

6. During egg-laying the parents spend the daytime out of the nest, foraging or collecting nest materials. The nights are spent in the nest, but incubation does not begin until the day before the last egg is laid.

7. On cold days the eggs are incubated almost constantly, the parents alternating about every ten minutes on the nest. On warm days much shorter periods are spent on the eggs, and the parents forage together to some extent. The temperature within the nest averages about 2.8° C. higher than outside. Both birds spend the nights in the nest.

8. Incubation lasts for twelve days, the birds hatching on the thirteenth.

9. The young are naked at hatching and down does not develop. The eyes are closed and remain closed at least through the seventh day.

10. The young are fed solid undigested food from the first day on, and lepidopterous larvæ are carried into the nest a few hours after hatching.

11. During early stages the young are brooded and fed as much by one bird as by the other. Toward the end of the period, one parent does about two-thirds of the foraging and feeding. The mate spends most of the time moving about in the nest tree.

12. The young apparently leave the nest on the fourteenth or fifteenth day.

13. They become independent of the parents within eight days after leaving the nest, but have been seen to feed themselves on the day of nest-leaving.

Palo Alto, California, August 25, 1937.

RELATIONS BETWEEN MAN AND BIRDS IN WESTERN EUROPE

WITH THREE ILLUSTRATIONS

By TRACY I. STORER

There is marked contrast between the conditions surrounding birds in western Europe and in California due to physiographic and climatic differences in the two areas and to the influence of man. In both regions primitive races of mankind levied upon birds for food and for other purposes, but the small human populations in those times left no obvious effect here, and the same may be inferred in Europe. Modern man has been in California for little more than a century, while in Europe his influence reaches back fully two thousand years. There his activities have altered profoundly the conditions of existence for birds. Discounting, for the moment, the important seasonal differences in weather of the two areas and the unlike size and shape of the land masses in the New and Old worlds in their bearing on bird populations and bird migrations, we may examine, in a comparative way, some of these human influences on birds. Observations made in 1934 in France (January), Italy (February), Switzerland and Germany (March-April), England and Scotland (April-July), while studying economic relations of birds and mammals in those countries, form the basis for this discussion.

To aid in visualizing conditions, the land areas and human populations of certain European countries may be compared with those of California. England and Scotland together are about one-half as large with seven times the population, France is a third larger with seven times the population, Germany is a sixth larger with ten times the population, and Italy is three-fourths as large with seven times the population. Thus, these countries, individually, are not greatly different from California in area but have enormously larger human populations. Much of the human population in Europe is grouped in cities and towns, so that there are many local areas with few or no human habitations, while in California people are scattered on farms over much of the non-mountainous part of the state.

A greater contrast between western Europe and California is found in the plant cover and in the degree of utilization of the land. In Europe there are few areas of "wild land" in the sense of our forests, chaparral, plains and desert. Whereas much of California shows human alteration by deforestation, overgrazing, change in water relations, and introduction of alien plants (both farm crops and weeds), many areas here are still natural or wild in appearance and are so, in fact, with respect to the habitats of birds. Europe has scarcely a square foot of land that does not exhibit some cultural alteration; the land is closely utilized for human necessities. There is no "virgin" forest, and there are few or no unaltered swamps, save perhaps in the Scottish highlands, as in Argyllshire. The pleasant English landscape with its scattered trees and hedge-bordered fields is, after all, not a truly "natural" condition, but represents a partial recovery in that direction. Few inferences as to the original wild vegetational cover are possible for western Europe. In England one relict area of lowland marsh, Wicken Fen, near Cambridge, which the National Trust is seeking to conserve as a sample of the once widespread "fens" (of Holland-like character) in Norfolk, requires careful "management" by competent and practical plant ecologists in order to maintain an approximation to the original condition because of the drainage of adjacent lands! In Europe generally, the mapping of life zones is impracticable; ecologic studies there must be restricted to "favorable localities," especially if the student wishes to avoid, in so far as possible, human influences.

The land in western Europe must serve several purposes. Arable land is cultivated intensively to produce human food, other areas are devoted to the production of timber, and the over-abundant waters are confined in canals, lakes, ponds and reservoirs. In England the same or closely adjacent fields may serve for agricultural crop production, for the rearing of a supply of pheasants or partridges for shooting, and for the production of foxes to perpetuate fox hunting. In France and Germany the regimented conifers of a state or private forest stand in neat, closely spaced rows so densely grouped that the ground beneath is heavily shaded and there is little or no other growth. Such artificial "forests" abut on, and alternate closely with, farm lands. In Italy the minutely divided holdings are surrounded by small scattered fruit trees or by grape trellises; if forest or woodland ever covered much of the Italian Peninsula, it early disappeared into the brick kilns of the Romans. Only in parts of the Alps and in the Scottish Highlands are there places that really present a wild appearance. In the latter region the names of numerous "deer forests" indicate that trees formerly occupied land now covered with heather. Thus, birds in Europe must, in the main, find their food and shelter in man-made or man-altered cover of various sorts, far more than in California.

The laws relating to wild life appear in different forms in the several countries of western Europe and none of these publications is distributed free! Germany and Italy now have unified game codes similar to that for California and some other states, while in France, England and Switzerland the legislation and decrees relating to wild life appear in various legislative and ministerial channels.

Documents which give information in this field are:

France. *La Louveterie . . . Ordonnances, Arrêts, Lois, Décrets et Circulaires sur la Louveterie et la Chasse . . .* publié sous les auspices de l'Association des Lieutenants de Louveterie de France avec le concours de M. M. Periere Directeur des Services Administratifs . . . Paris, 1929, 2+iv+416 pp., ill. 8°. 45.50 francs. (Laws, decrees, etc., from 1313 to end of December, 1926, relating to wild life are included, pp. 85-272.)

Italy. *La Legge Acerbo sulla Caccia. Commentata per il cacciatore per il riservista e per l'agente preposto alla vigilanza.* Edizioni Sapiientia. Roma, 1931, xxx+112+2 pp. 12°. 6 lira.

Testo Unico delle Leggi e Decreti sulla Caccia annotato e illustrato con la relazione al Re, la Dottrina e la Giurisprudenza, e coordinato con il codice penale del 1930. Roma, 1931, 85 pp. 6 lira.

Switzerland. *Loi fédérale sur la chasse et la protection des oiseaux* (du 10 juin 1925). Berne, 1925, 17 pp. (This is the French edition, others in German and Italian, possibly also in Romansch.)

Germany. *Das preussische Jagdgesetz vom 18. Januar 1934 nebst Ausführungsbestimmungen vom 24. Februar 1934 und Satzung des Landesverbandes der preussischen Jäger vom 24. Februar 1934*. . . . Berlin, Paul Parey, 1934, 67+60 pp. 12⁰. 1 Reichsmark.

England. *Poachers and Preserves, a handy guide to the Game and License Laws . . . Sporting Rights & Licenses*. By Stanley Savill. London, Police Review Publishing Co., Ltd., 1927, 70 pp. 12⁰. 1 shilling.

There is a distinct difference in the attitude of the Latin and Nordic peoples respecting bird life. In France and Italy the small birds, in differing degrees, are classed as game. Thrushes appear on the game list in France, and a host of small species is pursued by Italian gunners or trapped and netted in the various bird-catching devices evolved in that country down through time. Netting of birds is still in vogue in Italy, the practice being recognized and licensed by the game code of 1931. Several books are currently available on the subject, for example, Ghidini's "*Il libro dell' uccellatore colle reti verticali ed orizzontali . . .*" (Milano, Ulrico Hoepli, 1929, xiii+522 pp., ills.) A report summarizing studies of the fixed installations for this purpose in 1931 gave a total of 1890. These are in the central and northern parts of the country (Toschi, A., 1933, *Sulla distribuzione della Uccellande in Italia. Ricerche di Zoologia Applicata alla Caccia*, [No.] VII, Bologna, 32 pp., map). In Italy, rigid reduction of small birds is held to be necessary to the successful prosecution of agriculture; this opinion was expressed even by certain professors in the universities.

The fact that Italy constitutes one of the major migration routes of birds passing twice each year between Europe and Africa has a bearing on both the game and agricultural viewpoints in that country. Numerous paintings in the art galleries indicate the age-long hold of this viewpoint. Thus, one in the Vatican collection by Rosa da Tivoli (1657-1705) includes beside the hunters and their dogs, deer, fox, mallard, partridge, snipe, great woodpecker, thrushes, bullfinch and other small birds among the "game." Another by Arcangelo Resani (1670-1720), titled "*Natura morta*," has small rabbits, a boar, thrush, grouse, green woodpecker, mallard, pintail and other ducks, various dead birds mostly of small size in a basket and on hooks on the wall; also there are two live partridges (decoys?) in a cage. Still other paintings include small birds among the "game." In a gallery at Dresden, one of several such canvasses by a Hollander in the seventeenth century shows numbers of small birds on a skewer. Some of these paintings even include the small European Kingfisher. The painters of these pictures may be presumed to have figured the species commonly considered as game in those days; on this presumption the Latin countries have adhered to the older ideas, while the Nordic countries have changed. It should be said, however, that in Italy at the present time there is a group of bird lovers that opposes the conventional attitude, combats the agricultural argument, and champions the cause of the small birds.

Upon passing from the Latin to the Nordic countries, one has the impression at once of a greater number of small birds. In Switzerland and Germany, such species as the European Blackbird, Song Thrush, Chaffinch, Blue Tit, Coal Tit, and Nuthatch frequently come to attention. This was true even at Freiburg, in Baden, close to important agricultural areas in the upper Rhine Valley. Thus, south of the Alps small birds are trapped and netted, partly on the argument that such is a necessary aid to agriculture, while north of these mountains a different viewpoint obtains and small species are, in the main, protected. An old German illustration, dated 1517, shows farmers using sticks and slings to drive birds (and other wild species) from their crop lands. This is reproduced in Berger's "*Die Jagd aller Völker im Wandel der Zeit*" (Berlin, Paul Parey, 1928, p. 163).

In Switzerland bird protection finds numerous sponsors; the general attitude is more like that in the United States. The Swiss viewpoint, as expressed by Oberforst-inspektor Petitmermet, chief of the Department of Forest, Game and Fish, is that too much protection at the behest of the bird lovers tends to remove species from the game list, whereupon the hunters complain; if small protected species increase too far, the farmers protest.

The German attitude respecting birds also resembles, in general, that of the United States. The only small species (aside from snipe, woodcock, and shore birds) on the game list in the 1934 Prussian Game Law, is the Fieldfare, a gregarious migrant "robin" that forages in winter on open lands. Predaceous birds, such as the Osprey, the buzzards [hawks] and gulls, are subjected to an open season from October 2 to the end of February. The Coot, European Marsh Hawk, European Sparrow Hawk, Goshawk, Heron, Merganser and Crested Grebe may be killed at any time. The latter are considered as competitors of man in respect to supplies of game birds and fish. Gull eggs may be collected until May 15 each year.

Several problems are evidently involved here, a mixture of conservation and human use. One is reminded in part of the earlier "management" of the bird colony on the Farallon Islands off San Francisco where gathering of murre eggs went on year after year with maintenance of a large murre population, while the gull colony was held to a low level through destruction of gull eggs by the men gathering the murre eggs.

A high degree of "management" obtains in respect to game species, both birds and mammals, in Germany. For many years this has been regulated by laws of the various states. Under the Nazi government, the Prussian Game Law of January 18, 1934, unified procedure throughout the Reich. From central headquarters in Berlin the management reaches down through provincial officers ultimately to the local Kreisjagermeister, who is more than a warden, being responsible for actual field management. Operations leading to maintenance of the game supply, such as repopulation, feeding, and the slaying of predators, on private as well as on public lands (state forests), are subject to the approval of the local Jagermeister. Indeed, on each such preserve, even the number of individuals of resident game species that may be shot in any year is subject to official approval. The purpose of such regulations is obviously to maintain the game supply on a basis of continuing yield. The adjustment of differences between farmers and sportsmen regarding damage by game species to agricultural crops is likewise subject to detailed regulation. The rights and obligations of each group are defined, and damage resulting from failure to exercise proper precautions is assessed against the offending person or groups.

Amid this detailed management a pleasing variety and abundance of small birds is to be seen in Germany. The careful management of forests, woodlands and orchards leaves few or no dead standing trees. Hole nesting birds would be at a disadvantage were it not for the numerous bird boxes put up by both townspeople and farmers. Small farms and home properties abutting on the railroad rights of way abound in such boxes erected on slender poles. Here is a hint as to possible necessary aid to birds in areas depleted of dead trees by "clean-up" campaigns in California!

Societies interested in bird protection are numerous in Germany; for example, there are no less than seven such in Munich alone, and the total number and membership in such organizations throughout the Reich are very large. The general result is that small birds abound in the gardens, parks and open woods.

An outstanding example of bird protection and encouragement was seen at Munich in the great "English Garden," so called because of the informal character of its planting

contrasts with the geometrical patterns in many German gardens. In this great public park with scattered trees, bushes, lawns, ponds and streams there were numerous feeding stations for birds of various kinds in the trees and beside the footpaths. These were regularly supplied with food of appropriate sort, such as seeds for finches, and nuts and seeds embedded in suet for tits and woodpeckers (figs. 24–26). People sauntering

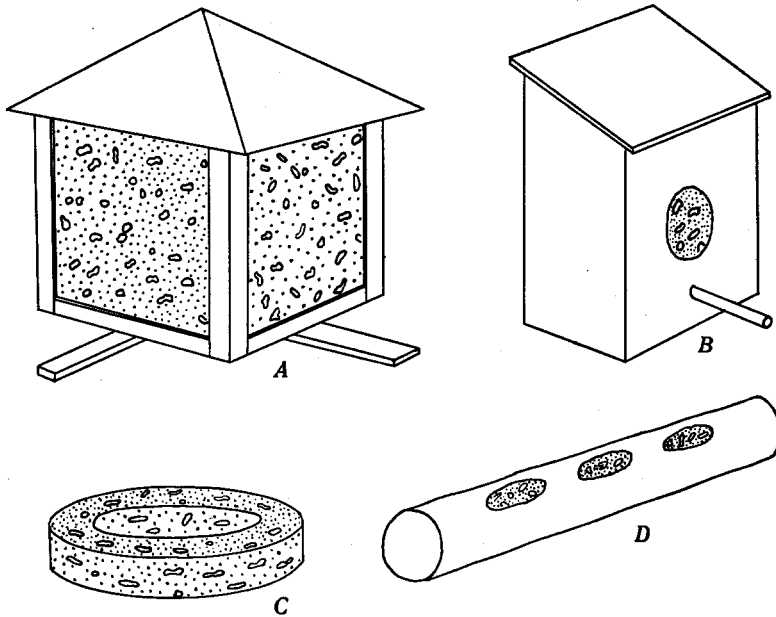


Fig. 24. Bird-feeding devices, using mixtures of suet and nuts, for sale in Munich, Germany. *A*, "house" of wooden frame, 5" x 5", with metal roof, to be suspended by wire. *B*, wooden block roofed with slab of wood, to be suspended, or fastened to window casing. *C*, ring of suet-nut mixture, to be suspended. *D*, portion of branch of tree, the holes filled with suet and nuts; to be hung upside down to exclude finches and suspended by wire so as not to be available to squirrels or mice; dimensions 2" x 12".

in the Garden, often carried food for the birds; a few "educated" birds, notably Blue Tits, would even take food from a person's hand. Window ledges of the four- and five-storyed residential buildings in the city often had feeding shelves resorted to by Green Finches, Tits, and House Sparrows.

The feeding devices were numerous and varied. Food in these is evidently provided by the park authorities (at least this was true at the time of our visit in March, 1934). A dealer in garden supplies, J. Schmitz, Victualienmarkt, 5, had for sale several prepared suet and seed mixtures. A resident of Munich stated that since this interest in the feeding of birds had developed, some species that were formerly birds of passage now remain through the winter. On the opposite side of the picture there were on sale devices intended to frighten birds from home gardens, such as a piece of blackened sheet metal cut in the silhouette of a cat's head with clear glass spheres for eyes, intended to be hung over a bed of plants, and a series of thin aluminum strips about 1½ by 6 inches in length, to be suspended on a string over a row of plants for the same purpose; however,

agricultural officials reported that neither of these was very successful in keeping birds away.

Falconry is still of interest in Europe, so much so that in Germany there are associations of falconers and a special license is provided, at a low fee, for interested persons.

The general attitude in England and Scotland regarding bird populations is perhaps better known to Americans than that of the continental countries. Legislation and royal decrees regarding the conservation of game, particularly on the lands of royalty and the nobility, dot the legal history of Great Britain. The modern attitude toward general protection of birds began in the latter part of the nineteenth century through action of the British Association for the Advancement of Science. The first specific parliamentary act on the subject dates from 1869. The most important single law was



Fig. 25. Small feeding station, thatched with fir branchlets. Supporting post on some stations surrounded by metal sleeve (English Garden, Munich, Germany).

passed in 1880. Subsequent enactments and governmental orders have markedly improved the status of small birds. An important recent development is that of prohibiting the trapping of small species for caging. An ingenious provision in this law requires that all caged birds offered for sale must have a solid band on the leg, such as can only be placed on during the nestling stage; this precludes capture of free-flying individuals and will force the cage-bird trade to depend chiefly, if not exclusively, on aviary-reared

stock. Posters calling attention to the laws protecting small birds are displayed on bulletin boards at post offices, town offices, and other public places in various parts of England. In consequence of these restrictions, which are well enforced, birds of various



Fig. 26. Large shelter for feeding finches and tits; 6 feet long. Tray below used by finches. A compartment under roof, protected by screen, is accessible to tits through holes in the end boards (English Garden, Munich, Germany).

species abound in England and Scotland. Public parks have their appropriate quotas and the farming areas have theirs.

Two major items of interest in human relations are the management of game birds and the means taken to protect garden plots from damage by small birds. Where Germany inclines to a program of state supervision in these matters, the English attitude is highly individualistic. A few of the age-old "decoys" for trapping ducks in winter (as described by Lubbock, R., 1879, *Observations on the fauna of Norfolk . . .*, Norwich, Jarrold & Sons, pp. 134-141) still persist in Norfolk. The artificial rearing and release of pheasants under close supervision engages the services of many game keepers in England; on estates with partridges, definite human aid is accorded "to assist nature" by interesting techniques that cannot be detailed here. Grouse on the moors of Yorkshire and in Scotland are supervised, and the heather is burned periodically, in patches, to ensure a crop of young shoots for their forage. On all game lands the destruction of "vermin" is a prominent activity. In consequence, hawks are scarce, although rooks and jackdaws survive despite continued persecution.

England lies too far north to permit of successful commercial production of fruit save in a few southern counties; yet many home gardens, even into the midlands, have a few fruit trees, while vegetable and flower gardens and berry patches are plentiful. These crops are to the liking of the European Blackbird, the Song and Missel thrushes, Bullfinch and other passerines. To conserve such crops for human use, string netting of small mesh is employed in various arrangements, supported over individual plants or covering entire garden plots during the fruiting season. Old herring nets find ready sale for this use, and several manufacturers make special nets for this service (for example, Walker's Fruit Tree Protectors, Ltd., Brecon, South Wales). The growing

and harvesting of such garden crops for table use would not be practicable in many localities without these nets. Indeed, one plant pathologist at Harpenden finds it necessary to enclose with nets his annual crop of experimental cereals grown for use in study of plant diseases to protect the plants from the "English" Sparrow. Such nets also are used in Bavaria to protect grain from doves. The introduction of this technique into American and Californian gardens merits consideration, although its application to commercial plantings has practical limits.

Sale of game is a regular practice in European countries. In Germany and England this can be done without endangering the future supply because the management plans provide for shooting from the local populations of game species each year no more than can be safely spared on a basis of continued yield. Such sale is not practicable in America where this type of regulation is absent. Dealers in game in England must obtain special licenses and in Germany the whole matter is incorporated in the Prussian Game Law, with specific arrangement for storage of game marked by lead tags in refrigerator warehouses, to be withdrawn as needed.

Game birds and mammals were on sale in practically all of the larger cities visited. In each of these effort was made to find markets displaying such materials. Less was seen in England because of the lateness of the season. Some of the offerings noted were as follows, the figures in parentheses indicating approximate value in American dollars at normal gold exchange:

Paris (January 21): wild mallard, 22 francs (87 cents); woodcock, 17 francs (67 cents).

Nimes (January 26): lapwing (*Vanellus*), 3 francs (12 cents).

Rome (February 11): wild mallard, 9 lira (47 cents); pheasant, 16.5 to 18 lira (87 cents); snipe, 3 lira (16 cents); large thrush and European blackbird [size of American robin], 1.4 to 1.6 lira (7.3 to 8.4 cents).

Munich (March 22), cold storage supplies: pheasant, 2.0 to 2.5 reichsmarks (44 to 55 cents); partridge, 0.8 to 1.0 reichsmarks (17 to 22 cents).

London (May 3), cold storage supplies, imported: hazelhuhn [equivalent to ruffed grouse], 1 shilling, 3 pence (30 cents); Russian ptarmigan, 1 shilling, 3 pence (30 cents).

In Rome during mid-February, a Rotisserie where cooked meats were sold had small passerine birds alternated with slices of bread on a rotating spit before a fire.

That all is not well with even so favored a song bird as the Skylark is indicated in a recent report from London that indicates complaint by farmers of damage to their crops by this species.

What then may be inferred from the European picture, as to the future, ornithologically speaking, in California? I think that with the growth of human civilization in California, we may expect that most, if not all, of our bird species will continue to exist. Application here of the "sportsman's" attitude with regard to predators and game, despite important differences in local conditions will, I fear, decrease further our birds of prey; our best efforts at education and legislation will aid these species only in limited degree. Further introductions of alien birds, despite advice and laws to the contrary, may shift the balance in respect to a few native birds, especially game species. More intensive activities may be expected here in respect to actual management of game bird populations. The recent waves of protest from farmers regarding bird damage to crops and from naturalists against invoking control measures will in time reach an equilibrium more nearly acceptable to both interests. Continued development of public parks and private gardens will compensate in considerable degree for destruction of wild cover. Our bird populations may be expected to persist, with but limited modification, for many generations.

Division of Zoology, University of California, Davis, California, December 31, 1937.