pterostichus madidus</i> .
2 other carabids.	4 other carabids (small).
2 <i>Forficula auricularia</i> .	1 <i>Staphylinus olens</i> .
	1 <i>Geotrupes stercorarius</i> .
	3 <i>Forficula auricularia</i> .
B. Powys, Carmarthen.	B. Seaford, Sussex.
6 <i>Abax ater</i> .	(a) 3 <i>Pterostichus madidus</i> .
1 <i>Leistus spinibarbis</i> .	1 <i>Harpalus æneus</i> .
2 <i>Calathus fuscipes</i> .	2 <i>Carabus violaceus</i> .
2 <i>Geotrupes</i> sp.	1 <i>Byrrhus pilula</i> .
1 <i>Byrrhus pilula</i> .	1 <i>Lacon murinus</i> .
1 <i>Staphylinus æneocephalus</i> .	4 <i>Otiorrhynchus clavipes</i> .
1 <i>Agriotes lineatus</i> .	19 <i>Forficula auricularia</i> .
1 <i>Curculionid</i> (weevil).	(b) From same locality.
2 <i>Forficula auricularia</i> .	16 <i>Melolontha vulgaris</i> (heads and legs only).
	1 Carabid.
	1 <i>Otiorrhynchus clavipes</i> .
AUTUMN.	WINTER.
A. Shaugh, Devon.	A. Bretton Park, Yorks.
Pellet crammed with eggs of <i>Tipula</i> sp.	7 Carabids (small).
Also contained :—	2 <i>Staphylinus æneocephalus</i> .
11 Carabids (small).	2 <i>Agriotes lineatus</i> .
1 <i>Byrrhus pilula</i> .	1 <i>Curculionid</i> (weevil).
1 <i>Necrophorus humator</i> .	
2 <i>Forficula auricularia</i> .	
B. Seaford, Sussex.	B. Laugharne, Carmarthen.
6 <i>Pterostichus madidus</i> .	4 Carabids.
6 Other carabids.	2 <i>Geotrupes stercorarius</i> .
1 <i>Staphylinus olens</i> .	2 <i>Staphylinus æneocephalus</i> .
2 <i>Geotrupes</i> , sp.	23 <i>Curculionids</i> .
343 <i>Forficula auricularia</i> (<i>i.e.</i> , 686 "pincers").	(chiefly <i>Sitona</i> sp.).
	46 <i>Forficula auricularia</i> .

Coleoptera, with their insoluble chitinous parts, lend themselves to very perfect preservation. Even when very much pulverized it was generally possible to identify them, though sometimes impossible to arrive at the full number present. Hence, strange though it may seem from the immense numbers recorded, the Coleoptera are, in fact, understated in the numerical reckonings.

With most members of other orders of insects it was found impossible to make a definite count, as soft-bodied insects, such as moths and craneflies, were usually completely comminuted. Hence the analyst had to depend chiefly on indestructible traces such as scales, eggs, etc., for the identification of the pulverized insect. The pincers of earwigs, however, provided a sure method of reckoning for that insect.

Table 9, showing samples of pellet contents, gives an idea of the richness of their insect remains. It is also clear from these analyses that one or two species usually preponderate in number over the rest of the species represented. In fact, one species of insect frequently dominates the pellets from any one site for several weeks. A correct estimate can therefore probably be made of the seasonal appearance, increase, peak point, diminution and disappearance of an abundant species by means of an examination of a series of pellets. This has been corroborated by observations made on live insects at the same time that pellets containing remains of the same species in large numbers were being found.

TABLE 10.

SEASONAL ABUNDANCE OF THE INSECTS MOST COMMONLY FOUND IN LITTLE OWLS' FOOD DURING ONE YEAR.

	Winter	Spring	Summer	Autumn	Total for Year
	(244 Pellets)	(760 Pellets)	(782 Pellets)	(163 Pellets)	(2,417 Pellets)
<i>Forficulidæ</i> ...	1,577	1,283	563	6,794	10,217
(Earwigs)					See Note.
<i>Carabidæ</i> ...	292	1,143	2,740	2,862	7,037
<i>Staphylinidæ</i> ...	972	727	190	1,584	3,473
(Rove beetles)					
<i>Curculionidæ</i> ...	170	883	293	231	1,577
(Weevils)					
<i>Elatevidæ</i> ...	—	254	331	55	640
(Click beetles)					
<i>Scarabæidæ</i> (<i>Geotrupes</i>)	118	476	443	706	1,743
(Dor-Beetle)					

AVERAGE NUMBER OF INSECTS FOUND IN 100 PELLETS.

	Winter	Spring	Summer	Autumn
	(244 Pellets)	(760 Pellets)	(782 Pellets)	(631 Pellets)
<i>Forficulidæ</i> ...	646	168	72	1,076
<i>Carabidæ</i> ...	116	150	350	453
<i>Staphylinidæ</i> ...	398	95	24	251
<i>Curculionidæ</i> ...	69	116	37	36
<i>Elateridæ</i> ...	—	33	42	8
<i>Scarabæidæ</i> (<i>Geotrupes</i>)	48	62	56	111

NOTE.—2,460 pellets were examined during a full year of the Inquiry. 43 of them were, however, obtained between February and May, 1937, (after these statistics had been drawn up) by observers who began their work in May instead of in February, 1936. This explains the apparent discrepancy in the number of pellets recorded elsewhere.

There can thus be no doubt that the Little Owl acts as a check on insects that are very abundant and easily obtained. This fact is clearly seen in Table 10 which shows the numerical rise and fall through the seasons of the insects most universally present in the pellets. Earwigs, for instance, diminished steadily in numbers from late spring till late summer, increasing suddenly with an enormous leap in early autumn. *Carabidæ*, on the contrary, whilst abundant throughout the year, increased steadily through the summer months, reaching their maximum in autumn.

Two comments on these tables are necessary :—

(1) The *Melolonthidæ* have not been included though cockchafers are among the most abundant insects eaten by the Little Owl. The reason is that their season is short. The "May bug" appears in small numbers in May, is extremely abundant in the food in June and July and disappears in August. Hence its numbers, however great, cannot compete with insects found throughout the year.

(2) Among the *Scarabæidæ*, *Geotrupes* (dor-beetle) only has been included. The reason is that *Aphodius*, another very frequent dung beetle is of very fragile consistency, consequently its remains, though identifiable, are frequently too comminuted for an accurate count. As a family, the *Scarabæidæ* would take a place much higher numerically than appears in the list for *Geotrupes* only.

INSECTS THAT OCCURRED ABUNDANTLY IN THE FOOD.

Forficula auricularia (common earwig) is at the top of the list as the commonest insect eaten by the Little Owl. Even in

May and June, when its members were diminishing till only one to ten had contributed to single pellets, large numbers still appeared locally, e.g., from 30 to 40 in single pellets from Looe (Cornwall), Longstanton (Cambs.) and Seaford (Sussex). By September these numbers had become the normal ones for all districts and were enormously exceeded in some of them. A plague of earwigs in 1935 at Seaford, for instance, was registered by the huge numbers still found in the pellets of 1936. The record number of 343 (686 pincers) in a single large pellet (1.6 gr.) has already been quoted. Other single pellets from Seaford during the autumn contained 255, 243, 181, 162, 128 earwigs respectively and many in October and November contained from 50 to 100. The insects appear to be taken direct from the ground since the pincers in the pellets were almost invariably buried in a matrix of soil or dung and pulverized earwigs.

Pterostichus madidus was by far the most abundant species of the *Carabidæ*. In fact, there were very few consignments of material throughout the year that did not contain it. This beetle has already been referred to under "Nest Contents". The most numerous of the rest of the smaller carabid beetles were *Pterostichus vulgaris*, *Abax ater*, *Harpalus æneus*, *Nebria brevicollis* and *Cyrtotus apricaria*. These were more locally represented than *P. madidus*. The large *Carabus violaceus* (violet ground-beetle) and *C. nemoralis* occurred in small numbers through the winter and spring and were somewhat abundant from May till October. Seven in one pellet was a record number for Ashford (Kent) on July 6th.

Two species of the *Staphylinidæ* were found somewhat sparsely in the pellets from most districts but abundantly in pellets from open country, such as downs and sandhills. *Staphylinus olens* (devil's coach horse) occurring in small but steady numbers as a rule, rose to abnormal numbers in one locality—Seaford Downs—in October. The sender remarked: "No wonder, the beetle is running about everywhere." By far the most numerous species, however, was *Staphylinus æneocephalus*. From autumn to spring most of the pellets from open country contained it in considerable or even very large numbers, for example 82 in three and 212 in six pellets from Seaford (December) and 34 and 24 in single pellets from Laugharne (December). Yet the entomologists do not consider that this species is either very abundant or gregarious. But the Little Owl apparently knows how to find it.

Scarabæidæ. There were very few pellets and nests that did

not contain *Geotrupes* sp. (dor-beetle). Though on account of the bulk of the beetle, the numbers found are not so impressive as those of some other insects, *Geotrupes* is undoubtedly the most constantly present of all the insects that form food for the Little Owl. The fragments of *Geotrupes* are usually embedded in dung, showing that the Little Owl had delved to procure the beetle. Also, not only is dung near the nests and roosts usually well turned over, but two observers have noticed that the bird seems to follow the cows; when their grazing place is changed in autumn no more pellets are found in the usual site; when the cows return, so do the pellets. Three or four *Geotrupes* often occur in one pellet and occasionally even seven. In such cases the heads and legs only are found. *G. stercorarius* (the common dor beetle) appears throughout the year. The black *Geotrupes typhaeus* which frequents rabbit dung becomes abundant in spring disappears in summer and reappears in considerable numbers in autumn.

Aphodius is represented by more species in the pellets than any genus in the whole list. Though not nearly so widely distributed or abundant as *Geotrupes* in the pellets, it occurs very frequently.

Melolonthidæ. This family forms a very important food item during the summer. *Melolontha vulgaris* (cockchafer) appeared in the pellets and nests at the end of May and became extremely abundant in June and July. Though still present in August, it was superseded by *Amphimallus solstitialis* (summer chafer) which continued into autumn. The nest debris was often permeated with the elytra, heads and legs of cockchafers. Whole pellets sometimes consisted entirely of the comminuted insects, whilst in others the legs and heads only were found.

Examples are: 26 cockchafers in two pellets; 23 in two pellets; 28 in three pellets all from Seaford on July 6th, 12th and 15th respectively.

Several correspondents had seen a Little Owl catching cockchafers. Mr. Clark wrote: "In July, 1936, for several nights I watched two adults and a young bird feeding on May beetles. These they took chiefly as the beetles left the grass but occasionally they took them on the wing."

Curculionidæ (weevils) were eaten throughout the year. They became very abundant rather suddenly in March and April, in food material from all localities. *Barynotus obscurus*, for instance, appeared simultaneously from many districts, in large numbers. This species, together with *Phytonomus*

punctatus and *Sitona* sp. were the most common and widely spread of the weevils. Some of the records are 36 in one pellet and 49 in six from Longstanton on March 28th and April 2nd; 41 weevils in four pellets from Ludlow on April 21st; 51 in one pellet from Laugharne on April 10th; 76 in four pellets from Hereford on April 29th. These are merely samples to show the sudden abundance of weevils that occurred from March onwards.

An interesting detail is that the presence of *Barynotus obscurus* was very frequently accompanied by the presence of chunks of wood, usually pine wood in the pellets. Yet the species is one that frequents vegetable refuse, and roots of grass and is often found under stones. The explanation has not been found.

Elatridæ. This family also appeared suddenly in early spring, sometimes in large numbers and reached its peak in summer. *Agriotes lineatus* (click beetle) was by far the commonest representative. Examples of its occurrence are: 17 in two and 23 in four pellets from Ludlow on May 12th and July 6th; 48 in three pellets from Market Harborough, on June 4th; 56 in three pellets from Seaford on June 17th. The larva (wireworm) was fairly frequent at all times of year. Two other species, *Agriotes obscurus* and *Lacon murinus*, in smaller numbers, were also widely distributed.

Tipulidæ. *Tipula* sp. (daddy long-legs or crane-fly) afforded one of the most interesting records of the year. No crane-flies had been found in the pellets in early summer. At the end of August they suddenly appeared almost simultaneously from eleven counties, in very great numbers. 204 *Tipula* pellets were received between August and November. Many of them consisted of little else but *Tipula* eggs in a matrix of pulverized *Tipula*. The black chitinous egg-cases 1 mm. in length literally rained down as the pellets were broken. A pinch of .6 gram (half a pellet) taken haphazard from 80 grams of this material yielded 2,000 eggs (see photo). As very few of the *Tipula* pellets were without eggs, it seems as though the female flies must have been taken as they hovered over grass in the act of egg-laying. The crane-fly is believed to lay her eggs in batches of about 200. The species was chiefly *T. paludosa*.

Several cultures were made to test whether the eggs would hatch when taken from pellets. None did so.

The Little Owl must obviously have acted as a controlling factor on leather jackets during 1936.

Necrophoridae (carrion beetles).

In view of the opinion of some people that Little Owls are specially partial to carrion beetles as food, the exact record of the experience gained by the Inquiry is now given.

Only three specimens of the brightly coloured species of burying beetles were found, the rest, 72 in all, were the black *Necrophorus humator*. Of other genera of carrion beetles, such as *Silpha* less than 20 specimens were found. The seasonal record for *Necrophorus sp.* was : winter, nil ; spring, 27 ; summer, 28 ; autumn, 20. This gives an average of 3 for every 100 pellets.

A similar calculation made for *Geotrupes*, the commonest dung beetle, gives an average of 75 for every 100 pellets in the same three seasons. Dung beetles therefore seem to be used as a food supply more than those from carrion. The fact is that carrion does not lie about so frequently as dung. When it is found within the Little Owl's food territory, no doubt it is dealt with in the same way—turned over and the beetles extracted. The largest number of burying beetles for any one spot was eight in the Woking nest. Five were found in a larder at Wilmslow and four in food remains from Bretton Park and Shaugh. Otherwise the beetle occurred singly or in pairs in pellets containing many non-carrion beetles. A late autumn record was explained by the fact that a rabbit catcher had left many dead rabbits on the Seaford feeding haunts of the Little Owl. But even then, only four were found in a batch of pellets.

An examination of the habits of the common insects recorded shows that in almost all cases the species are such as hide by day and are active by night. Several of them, such as the carabids, earwigs and weevils, only use their wings under special conditions ; others do not possess any. Moreover, the fact that soil, moss or dung is almost invariably present in the pellets containing them is a further proof that they were taken direct from the ground. Hence the evidence goes to show that the Little Owl feeds to a great extent on what is common on the ground at dusk and by night.

INDIVIDUALITY IN FOOD HABITS ?

Any signs of individuality that have appeared in the food habits can be explained by the prevalence of certain food items on or near the feeding ground. Thus the Seaford, Carmarthen and Shaugh pellets are outstanding for the abundant remains of those kinds of insects that frequent open country. The Harold Wood, Bretton Park and Limpsfield sites were in wooded country, consequently rodents and birds were

used as food in greater numbers than in open country, though insects by no means disappeared. On the damp meadows round the Woking nest frogs are very plentiful, hence they appeared in the food in greater numbers than from any other site. On the beach at Dungeness sea-bird chicks may be easier to obtain than the normal food, though there is no evidence at hand to show what else the nest contained. The propensity for Storm-Petrels on Skokholm, as has already been described, is due to the abnormal food conditions of the Little Owl on the island.

How then does it happen that game chicks have not appeared in the food in districts where they are abundant? Partly (in the opinion of the writer) because they are under shelter when the Little Owl begins its night hunting, but chiefly because chicks are not its natural normal food and the latter is taken first wherever it is abundant.

To quote from Mr. Rolls once more: "It seems to me from watching so much the one pair of owls (surrounded by Partridge chicks) that they have got to be hard pushed for food to take game birds; it does not appear to be natural food for them."

An occasional so-called "rogue" Little Owl may, however, acquire a taste for chicks (as, for instance, with the Osgathorpe and Roburgh pairs) and make depredations. But there has been no other evidence of this during the Inquiry.

In the matter of day-hunting, some individuals may practise this as a habit and others only rarely. From the evidence obtained this seems probable. But such factors as frost, rain and need of food for the young may act as an occasional urge. It cannot yet be stated with certainty that some Little Owls hunt habitually by day and others do not.

The results of the Inquiry into the nature of the food of the Little Owl have now been fully recorded. A summary of the conclusions arrived at by the writer from the combined work in the field and in the laboratory is as follows:—

SUMMARY OF THE CONCLUSIONS.

I.—GENERAL FEEDING HABITS.

(1) The Little Owl is chiefly crepuscular and nocturnal in its feeding habits.

(2) It sometimes hunts by day, especially during the nesting season. The extent to which this is done appears to vary with individuals. Very few observers have recorded habitual day-hunting.

(3) It is primarily a ground feeder. The rodents and insects found in the food prove this.

(4) The prevalent food at all times of year consists of insects and rodents.

(5) Carrion is very little used as food.

(6) There is no evidence to show that the Little Owl kills prey in order to store it, returning later to procure carrion beetles from it. The evidence is entirely against such a practice.

(7) The so-called "larders" are not used for the storage of food beyond present needs. They contain wings, bones and partially eaten animals. They might better be called "carving holes" or "refuse dumps".

(8) There is no evidence to show that the Little Owl is in any way a menace to other species of owls. The pellets of the Little Owl found in the same tree holes as those of the Barn and Tawny Owls respectively have shown entirely different food remains.

II.—RODENT FOOD.

(1) Small rodents are used as food throughout the year. During the nesting season large and medium-sized rats and small and medium-sized rabbits are also found frequently in the food remains.

(2) In districts and during seasons where voles and mice are abundant, they appear in regular succession in the food remains. This has been a marked feature of the food in 1937 in most districts.

III.—BIRD FOOD.

(1) Birds take their place with insects and rodents as an important food constituent during the nesting season.

(2) At other times of year they are used sparsely.

(3) The birds most commonly taken are Starlings, House-Sparrows, Blackbirds and Song-Thrushes, in that order of abundance. There is a great numerical drop between these and all others recorded.

(4) The birds used as food are such as often frequent the ground (see Table 7).

(5) Very little evidence of nest-raiding has been recorded. Nests in holes, *e.g.*, walls, trees, boxes, are occasionally raided. No evidence of the destruction of nests and their contents concealed in thick bushes or herbage (*e.g.*, warblers) has been obtained.

(6) No eggs of other birds have been found in the Little Owls' nests or food.

(7) Game chicks are taken rarely. One certain and one doubtful game chick and seven poultry chicks (the latter from one Little Owl's nest during two seasons) is the sum total of the evidence gained by the field workers and analyst during sixteen months. But the reports of other correspondents have shown that locally, individual Little Owls sometimes acquire a tendency to take chicks.

IV.—INSECT FOOD.

(1) The Little Owl feeds largely on insects at all times of year, during all stages of growth and in all localities.

(2) The dominant species used as food are extremely abundant, either seasonally or through the year, *e.g.*, cockchafers, dor beetles, carabid beetles, weevils, earwigs and crane flies. There is a great numerical drop between the dominant species and the rest of the insects recorded.

(3) Any insect that appears in great numbers locally or universally becomes dominant for a time in the food remains, *e.g.*, cockchafers, crane flies, earwigs, devil's coach-horses.

Readers of the Report are reminded once more that the tables of animals, recorded as found in the food remains, refer to the period February, 1936, to July, 1937, only and include only those that have been actually seen by the regular field observers and the analyst.

From the evidence of the 1936-1937 Inquiry, the Little Owl cannot be said to feed habitually on game and poultry chicks. That it takes them in small numbers is certain. That it takes them in large numbers has not been proved during the sixteen months of investigation. The same is equally true of song birds, with the exception of Blackbirds and Song-Thrushes.

The writer has made no attempt to group the animals used as food according to their degree of usefulness or harmfulness. The obvious reason is that, with many species, even those engaged in biological research in agriculture do not yet feel qualified to do so. It is, of course, a known fact that cockchafers, daddy-longlegs, click beetles and millipedes are very harmful to agriculture. On the other hand, the Carabid beetle (*Pterostichus madidus*) (extremely frequent in the food remains) is useful on account of its predatory habits and yet harmful in destroying the fruit of strawberry crops. Earwigs, again, which may be comparatively harmless on ordinary farm land are troublesome under horticultural conditions, as, for instance, by spoiling the petals of pyrethrum and other flowers grown for market. They are regarded as even more objectionable when they invade houses in large numbers as

sometimes occurs. The truth perhaps is, that with many species of insects it is impossible to generalize, and their usefulness or harmfulness can only be estimated by relation to the local circumstances in which they may at the time be occurring. Readers must therefore be left to form their own opinions on species such as these, and all that has been possible in the lists of invertebrates is to indicate by means of an * those species definitely known to be important as pests.

The above summary brings the Report of the Inquiry into the food of the Little Owl to a close.

HELPERS IN THE INVESTIGATION.

Dr. Claud Ticehurst and Mr. Kinnear have given unstinted help with the bird section throughout the investigation. Their advice has been as valuable as their help with the identification of feathers. Dr. Blair provided a basis for the whole of the insect work, when he named the first sets of beetles that were found in the pellets. Mr. Hugh Main procured for the analyst a collection of the most frequently occurring beetles, in order that the fragments could be compared with the entire insects. At the end of the investigation the bits of beetles were sent, in their Families, to Messrs. Coulson and Allen, who named every species that had not been seen by Dr. Blair. This was an extremely lengthy and intensive piece of work. Mr. Fryer gave time and valuable advice whenever called upon. To all these experts the Trust owes its warm thanks and the analyst deep gratitude. To Miss Margaret Perry and Mr. Seth-Smith for their experiments, to Mr. Kenneth Humphries for great help with the practical work of analysis, and to Mrs. Burrows (Girton) and Miss Sturge and Dr. Janet Vaughan (Cambridge) who made the "spade-work" lighter than it would otherwise have been, the analyst offers her warm thanks. The complement to this assistance in the analysis is the co-operation of the field workers, whose efforts have been fully described already. Without them a thorough inquiry would have been impossible.

A FORMER INVESTIGATION OF THE LITTLE OWL'S FOOD.

Dr. Walter E. Collinge made an extensive three-year investigation of the Little Owl's food from 1918, the Report of which was published in his book, *The Food of some British Wild Birds*.

His researches comprised the examination of the gizzards of 194 adults and 18 nestlings, of 267 pellets and many larder holes. When this work was completed he received an offer to supply him with dead Little Owls from estates in

Hampshire. This resulted in a further examination of 96 gizzards, representing 27 estates.

The gist of his conclusions, as the result of both parts of the investigation, was that insects, voles, and mice constitute the chief items of the Little Owl's food throughout the year. He found that birds are not taken in large numbers and that "in comparison with other food items the amount of game birds used is infinitesimal".

Readers of this Report cannot fail to be impressed by its similarity to that of the present Inquiry. Any differences are those of mere details. The same predominating types of food are reported by both. Moreover, the conclusions drawn, in each case from first-hand experience, are alike.

If the opinions, given below, of various Scientific Institutions of Europe are also carefully read, it will be seen that they too correspond with the results recorded in the two Reports.

The conclusions of this Inquiry are, therefore, fully corroborated by those of other workers in this country and in Europe.

OPINIONS OF THE LITTLE OWL FROM OTHER COUNTRIES.

The following reports from Scientific Institutions on the Continent were sent to the writer shortly before the Inquiry began.

SWITZERLAND: A. Schifferli, Station Suisse d'Ornithologie de Sempach:

"In Switzerland the Little Owl (*C. noctua*) is among the birds which are protected by the Government. Among ornithologists this Owl is everywhere appreciated as very useful because it is well known that its food consists chiefly of mice, harmful insects as grasshoppers, cockchafers, crickets, etc. I can confirm that by my own experience. It happens exceptionally that the Owl kills a pigeon in the dove-cot but only when it is bitterly cold and nothing else to get for food. And even then we cannot speak about a damage. The Owl is known as very useful."

HOLLAND: Dr. G. J. Van Oordt, Zoologisch Institut der Rijksuniversiteit: "I have now a long letter from the Phytopathological service at Wageningen by which the investigations about utility of birds are done. This is stated: the Little Owl is a rather common bird all over the country. It is especially a bird of the pollard willows in which it likes to breed. The food after investigations of a number of balls (pellets) consisted of 214 shrews, 79 mice, 18 Sparrows, 7 Starlings, 1 young Blackbird, 3 frogs, many beetles (especially *Geotrupes*). Hunters declare the bird to be harmful and

of course Little Owls will take young Pheasants when there are many available. But the standpoint of the Phytopathological service is that the Little Owl is only harmful in a few cases and must be preserved mostly."

GERMANY: Dr. phil. h.c. Hans Freiherr von Berlepsch, Versuchs und Musterstation für Vogelschutz:

"The small Owl (*C. noctua*) is without doubt of the greatest use in Germany. 90-98 per cent. of its prey are mice, chiefly field-mice (*Arvicolidae*). It is only during hard winters when there is heavy snowfall that an owl will occasionally get into a Pigeon cot. Its utility is beyond doubt."

HUNGARY: James Schenk, Director of the Royal Hungarian Institute of Ornithology: "The Inquiries in Hungary have given the result that the Little Owl eats chiefly little mammals and insects, also to a small extent little birds. The Little Owl is in Hungary therefore a useful bird and protected by the law of Bird Protection. The birds that it takes are generally Sparrows but sometimes Redstarts and other birds which breed in holes of trees. Keepers and farmers here see first the harmfulness and last the usefulness. I think it is the same also in England."

DENMARK: Ingvald Lieberkind (Mag. Scient.), Copenhagen: "Both farmers and gamekeepers formerly considered the Little Owl as being a great destroyer and many have been killed for that reason. Now this opinion is changed and the Little Owl is considered a harmless bird." Herr Lieberkind sent the letter to Halfaan Lange who had made a special investigation in various parts of Denmark. He sent the following list of contents from pellets and gizzards: Many earthworms (he enclosed a packet of setæ), mice and voles in great numbers, moles, Starlings, House-Sparrows, Chaffinches, Larks, many *Scarabæus* beetles.

It is interesting to note that Aristotle (384-322 B.C.) was probably the first naturalist to describe the feeding habits of the Little Owl. His results coincide very closely with those of the present Report in A.D. 1937.

"The Glaux and the other birds which see imperfectly procure their food by hunting in the night. They do not this all the night, but in twilight and at early dawn. *They hunt mice and lizards and beetles* and such other small animals."

"Glaux and all other birds with crooked claws eat the *Kalaris*." (*i.e.*, White Wagtail, exceedingly frequent on migration in the Mediterranean countries.)

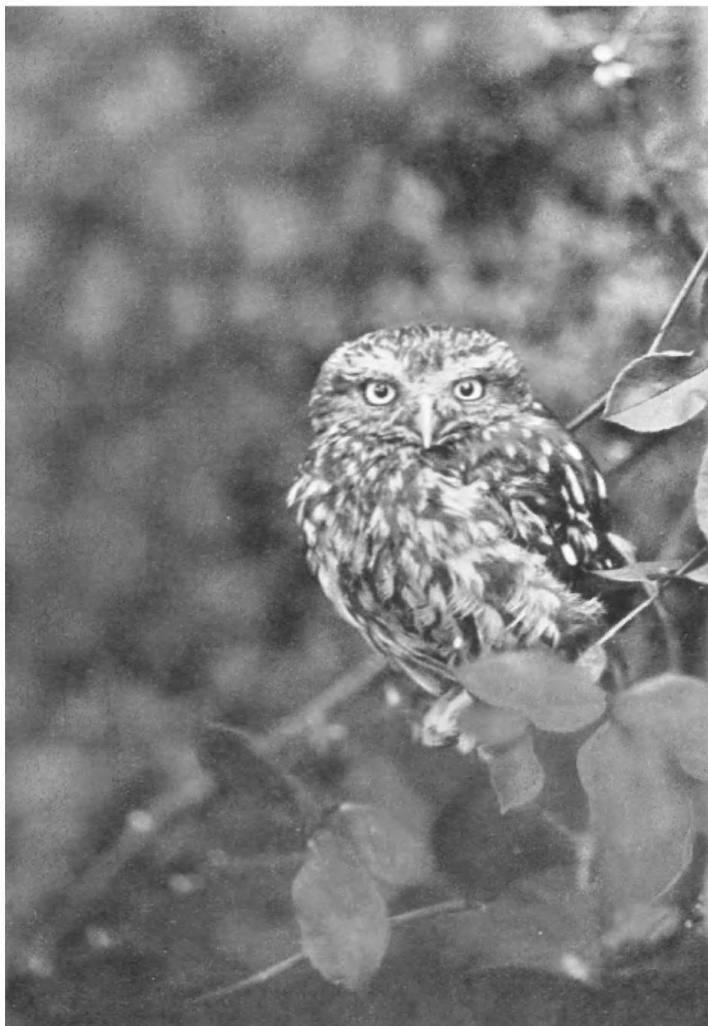
TABLE OF CONTENTS.

	PAGES
Report of the Special Committee of The British Trust for Ornithology	162-163
Geographical Distribution of the Little Owl. History of its Introduction into the British Isles	164
Organization by The British Trust for Ornithology of an Investigation into its Food Habits. Scope of the Inquiry	165-166
Counties and Localities from which Food Material was sent	167
Numerical Status of the Little Owl. Evidence of a decrease in numbers in some districts	167-171
Field work done by regular observers. Areas worked during Part I. of the Inquiry. The special game and poultry investigation of Part II.	171-176
Food Pellets. Their varieties. Methods of finding and examining them. Periodicity of pellet evacuation ...	176-178
Nests and "Larders". Characteristics of contents. Table of contents. "Roughage." Use of nest after nesting season	178-182
Gizzards. Tables of gizzard contents examined during the Inquiry (Parts I. and II.). Sparsity of contents in many gizzards	182-186
Problems concerning Feeding Habits. Daylight feeding? Nest raiding? Food storage? The "beetle-bait" theory	186-187 and 205-207
Special Incidents. A Sick Little Owl. A Red-legged Partridge. A Pheasant's Wing. The Gawsworth Nest. The Buckleigh Nest. A Dead Little Owl. A possible Association between Little Owls and other species of Owls	207-211
Some Causes of Mortality	211
Vertebrates found in the food remains	211-226
Rodents. Their prevalence. Increase in number in the food during 1937	212-213
Birds (other than game). Calendar of species found during Inquiry. Skokholm Island Incident. Evidence of Correspondents on the Little Owl's food	214-218
Poultry and Game. Experiments with caged Little Owls fed on chicks	218-220
Poultry and game chicks as food of the Little Owl in the field. Comments on the results recorded. Summary of work done on Bretton Park Estate	220-226

	PAGES
List of Invertebrates found in the food remains	227-229
Prevalence of insects in the diet. Contents of some insect pellets. Seasonal abundance of definite species in food remains. Notes on insects of special interest	249-256
Individuality in food habits determined by the local prevalence of certain food items or by external conditions ...	256
Summary of Conclusions, drawn from the results of the Inquiry	257-260
Helpers in the Investigation	260
Dr. Collinge's previous Investigation of the Little Owl's food	260
Opinions from other European Countries on the Little Owls' food	261-262

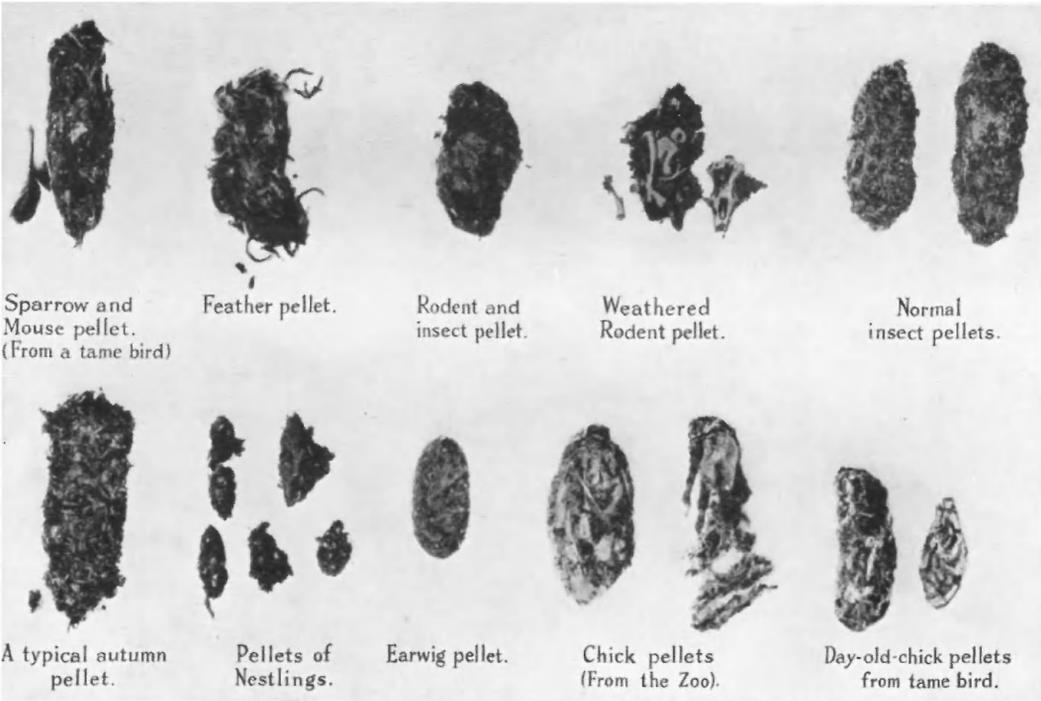
ERRATA.

- Pages 167 and 169: Carmarthenshire (Laugharne) (not Abercorran).
 Pages 167 and 182: *Lancs.* (Warrington) (not Cheshire).
 Page 169: *Westmorland* (Windermere) (not Cumberland).
 Page 169: (2). Yorks (Filey, *East Riding*) (not North).
 Page 171: (7). Essex, Little *Burstead* (not Bursted).
 Page 175: Cheshire, *Wilmslow* (not Wimslow).
 Page 175: Shropshire, Apley Castle Estate (much wild game) (delete parentheses).
 Pages 182 and 183: *Berks* (Newbury) (not Bucks.).
 Page 184: H. *Britten* (not Britton).
 Page 213: line 9 from bottom. *Also* one water shrew (not including one water shrew).
 Page 213: line 2. *Wilmslow* (not Altrincham).
 Page 228, 2nd column: * *Agriotes lineatus* L. (insert sign of frequency—‡).
 Page 228, 2nd column: ‡ *Corymbites pectinicornis* L. (delete sign of frequency).
 Page 228: *Lepidoptera*, *Smerinthus ocellatus* (not *Sinerinthus*).
 Page 228: *Lepidoptera*, *Smerinthus populi* (not *Sinerirthus*).
 Page 229: *Stuart Boardman* (not *Stewart Boardman*).
 Page 229: E. M. Nicholson, *Sussex* (not *Surrey*).



Little Owl.

(Photographed by W. A. Ramsay.)



Typical pellets of the Little Owl.
(*Photographed by J. R. Marriott.*)

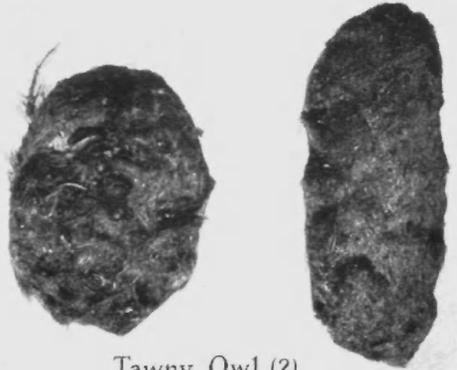


Kestrel (4)

Little Owl (1)

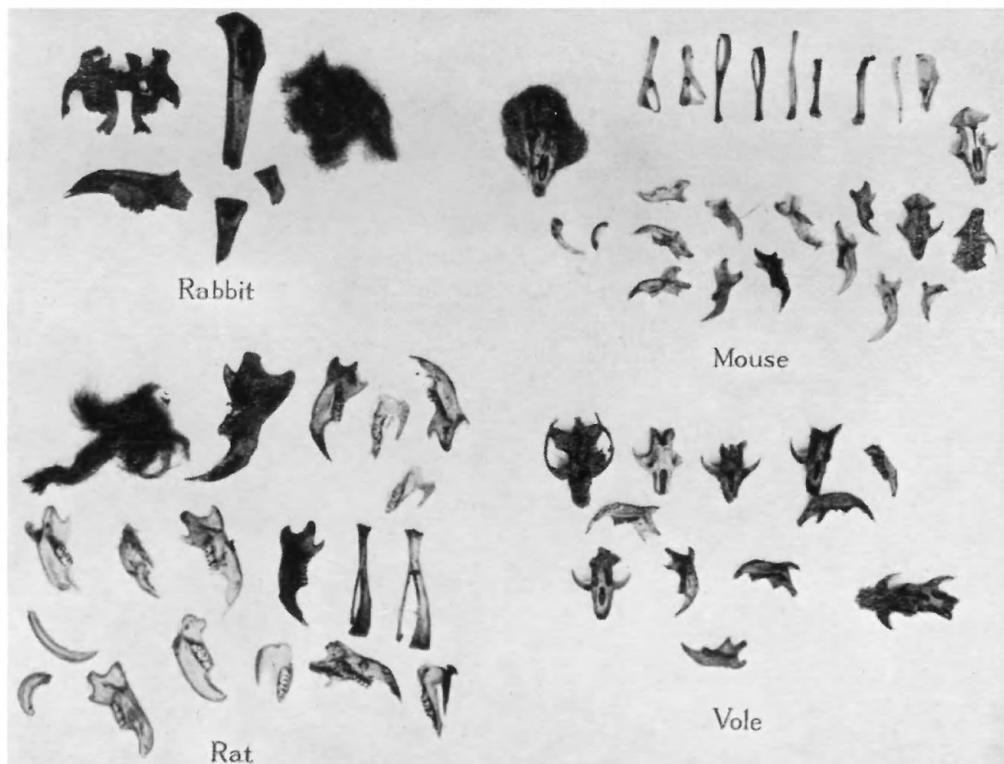


Peregrine Falcon (1)



Tawny Owl (2)

Pellets of some Birds of Prey.
(*Photographed by W. Tams.*)



Remains of Rodents from Little Owl food material.
(*Photographed by J. R. Marriott.*)



UPPER—Result of experiment, showing the down, bill and bones of a chick, taken from a pellet.

LOWER—Sample taken from 2,000 eggs of daddy-longlegs (*Tipula*) contained in .6 gram of pellet material.

(Photographed by J. R. Marriott.)

