The remaining families—*Dulidae* and *Chamaeidae* have rounded wings and are of southerly distribution.

To sum up: No North American ten primaried oscine bird makes a long migration unless the outer primary is minute or apparently lacking; nor has any member of a tropical or semi-tropical group become a migrant in North America without showing the effect of its journeys in the form of the wing and the relative size of the outer primary.

1075 Iranistan Ave.,
Bridgeport, Conn.

SOME RESULTS OF BIRD BANDING IN EUROPE.[1]

BY FREDERICK C. LINCOLN.

Plate XVIII.

THE phenomenal increase in the popularity of bird banding in North America as a means of acquiring precise information bearing upon the problems of migration and life histories of birds, is responsible for a material interest in the results obtained by European investigators in this same field of research. The present

[1] In reading an account of bird banding in Europe the American reader should bear in mind that on a continent so divided politically and geographically as Europe, with the differences of race and language between different countries it has not been possible to organize banding, to use one system, or a uniform series of bands, nor one central control as in America; in Europe the banding has been done by single stations, or by scattered volunteers cooperating with the station in each separate country. American ornithologists have already seen and will appreciate more and more the very great advantage we have in the study of migration by reason of the uniform system extending the length of the continent, as well as the more uniform race of people and language; this advantage appears not only in greater probability of returns, but it makes it possible to organize banding stations along definite routes of migration.

While many American birds may travel far beyond the limits of the continent, many other species do not go beyond these limits or beyond this uniform system of banding control.

Again, the World War was a severe blow to progress in bird banding in Europe. Professor Mortensen had started serious study by means of banding in Denmark as early as 1899, and gradually it had been taken up by certain ornithologists in other countries and made good progress, especially from 1910 to 1914, but of course was largely prevented during the war and has made slow progress since.

Systematic trapping for the purpose of banding adult birds, and to recover them, has not been adopted in Europe to any such extent as in America. A

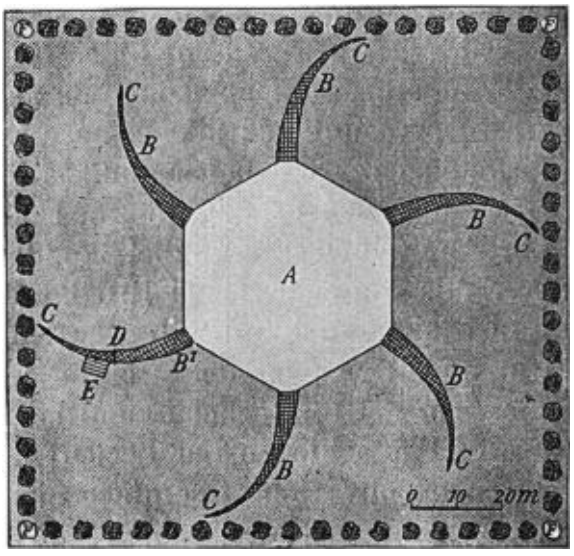

FIG. 1. THE BIRD OBSERVATORY AT ROSSITTEN, GERMANY, DESTROYED DURING THE WAR AND RESTORED (THIENEMANN)

FIG. 2. DIAGRAMMATIC SKETCH OF TRAP USED BY MORTENSEN TO CAPTURE DUCKS. "A." ALIGHTING POND; "B." CANALS COVERED WITH NETTING WHERE DUCKS ARE BAITED WITH BARLEY. WHEN THEY COLLECT AT "C," THE SLIDING DOOR "D" IS CLOSED. GATHERING CAGES ARE PLACED AS AT "E." AND POND IS SURROUNDED BY SHRUBBERY "F" (MORTENSEN).

paper is intended to present a résumé of the most noteworthy of these results and may be considered as the natural sequel to a paper by the writer outlining the history of bird banding and the problems to which it was believed the method might be advantageously applied.[1] It has been prepared at the earnest solicitation of Mr. S. Prentiss Baldwin, whose interest and generosity in this work it is a pleasure for the writer to acknowledge.

In presenting the following summaries of the information relative to the different species, the object has been as far as possible to consider the data as though obtained under the direction of a single agency, i. e., in the same manner that problems would be considered in North America, where the work is entirely under the direction of the Biological Survey aided by cooperative agencies. It is obviously outside the scope of this paper to present the details that would be of principal interest to workers in the ranges of the respective species, and for this same reason only those species have been selected for treatment for which there is available a sufficient amount of data to render this résumé of importance to American students. Analyses only are therefore presented of the returns obtained from banded White Storks, Great Gray Herons, Pintails, European Teals, Black-headed Gulls, Lesser Black-backed Gulls, Starlings and Swallows. There are many additional species for which data are accumulating, and with continued effort on the part of the banders there can be no doubt that other important contributions will be possible. The published reports available treat almost exclusively the data that have been amassed by single organizations, although papers appearing within the last two or three years have frequently made supplemental reference to the notable records of other workers. It is believed that all of the important papers have been examined, and a list of these

Mr. Lincoln says, the results are confined largely to chance returns mostly of dead birds, and to a few species most likely to be reported.

Bird banding in Europe, and in America also, has been used chiefly in study of migration, or a few chance age records, but in the opinion of some ornithologists the greatest value of banding will be in the intimate study of the daily life of the individual bird, and better understanding of the home life of each species. We believe that systematic trapping will open possibilities in bird study that have been realized as yet neither in Europe nor in America.—S. PRENTISS BALDWIN.

[1] "The History and Purposes of Bird Banding," by Frederick C. Lincoln, 'The Auk,' vol. 38, no. 2, pp. 217-228, April, 1921.

together with other works by European writers that have been of service in the preparation of this digest is added to the form of a bibliography. Much credit is due the painstaking efforts of these investigators and the author makes no effort to conceal the fact that in some instances he is quoting almost verbatim from their reports, supplementing their conclusions only by the addition of the deductions of other workers along the same lines.

With few exceptions, bird banding in Europe has been of a promiscuous character, that is to say, determined attempts to effect returns by systematic trapping have not been generally undertaken. A few workers in the British Isles and apparently also in Hungary have maintained small bird trapping stations and, as would be expected, have thereby materially increased the number of returns. Thomson (1921) has referred to the obvious importance of such work, as demonstrated in the course of the Aberdeen University bird-migration inquiry, when, through systematic trapping, three stations obtained as returns on the Blue Titmouse, the high percentages of 90.2, 53.3, and 42.2. In contrast to this, a much larger number of individuals of this species banded at other places where trapping was not practised yielded only 1.1 per cent returns. But as will be observed from the different species here treated the most notable contributions are those relating to birds which by virtue of their place in sport, or by other factors which cause them to be killed by hunters, still allow the element of chance to assume considerable importance. This is, however, the natural course of the initial stages of such investigations, and may be considered as approximating the course that will be followed to a greater or lesser degree with similar species in this country, although, through the application on a large scale of systematic trapping to the smaller species, American bird banders may be expected to forge ahead of their co-workers in Europe in the prosecution of such studies.

Because of the fact that practically all of the returns here utilized are from dead birds, obtained by chance, they are considered as applicable only to problems of migration and orientation.

White Stork (*Ciconia ciconia*).

Among the many birds studied in continental Europe by means of numbered bands, probably none have yielded results of greater interest than those of the White Stork. Occupying a prominent place in history and regarded with almost reverential respect by the peoples of many countries, it was but natural that storks should be given considerable attention by exponents of the banding method. The customary nesting sites of the birds have no doubt been contributory to this, for in taking up any new method of investigation, the species most readily obtainable is almost always sure to receive first treatment. On the other hand, despite the regard that popular fancy attaches to these birds, it is a curious commentary that such large numbers should be killed, particularly in those countries of Europe where they have long been considered as birds of good omen.

The center of abundance of this species during the breeding season is that portion of continental Europe from northern France, Belgium, Holland, Denmark, Germany, Austria, and Hungary to Scandinavia and Russia. In this region Storks have been banded by the Leyden Museum, Holland; by Prof. Mortensen in Viborg, Denmark; by the German Ornithological Society, at Rossitten on the Baltic Sea (See 'Bird Banding and Bird Migration Work at Rossitten on the Baltic Sea' by Theodor G. Ahrens, 'The Auk,' vol. 40, pp. 247–256, April, 1923) and elsewhere; and by the Hungarian Central Bureau for Ornithology. Returns have been received on a comparatively large scale so that it is possible to outline with reasonable accuracy the wintering areas, the routes thereto, and other facts of importance.

As shown on the map (fig. 1), the principal winter quarters of Storks from Europe, are located in Africa from the headwaters of the Nile (Lake Victoria Nyanza) south to the Transvaal, Orange Free State and Cape Colony. To reach these regions one route of travel may be sketched almost with certainty. The birds from Denmark evidently follow the peninsula of Jutland southward to the mainland where with constant accretions to their numbers the flight is continued southeastwardly through the valleys of the Elbe and Oder Rivers, the passes of the Carpathian Mountains and Transylvania, and the Balkan Peninsula to the Dardanelles.

Fig. 1.—The migration of the White Stork, as shown by banding records. (After Mortensen.)

Thence, skirting the shores of Asia Minor and Syria to the delta of the Nile, from which point the route is more or less directly south.

Another route, seemingly of lesser importance, is indicated by a series of returns from France, Spain, and northwestern Africa. It would appear that those birds breeding west of the Weser River, fly south and west through the valley of the Rhone to the Mediterranean coasts of France and Spain to Gibralter, thence across the straits to Morocco. From this point the flight of this group is somewhat obscure, and it is of course possible that the long flight across the Sahara Desert is undertaken with only the scattered

oases as possible points for rest and food. Whitaker (1905) states that in Tunis he has never met with this bird in winter and as supporting evidence that the trans-Sahara flight is actually made, as has been asserted by some writers, reference must be had to two returns from central Africa south of the desert. One is from the vicinity of Lake Chad and the other from a point to the south and about midway to the Nile. In view, however, of the connecting link afforded by this latter case the suggestion is made that occasionally wanderers reach such western points from the north and south flyway in eastern Africa. It is also quite evident that prolonged flights do not appeal to this species, which is demonstrated by the fact that the flight across the Mediterranean is avoided by taking the circuitous land route previously outlined.

The dispersal of young birds and the possibility of the colonization by them of new areas, together with the probable ages attained by birds in a state of nature, are questions that hold much interest to the investigator. Returns to the point of banding have been largely from adults, and it is therefore advantageous to consider other returns obtained principally by Dr. Thienemann of the Rossitten bird observatory. Several young Storks banded in East Prussia and Mecklenburg have been killed or recaptured within comparatively short distances of the points of banding. Two or three of these were recovered at points only about 18 kilometers (about 7 miles) from the stations where banded. It is nevertheless peculiarly significant that these recoveries were not effected in the season immediately succeeding, but all after a period of at least three years, while in a few cases, the time extended over four or five years. The hypothesis immediately presented is, that the White Stork requires a period of not less than three years in which to reach sexual maturity, a deduction that would appear to be well justified. Shenk (1923) has presented interesting data relative to the number of young produced during a term of years by these birds. He found that 2,199 pairs raised in eleven years 5,790 young. The record year was 1915 when 136 pairs raised 509 young, while the lowest was 1918, when 21 pairs raised only 72 young. Considering the records for the entire period of eleven years, an average propagation coefficient of 3.07 per cent is obtained.

This species is one generally credited with long life but although

the banding of Storks was started by Mortensen in 1899 and by the German and Hungarian agencies in 1903 and 1904, the oldest bird for which the record has been made available is one that carried a Rossitten band and which was killed when eleven years old.

A matter of incidental interest relates to the speed of travel which is rather slow as would be expected of such a bird. One Stork banded about 120 kilometers northeast of Berlin, was observed to leave on August 19, 1908. Seven days later (August 25) it was killed at Kassa Bola, Hungary, a distance of 640 kilometers, or 247 miles, which represents an average daily flight of a little more than 35 miles. Mortensen has figured the speed of flight during migration at an average of 300 kilometers per day (96 miles). This was computed on the basis of the long flights from Jutland to the Orange Free State, a distance of 24,000 kilometers (14,880 miles).

Great Gray Heron (*Ardea cinerea*).

Herons have been banded wherever found by investigators in all countries, but the only project that has yielded any quantity of data is that conducted by Prof. Mortensen (Saxtorph, 1922).

A heronry in North Zealand, Denmark, was worked during 1910, 1911, and 1912, with the result that 186 nestlings were banded, yielding (to 1922) 70 returns. Eleven countries (including Denmark) are represented in these records, extending from Sweden south to Algeria. Four returns were recorded from England and Scotland, all the others (except one from Sweden and one from Hungary) coming from countries lying south or southwest of the point of banding. It is therefore apparent that these birds perform their migratory flights over the well-known coastal route, following in a general way the western shore line of Europe. In Denmark banded Herons have been taken in almost every month of the year, while other winter quarters appear to be found over a large part of western Europe. The areas most favored seemingly are the regions around the mouth of the Elbe River and the rivers of Spain and Portugal. A few birds returned and were killed in subsequent seasons as breeding birds in the original colony, and many of the returns are from birds secured while the carriers were

still young, but a few have succeeded in avoiding capture for several years. The record for longevity is held by one that was nine years old when killed.

Herons also have been banded on a considerable scale in England and have yielded several recoveries but all are either from the immediate vicinity where they were banded or from more distant areas within the British Isles.

Pintail (*Dafila a. acuta*).

Particular interest attaches to game birds by virtue of the fact that comprehensive results of banding may be confidently expected at an early date. This is, of course, due to the great number of returns that are sent in by sportsmen.

For some reason migratory game birds of the Anatidae have been largely ignored by both the German and Hungarian agencies and our attention is therefore necessarily confined to the records brought together by Aberdeen University, by British Birds Magazine, and particularly by Prof. Mortensen, of Viborg, Denmark. With the present species, the investigations of Mortensen offer almost the only material, as the few recoveries of birds banded in the British Isles are all from relatively short distances from the point of banding.

The breeding range of the Pintail as given by the 'List of British Birds' extends from 72 degrees north latitude south to about 50 degrees but also occasionally to southern Spain, the delta of the Rhone, and Hungary. The winter range extends to northern Africa including Egypt and Abyssinia, and to India, Ceylon, Burma, China, and Borneo. In the British Isles this Teal is a resident and is a regular visitor from the continent between September and April.

By means of a specially built trap or "duck-decoy," Mortensen (1914) banded 320 Pintails at the island of Fäno on the west coast of Denmark during the fall seasons of 1908, 1909, and 1910, (Plate XVIII fig. 2).

From these birds 67 returns or 21.5 per cent were obtained, a most excellent percentage when it is considered how many different countries were involved in the returns. These data indicate with great accuracy the breeding and winter ranges and the route fol-

lowed by the individuals of this species that pass through the region where the banding was done.

The principal breeding area of these birds is shown (fig. 2) to

Fig. 2.—Migrations of the Pintail. The island of Fäno where most of the birds were banded is shown by a spot enclosed by a circle. (After Mortensen.)

extend from Lapland (Muonio River) and Finland (Uleaborg), east to the tundra of northern Russia bordering the White Sea (Archangel). The winter range is indicated as extending south and east from the latitude of Fäno, through the valley of the Rhine, and along the Bay of Biscay thence to the northern shores of the Mediterranean Sea (Gibralter, Seville, Valencia, and Aude), Italy (Ferrara, Umbria, and Capua) and the eastern shores of the Adriat-

ic Sea (Jugo-Slavia). A bird taken on April 29, 1910 at Nizhni Tagilsk, Siberia, on the east side of the Ural Mountains, was probably en route to the breeding grounds by an interior route, not used by the majority of the flocks, while another taken near Kief, Russia, on July 29, 1909, may have either been a breeding bird or a male that had wandered south into the interior after the breeding season.

The migratory flight to the south and the gradual working back with a moderation of the weather is well illustrated by the returns. One bird was secured in Scotland (Edderton) on November 20, 1908, another was captured in Ireland (Tyrone) in April, 1909, and another at Devonport, England on December 10, 1909. Dr. Eagle Clarke (1912) has already shown the British Isles to be the winter home of some of these birds that breed in more northerly latitudes on the continent, an assertion that is substantiated by these data. Sixteen of the banded birds also were recaptured during fall migrations at Fäno, Denmark, demonstrating the well established character of the southwest route along the coast which is followed by a majority of the individuals of this species in successive seasons. The records contained in this series may be considered as one of the most successful examples of results obtained by an intensive application of the banding method, and one that is hoped may be checked and extended by similar activities in other parts of the range of this almost cosmopolitan Duck.

European Teal (*Nettion crecca*).

According to the List of British Birds, the European Teal breeds in Iceland, the Faroes and in continental Europe and Asia north to about 70 degrees north latitude, decreasing in numbers south to the Mediterranean, Turkestan, and the Amur Valley. In winter it is found south to the Canary Islands, Abyssinia, India, China, and Japan. It is a resident species in the British Isles, although in winter its numbers are greatly increased by the arrival of visitors from the continent.

From the above outline of the range of this species it is evident that a great number of birds must be banded before any comprehensive report can be made on their periodic movements. This has not yet been done and it again becomes necessary to confine

our review largely to those records obtained by Mortensen(1908), supplemented by a few from birds marked in England and Scotland with bands from British Birds Magazine and Aberdeen University respectively (Thomson, 1923) from the island of Fohr off the western coast of Schleswig-Holstein with bands from Rossitten bird observatory and from Leyden, Holland, with bands from the Leyden Museum.

By reference to the published reports it is noted that Mortensen banded 102 Teal at the island of Fäno, Denmark, in October, 1907, from which 22 returns have been obtained; 149 were marked

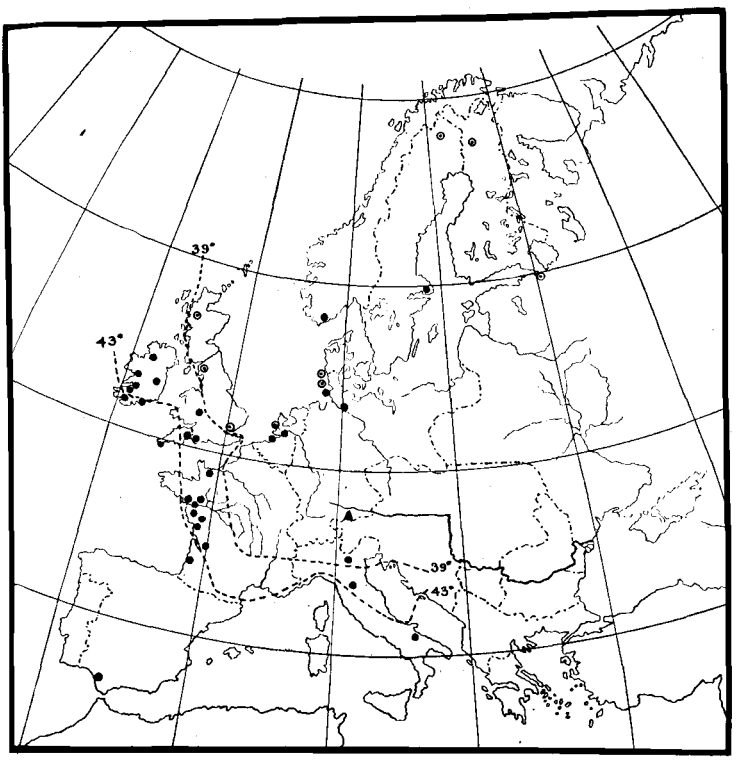

Fig. 3.—Migrations of the European Teal. The dotted lines represent the isotherms of 39° and 43° for the month of January. Spots enclosed in circles denote points where banding was done. (After Mortensen.)

with British Birds Magazine bands, yielding 17 returns; and 28 were banded during the course of the Aberdeen University investigations, producing 2 returns. The number of records from other sources is small (fig 3).

As Mortensen's birds were banded in the fall it is apparent that they were on migration and no clew is afforded regarding their breeding grounds, but one taken in the following spring (April 12, 1908) near Stockholm, Sweden, probably denotes a bird at or near its nesting area. The Scandinavian peninsula is very likely the summer home of a great many of the Teal migrating through western Europe for among the returns of birds carrying British Birds bands, there are two (banded in Staffordshire and Wigtownshire) that also were recovered in southern Sweden during the months of July and August respectively, whilst a third, banded at Essex on February 14, 1910, and recovered near Hamburg in northwestern Germany on August 8, 1910, may either have bred in the vicinity or at a point farther north, in which latter case the bird was on migration when killed.

As is well known, this Teal generally prefers a mild climate being in this respect comparable to the American species of *Querquedula*, and it is, therefore, not surprising that Ireland with an almost frostless winter, numerous marshes and a network of streams should be favored by them as wintering grounds. The same may be said for the region in the western part of France between the rivers Loire and Gironde. By following the isotherms of 4° and 6° C. (= 39° and 43° F.) for the month of January, Mortensen has discovered that the regions included between these lines, cover the areas mentioned above and it is from them that most of his Teal were reported. As will be observed from the map the French and Irish areas are connected by the records of a few birds that were taken in southern England. After pursuing a southeasterly course down the west coast of England and including almost the whole of Ireland these isotherms continue to southeastern France where they turn abruptly eastward, crossing northern Italy, the Adriatic Sea, and Jugo-Slavia. The winter range of the banded Teal is carried through these regions with remarkable fidelity as is indicated on the map.

The fall migration to these areas is probably by a main route

down the coast of the continent, supplemented by a line of flight that crosses the North Sea to the British Isles from southern Scandinavia, where it would most likely meet a line of birds moving southward from Iceland. Eagle Clarke has already recorded the fact that at Fair Isle (midway between the Orkney and Shetland Islands) Teal are fairly common during both spring and fall migrations, indicative of a regular and possibly important flyway that as stated above, may have its origin in Iceland and Scandinavia. From observations at light stations on the east coast of England, it is known also that there is a regular movement of birds from the continent to the British Isles, so that there may be a continual arrival in that country of birds that leave the continental route at any point along the English Channel. It is furthermore not improbable that many of the exotic Teal wintering in France proceed thereto via the English-Irish flyway, although this would imply a roundabout course. Some weight to this hypothesis is gained from a consideration of the dates of the capture in France of Teal marked at Fäno, most of which are included in the period from November 9 to February 15, and by the fact that there are but few returns of these birds from the coastal areas immediately south of the point of banding.

A Danish Teal captured in the marsh of Las Marismas at the mouth of the Guadalquivir River, in southern Spain, probably indicates the southern limits reached by these birds.

Black-headed Gull (*Larus ridibundus*).

As in America, so in Europe bird banders have given much attention to the colony breeding birds, which furnish large numbers of both young and adults for banding purposes. Of such birds, there are two or three species of Gulls, the banding of which has furnished a considerable quantity of data pertaining to their movements after the nesting season. Among these the Black-headed Gull (*Larus ridibundus*) offers the best case for consideration, made doubly so through the capture in American waters of two birds banded in north-central Europe.

This species breeds in the Faroe Islands and in Europe generally from southern Scandinavia and northern Russia southward to the Mediterranean, Sardinia, and Asia Minor, and eastward through

temperate Asia to Kamchatka. In winter it visits North Africa and southern Asia, including India, China, Japan, and the Philippine Islands. It is resident in the British Isles and in other portions of temperate Europe.

The southern and eastern coasts of the Baltic Sea contain many

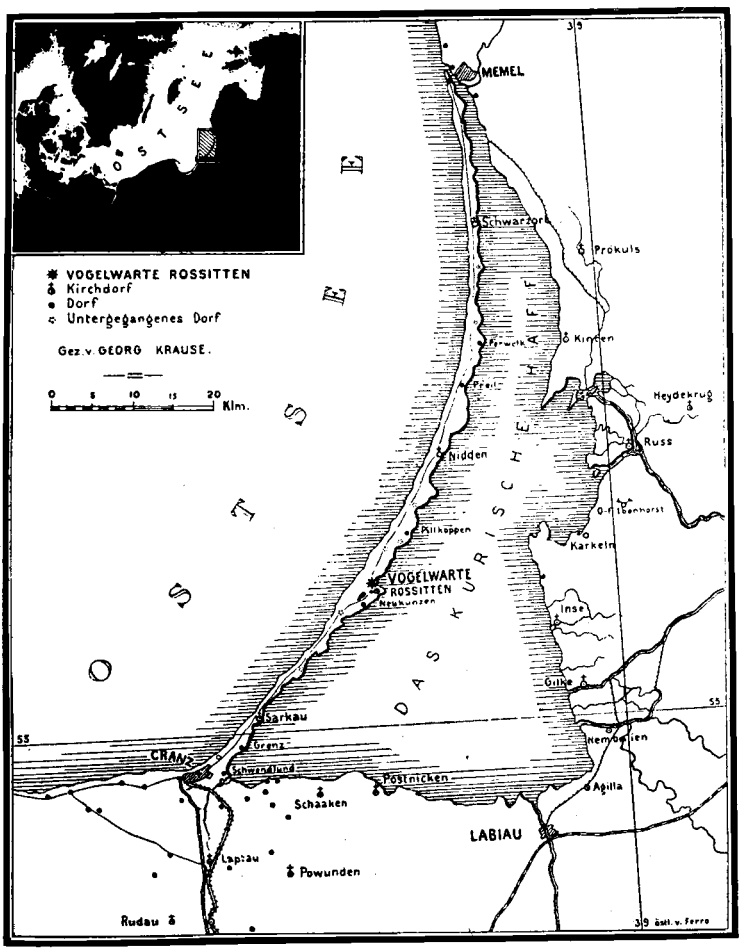

Fig. 4.—Map showing the location of the Rossitten bird observatory on a sand-spit on the southeast coast of the Baltic Sea. (Thienemann.)

large colonies of these birds, one of chief interest being in the neighborhood of the German bird observatory at Rossitten (Pl. XVIII fig. 1 and text fig. 4), forty or fifty miles north of Königsberg. The "gull marsh" as Dr. Thienemann calls it, has figured largely in the banding activities of that station, and it is from that point that the most surprising returns have been received. In a manner comparable to *Larus franklini* of America, the Black-

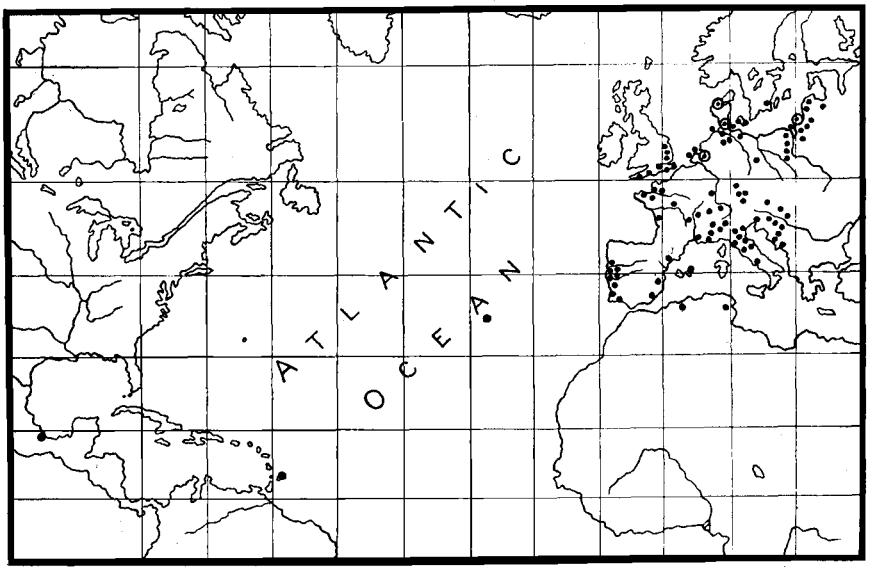

Fig. 5.—Migrations of the Black-headed Gull. The returns of particular interest are those from the Azores, British West Indies, and the vicinity of Vera Cruz, Mexico.

headed Gull of Europe breeds in the marshes of inland lakes and it is to such colonies that attention has been given by Austrian and Hungarian ornithologists. Prof. Mortensen and his assistants also have banded these birds in the colonies along the Danish coasts, Dr. Van Oort has banded them in North Holland, and between 1,100 and 1,200 were banded in Scotland and northern England during the course of the investigations by Aberdeen University.

Returns in large numbers have been obtained, indicating with much accuracy the southward movement to winter quarters (fig. 5). In studying these data, it must be borne in mind that the migrations of the Laridae are usually performed in a desultory manner, the birds wandering along in a leisurely fashion, although holding to the general direction dictated by the season, but only occasionally making the long non-stop flights characteristic of many other groups. An example of the exceptional cases is found in a young bird marked June 25, 1911, in North Holland, and recovered on the Mediterranean coast in the south of France on August 9, 1911. Generally speaking, however, the Black-headed Gulls adhere to the rule above mentioned, as the returns indicate that the long journey via the coast line is followed by a large percentage of the birds. This route takes them along the coasts successively of Germany, Holland, Belgium, France, Spain, Portugal, and Spain (again) to the north African coast where the winter months probably are passed. From this main flyway there are several offshoots or branches, marked by the principal river courses that are encountered. Foremost amongst these is the valley of the Rhine which is evidently followed by the migrating birds as long as a southerly direction is maintained, but at Basel, Switzerland, the birds appear to cross the Jura Mountains, in order to reach the north and south valley of the Rhone, which then becomes the flyway to the coast in the vicinity of Marseilles. There is no doubt but that many birds remain in that region for the winter, working gradually along the coast to the east and west, but it would also appear that others continue the movement along the Spanish coast to a point where meeting the travelers from the Atlantic seaboard—the flight is ended on the coast of Morocco. The returns also show that other birds prefer the shorter flight to southern England, where conditions are such as to permit their wintering. The flight to such points is obviously from the coastal or southwestern route.

Another flyway of much importance is one that takes an almost due southerly direction, crossing the Vistula and the Oder, and passing between the Carpathian and Reisen Mountains to the valley of the Danube thence along that river to a point approximately opposite the Gulf of Trieste in the Adriatic Sea, which is

reached in part via the River Save and its tributaries, and in part by a short cross-country flight through Jugo-Slavia. The northern shores (both east and west) of the Adriatic Sea, support a large number of the migrants, while there is further evidence that at least a few birds continue south through Italy and cross to Tunis via Sicily.

The flight of two Gulls from Rossitten to American waters is of exceptional interest, offering parallel cases to the American Common Tern that was found in West Africa. One of these Gulls, banded at Rossitten on July 18, 1911, was recovered near Bridgetown, Barbados, British West Indies, during November of the same year, while the other was captured during the following February (1912) near Vera Cruz, Mexico, in the Gulf of Campeche. As a possible connecting link that may indicate the course followed by these transoceanic travelers, reference may be had to the record of one that was banded in Yorkshire, England, and which was recovered from the Azores during its first winter.

Lesser Black-backed Gull (*Larus f. affinis*).

A recent paper by Dr. Thomson (1924) presents an admirable analysis of 153 returns received from a total of 3,865 birds of this species banded in the British Isles, chiefly on the Faroe Islands, off the coast of Northumberland or at Foulshaw, Westmoreland. These birds also have been banded to some extent by Dr. Thienemann at Rossitten.

The two races of this species breed generally in northern Europe from the Faroe Islands and Scandinavia eastward through Russia to the Dvina River. The winter range extends south to Arabia, western India, the west coast of Africa, the Canary Islands and the Azores. Generally speaking the two subspecies may be considered as eastern and western races, but as there appears to be a certain intermingling during migration and on the winter range no attempt is made to separate the banding records.

A well defined migration is performed, the coastwise route being favored and the returns from birds marked in England and on the Faroe Islands are well connected from the Gulf of St. Malo on the west coast of France, southward along the French coast, the north and northwest coasts of Spain, the coast of Portugal, and the south-

west coast of Spain to Gibraltar. At this point the route divides, one line turning eastward along the coast of Spain and crossing to Algiers, Sardinia, and southern Italy, while the other continues southward across the Strait of Gibraltar to Morocco, the Rio de Oro, the Canary Islands and Senegal; a total distance of about 3,000 miles.

The bird recovered in southern Italy (Calabria) was banded near Danzig and, as Dr. Thomson points out, there is no definite proof that some or all of the birds that reach the Mediterranean area may not have crossed overland from such a point as the Gironde estuary to the Gulf of Lyons. Such a course is obviously much shorter than the long coastwise journey via the Spanish and Portuguese coasts, but from the fact that Gulls are more or less nomadic it may be considered doubtful whether they make any effort to search out the most direct route to winter quarters. There are moreover, very few returns from the interior that would indicate such flyways. Only one of these, a Rossitten bird taken at Plauen, Saxony, a month after banding, appears at all suggestive of an overland route to the southwest.

The other inland records do, however, offer some basis for belief in a cross-country flight leading almost directly south. All are of birds with Rossitten bands. One was recovered thirteen days after banding at Saromberke in central Roumania and another, taken twenty-two days after banding, was reported from Belgrade, Serbia. The farthest point reached on this presumed flyway, is marked by a bird banded in October and captured during the following May in the delta of the Nile.

There are a few records of birds banded both in England and on the continent that are curious in that they cannot be definitely applied to any of the well marked highways. Rossitten birds recovered in Denmark shortly after banding do not appear to have any special significance unless the carriers were merely flying westward to join the main stream of migrants working down the coast. An English Gull taken on the west coast of Norway in September of the same year in which it was banded can only be considered as an exceptional case of wandering. Another bird banded in southern Sweden and recovered in Essex, England, twenty months after, also is lacking in special interest.

Starling (*Sturnus vulgaris*).

Studies of the migration of this species early attracted the attention of bird banders in Europe, resulting in a great number of birds being marked in England, Scotland, Norway, Denmark, Germany, and Russia. The returns obtained are of considerable interest and have been recently summarized by Dr. Thomson (1922).

Dr. Thomson's paper deals primarily with the data amassed by British Birds Magazine, but in order that his analysis be as complete as possible, the records from the investigations of Aberdeen University also are included, together with a short résumé of the outstanding records from other countries. As a result of the two British projects 472 returns were available, from a total of 9,498 banded birds, the equivalent of 5 per cent. Dr. Thomson explains that the number of recoveries is somewhat artificial due to the retrapping activities of the markers, but according to American methods of operation these records in themselves are of considerable value, although it is clear that part of these cases should be classified as "repeats."

In analyzing the data, it is shown that birds banded in summer, both as adults and fledglings, are mostly sedentary, for of 119 returns of birds banded at that season, 105 are from the vicinity where they were banded. Thirty of these were banded as adults, and 75 as nestlings. These data cover a period of six years, most, however, being secured during the first two years after banding. Of the returns from nestlings six (two each in the second, third, and fourth years) were reported as breeding at or near the place of marking, while five adults were reported as breeding returns to the original locality. Only 14 distant returns were received from these summer banded birds and none of these were outside of the British Isles. There is, however, a record of a nestling Starling, banded in Kent, on May 22, 1908, by Dr. C. B. Ticehurst (1910), which was returned from near Boulogne, France, under date of October 8, 1908.

Birds banded in winter yielded a total of 323 returns, 307 being to the region where they were banded and 16 coming from a distance. It is evident from a consideration of these records that the winter Starlings of the British Isles comprise a mixed popula-

tion those native to the area and winter visitors from the continent, a conclusion that is largely substantiated by records from mainland stations. It would also appear that of the native birds some may be strictly sedentary, while others are migratory within the limits of the British Isles. Many of these records do, in fact, confirm the conclusions reached from a study of the returns from birds marked in summer.

The records of Starlings banded in England and Scotland and recovered in the summer from the continent present a fairly accurate indication of the area to which at least some of the British winter-residents are native. These regions include Norway, Sweden, Denmark, Finland, and northern Germany (two from Norway, coming from north of the Arctic Circle). There are also a few records of winter banded birds recovered from distant points in succeeding winters. Such evidence must be considered as negative for they are not sufficiently numerous to show whether or not the birds at the time of recapture were merely late in starting migration, were already en route, or were already established in winter quarters different from those occupied at the time of banding. Dates of recovery do not render much assistance in these cases as they are all either from the beginning or the close of the winter season. One bird, banded at the lighthouse on the Isle of May, Firth of Forth, Scotland, on October 12, 1913, was recovered on January 29, 1914, from County Antrim, Ireland, showing clearly a bird of passage. In addition to the British cases summarized above, there are thirteen records of Starlings banded on the continent and returned from England, Scotland and Ireland. These originated at Heligoland, Viborg, east-central Sweden, Mecklenburg, Latvia, Courland, and western Russia. As previously stated these appear to substantiate the conclusions reached from a study of the records of British origin, for the reason that they were banded mostly in the summer while in almost every instance their recovery was during the winter.

Other records from birds marked on the mainland are not particularly numerous but they are sufficient to indicate that such migrations as are made by this species are from northeast to southwest. (fig. 6.) Recalling the more or less sedentary habits of the Starling in some regions, the flights of a few individuals

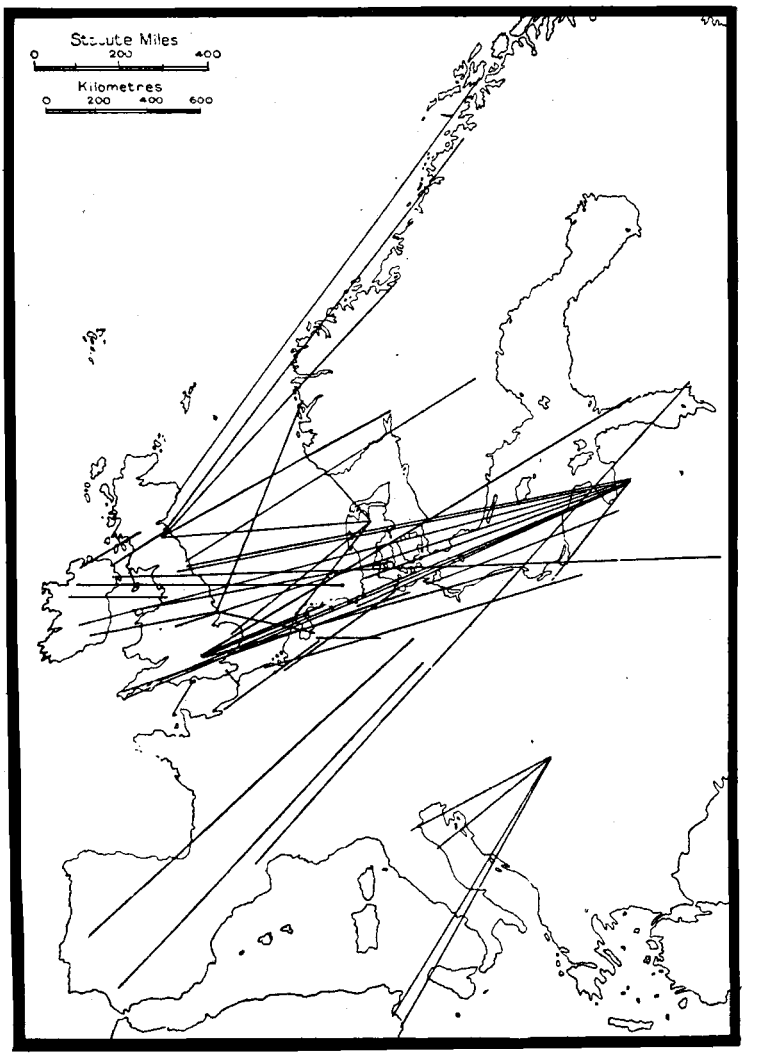

Fig. 6.—Migrations of the Starling. Each line indicates the points of banding and recovery of a banded Starling but is not intended to represent an actual line of flight. (Thomson.)

are decidedly remarkable. Such an instance is the case of a young bird banded at Wiborg, Finland, on June 8, 1914, and recovered

previous to July 26, 1915, from Aude in southern France, and of two birds marked at Lubeck and Hanover in May and recovered in Holland during July of the same year. Two Starlings banded in central Germany (near Leipzig and Magdeburg) were recaptured in southern Spain and Portugal respectively, while of seven nestlings marked in Hungary, two were recovered from Ancona and Rovigo, Italy, and the other five from Tunis, North Africa.

In drawing conclusions from these investigations Dr. Thomson states (loc. cit.) that "Many British native Starlings are sedentary while some are migratory within Great Britain or from Great Britain to Ireland, and except for one record of a short cross-channel journey, there is no proof from this source that any of these native birds emigrate to countries abroad. British winter immigrant Starlings come from Denmark, southern and Arctic Norway, Sweden, Finland, northern Germany, the Baltic States, and western Russia. Records of Starlings marked abroad also show journeys from Finland to southern France, from the Baltic States to northern Germany, from Denmark to Holland, from northern Germany to Holland and Belgium, from Holland to Belgium and northern France, from central Germany to Spain and Portugal and from Hungary to Italy and northern Africa."

Swallow (*Hirundo r. rustica*).

As is the case with all small non-game species, returns from this species are not numerous and much intensive banding must be done before definite contributions to our knowledge of their movements will be possible. The Swallow is, however, selected for inclusion in the present paper by virtue of the fact that what data are available are of considerable interest as bearing on the oft-repeated theory that with some species, those individuals that breed in the most northern latitudes, make the longest migratory flights, passing entirely over the inhabitants of the intermediate zones which are presumed either to not migrate at all or to perform journeys of much shorter lengths. The assertion has also been made that it is the young birds that occupy in winter the northerly regions, not yet having the strength and endurance to make the prolonged flights of their parents to more southern latitudes. The records from banded Swallows would appear to lend strength

to the former theory while refuting general acceptance of the latter.

The European Swallow breeds over a large part of the continent and the British Isles, wintering in Africa, India, and Australia. It must, however, be recorded that they have been observed in England in every month of the year, although occurrences during the period from the first of December to the middle of March can only be considered accidental.

Banding of this species has been done at several points in England and Scotland under the auspices of British Birds Magazine and Aberdeen University, and also in Holland by the Leyden Museum, in Schleswig-Holstein by the German Ornithological Society, and at points in Hungary by the Hungarian Central Bureau for Ornithology. Most of them were banded as fledglings but a few adults were captured for the purpose. In point of distance covered some of the returns rival those obtained in the case of the White Stork, as the same winter quarters are shown to be favored by a great many of the birds from England. Seven returns from birds banded in that country have been secured in South Africa, an air-line distance of over 7,000 miles, which easily places them in the class of land birds having annual migratory flights exceeding 10,000 miles (fig. 7). The route utilized in making this flight is scarcely indicated, for although a few birds banded in England have been recovered from France, there are, with two exceptions, no returns from the vast intermediate regions that must be traversed by the migrants. The exceptions are the record of a bird banded at Overyssel, Holland, and recovered on October 1, of the same year from Tangiers, and another banded on July 31, 1921 at St. Nicholas, near Cardiff, Wales, and recovered in December, 1922 from the upper eastern Luozi district, Belgian Congo. As Witherby has pointed out, the bird represented in the latter case was most assuredly in its winter quarters and not en route to a more southern latitude. But the locality is a full 1,700 miles from the nearest of the other records in South Africa, showing how widely separated in winter may be two birds that in summer are occupants of the same restricted region. A return from a Swallow marked in Schleswig-Holstein and taken near Lake Constance, Switzerland, shows little more than a line of flight almost due south from the place of banding.

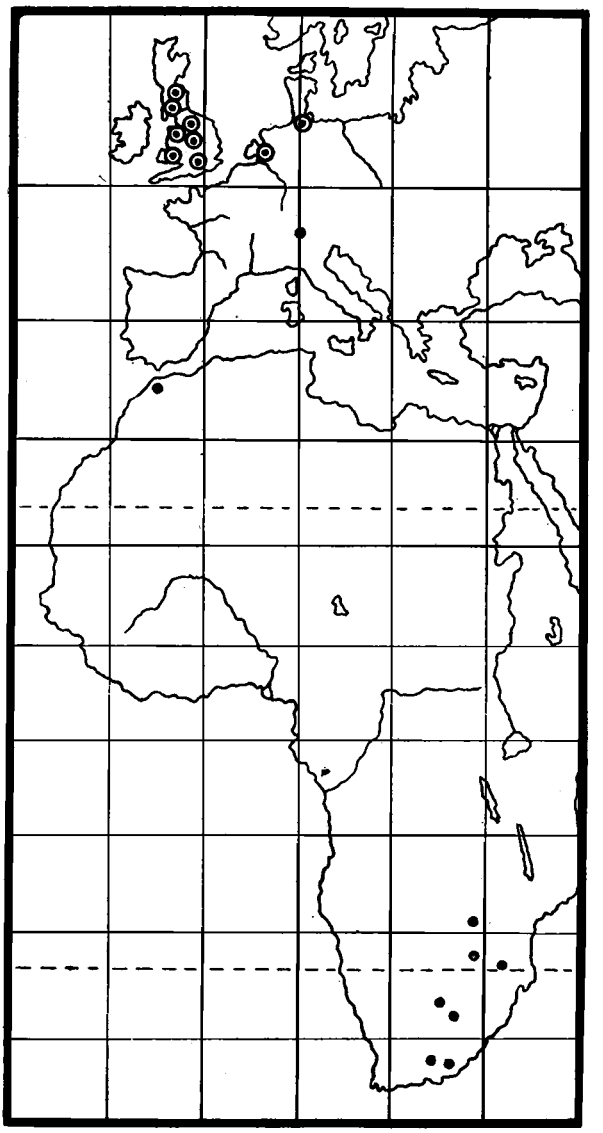

Fig. 7.—Migrations of the Swallow. Spots enclosed by circles denote points of banding.

With reference to the age of the birds making these long flights it may be stated that seven of the eight were banded as nestlings and were all recovered within from 5 to 8 months after banding. The other bird, an adult banded in Staffordshire, on May 6, 1911, was not recovered until December 23, 1912. It would therefore appear that with this species age has no bearing upon the length of the migratory flight.

Supplemental to the above data applying to migration studies are a series of returns, obtained in Scotland, England, and Hungary, which constitute most gratifying evidence of the strength of the homing instinct possessed by these birds. In a series of 15 Hungarian returns to the point of banding, 11 birds are represented, 2 of which have yielded three returns each. Seven of these were adults and five were nestlings when banded. Corroborative records of a similar nature also have been secured in both England and Scotland, British Birds Magazine having obtained fifteen or twenty records of birds banded as fledglings, and which returned to the same neighborhood; in one instance the return was effected two years after banding.

A curious angle is given to the investigations of this species by the statement of Shenk (1923) that of 9,000 individuals of the Swallow and House Martin (*Delichon urbica*) banded in Hungary, he has not received one return from outside the country.

Birds of Prey.

Species of this group have received attention mostly from Dr. Thienemann, but Mortensen and Skovgaard also have obtained returns from banded Hawks and Kites. There is not available adequate data to permit a diagnosis of their migratory flights, but a few instances will be of interest.

Two Sparrow Hawks banded in Pomerania, Germany, in July 1913 were recaptured in France (La Verdiere and Chambost in Alliers) in November of the same year, while a third banded in Switzerland was taken three days later at a point 30 miles distant. Two Rough-legged Buzzards (*Archibuteo lagopus*) carrying Rossitten bands from Torne Trask, Swedish Lapland, which were banded on July 7, 1911, were recaptured, one on November 26, 1911 in the vicinity of Vienna, Austria, and the other on April 12,

1913 at Guhrau in Silesia. Other returns for this species are from relatively short distances from the place where they were banded. The Common Buzzard (*Buteo buteo*), also has yielded a few interesting returns, one banded on May 19, 1917 at Schaffhausen, Switzerland, being recaptured at Bordeaux, France on December 1, 1917; one from the Jura Forest District in East Prussia, banded on May 30, 1913, was retaken on February 15, 1914, at Sagan in Silesia; one banded at Rominten in East Prussia on June 8, 1913, was killed at Schladen in the Harz Mountains on December 12, 1913, while another banded on June 12, 1913 in the Zehdenick Forest District of Germany was recovered in March 1914, from Spain, the exact locality being unknown. Many short recoveries also have been secured.

A Kite (*Milvus milvus*) banded at Rossitten, on July 3, 1909, was taken in July, 1912, at Dubenalken, Courland, and an Eagle (*Aquila pomarina*) banded about July 31, 1911, at Mitau, Courland was taken near Sofia, Bulgaria on September 28, 1911.

Miscellaneous Birds.

In addition to the cases above summarized, Thienemann has obtained many returns from Crows (*Corvus cornix*), banded at Rossitten and distributed along the coast of the Baltic Sea to a point north of Petrograd and west to the base of the peninsula of Jutland. From there, banded birds apparently kept more to the interior as there are no returns from coastal points on the North Sea, although recoveries have been obtained in the interior from areas almost as far west as the longitude of Paris.

Terns (*Sterna hirundo, S. sandvicensis, S. cantiaca,* and *S. fluviatilis*) banded in England and Holland, have been recovered from France (Brittany and Gironde), Germany, Denmark, Spain, Portugal, and southwest Africa. Of these, *S. cantiaca* has made the longest flights as one bird bearing a band from the Leyden Museum was taken near Quittah on the Gold Coast and two others, also with Leyden Museum bands, were taken on the coast of Angola. A specimen of *S. sandvicensis* marked at one of the Faroe Islands, with a British Birds band, was secured from the Ivory Coast province of French West Africa.

Cormorants (*Phalacrocorax carbo*) banded in England have

been recovered in France, Spain, and Portugal, and a Spoonbill (*Platalea leucorodia*) banded in Holland, was recaptured at Corvo, one of the Azores.

Among the shorebirds and smaller perching species there is available a limited number of returns, the largest number coming from the investigations conducted under the direction of British Birds Magazine and Aberdeen University, although the Hungarian Central Bureau for Ornithology and the German Ornithological Society also have obtained a certain amount of data pertaining to these groups.

Witherby (1917 and 1920) and Thomson (1921) have presented brief summaries of the information at hand for many of these species, but in no case are data sufficient to warrant any definite conclusions. It would appear that most of these birds (usually banded as fledglings or as breeding adults) are either sedentary or else they perform migrations of very limited extent, Ireland seeming to be favorite winter quarters for such species as the Curlew, Lapwing, Woodcock, and Snipe. The advantages of Ireland for avian winter quarters were, it will be recalled, pointed out under the discussion of the Teal. In the cases of the Lapwing and Woodcock there are returns also from France, Spain, and Portugal.

With the exception of two scattering records (one from Holland and one from the southwest of France) the Redbreast (*Erithacus r. melophilus*) shows no movement, many returns coming from the exact locality where the birds were banded. This applies also to many other passerine species.

Such returns from British marked birds as have been received from the continent, are mostly from France, Spain, and Portugal, particularly the two latter countries, indicating that there is a regular flyway for many species across the narrowest part of the English Channel.

In Hungary and Scotland the Blue Titmouse (*Parus caeruleus*) has yielded interesting data through trapping activities, 70 returns from 653 banded birds, being obtained in Scotland, one bird being recovered eleven times, while at a station in Hungary a specimen was recaptured every season for a period of five years.

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THE GRAY-HOODED QUAIL DOVE (GALLICOLUMBA RUBESCENS) OF THE MARQUESAS ISLANDS, IN CAPTIVITY.

BY E. W. GIFFORD.

Plate XIX.

DR. ROBERT CUSHMAN MURPHY has recently published a description[1] of *Gallicolumba rubescens* which hitherto has been known to science only from Krusenstern's plate published in 1814.

In January, 1923, I received thirty-one of these birds from Mr. R. H. Beck. As they had been in a traveling cage for three months they were in an exceedingly dirty condition. I immediately turned them into a sunny outdoor aviary at my home in Oakland, California, where they rapidly regained their normal cleanliness. The backs and heads of many which had been partially denuded of feathers in the perpetual squabbling for weeks in the cage were soon again copiously clothed in feathers. Their natural pugnacity continued to be manifested, however, after they were placed in my aviaries. The same quarrelsome disposition manifests itself in their offspring.

Although sparring with the wings is frequent where a number of Gray-hooded Quail Doves are together no physical harm results, unless a single bird becomes the object of the attacks of many. This has rarely happened in my flock. When it has, the victim of such continual persecution has always been given more congenial companions in another aviary. Often the pugnacity of the attacker evaporates if the attacked bird stands its ground. At times a

[1] Birds collected during the Whitney South Sea Expedition. I., American Museum Novitates, no. 115, pp. 10, 11, May 29, 1924.