

living animal; nor was there any substantial reason given for considering the helobacterium as belonging to the same species as the micrococci, or, if they happened to be different, which, if either, was able to cause the disease.

The same volume contains my report bearing the date of Jan. 27, 1882. In this are details of successful inoculation experiments with the sixth pure cultivation of micrococci which had been obtained and cultivated with every precaution known to science at the present day.¹ It was the first real evidence of the pathogenic action of these organisms. It was equally satisfactory with the experiments of MM. Pasteur and Thuillier; and the inoculations were made Jan. 17, 1881, or fourteen months before the discovery of this same organism by these gentlemen.

The communication of Dr. Detmers, referred to by M. Pasteur, appeared in the *American naturalist* for March and April, 1882, and was a *résumé* of his studies for the department of agriculture. In this article he still thinks there is just cause to suppose that the organism of swine-plague has a helobacterium, or rod form, and a resting spore. There are, however, no new observations or experiments referred to, there is no additional proof that the micrococci seen by him were not the result of atmospheric contamination, — nothing to show that a pure cultivation of these would produce the disease. On the other hand, the organism which he describes possesses a flagellum, and a moving stage or period, neither of which have I been able to observe with the true germ of this disease, nor with the closely allied micrococcus which causes fowl-cholera.

It is a matter of record, therefore, that the organism which constitutes the cause of swine-plague was first discovered by Klein in 1876, but that he failed to connect it in any way with the virus of the disease, and afterwards concluded that it depended upon a very different schizophyte. It is also a matter of record that I was the first to demonstrate by satisfactory methods that this micrococcus exists in the blood during the life of the animal, that it can be cultivated in flasks, and that the sixth successive cultivation, made in considerable quantities of liquid, and which contained no other form than micrococcus, still produced the disease. Neither Pasteur and Thuillier, nor any other investigators that I am aware of, have added one particle of evidence, except by way of confirmation, to that previously advanced by me. M. Pasteur is usually very particular in giving credit, but he does not seem to be keeping up with the progress of American science. D. E. SALMON.

MIGRATION OF BIRDS IN ENGLAND.²

THE general report of the committee of the British association, of which this is in fact an abstract, comprises the observations taken at lighthouses and light-vessels, and a few special land-stations, on the east

and west coasts of England and Scotland, the coasts of Ireland, Isle of Man, Channel Islands, Orkney, and Shetland Isles, the Hebrides, Faroes, Iceland, and Heligoland, and one Baltic station (Stevns Fyr, on Stevns Klint, Zealand), for which the committee is indebted to Professor Lütken of Copenhagen. Altogether, a hundred and ninety-six stations have been supplied with schedules and printed instructions for registering observations, and returns have been received from about a hundred and twenty-three, — a result which is very satisfactory, showing, as it does, the general interest taken in the work, and the ready co-operation given by the light-keepers in assisting the committee.

As in preceding years, the line of autumn migration has been a broad stream from east to west, or from points south of east to north of west, and covering the whole of the east coast. In 1880, to judge from the returned schedules, a large proportion of the immigrants came in at the more southern stations; in 1881 they covered the whole of the east coast in tolerably equal proportions; but in 1882 the stations north of the Humber showed a marked preponderance of arrivals. Altogether, a vast migration took place this year upon our east coast; the heaviest waves breaking upon the mouth of the Humber, Flam-borough Head, the Farne Islands, Isle of May at the entrance to the Firth of Forth, and again, after missing a long extent of the Scotch coast, at the Pentland Skerries. The Bell Rock also came in for a share, although apparently a much smaller one than the Isle of May. The easterly winds prevailed all along our east coasts, generally strong to gales; and the succession of south-easterly and easterly gales in October, between the 8th and 23d, occurring as they did at the usual time of the principal migration, brought vast numbers of land-birds to our shores. From the Faroes in the north, to the extreme south of England, this is found to have been the case.

Although migration — that is, direct migration — on our east coast is shown to have extended over a long period, commencing in July, and continuing, with but slight intermissions, throughout the autumn and into the next year to the end of January, yet the main body of migrants appears to have reached the east coast in October, and of these a large proportion during the first fortnight in the month. From the 6th to the 8th inclusive, and again from the 12th to the 15th, there was, night and day, an enormous rush, under circumstances of wind and weather, which, observations have shown, are most unfavorable to a good passage. During these periods, birds arrived in an exhausted condition; and we have reasons for concluding, from the many reported as alighting on fishing-smacks and vessels in the North Sea, that the loss of life must have been very considerable. Large flights, also, are recorded as having appeared round the lanterns of lighthouses and lightvessels during the night migration. From the 6th to the 9th inclusive, strong east winds blew over the North Sea, with fog and drizzling rain; and from the night of the 12th to 17th very similar weather prevailed. Mr. W. Littlewood, of the Galloper lightship, forty miles south-east

¹ Loc. cit., pp. 287-289.

² Report of the committee of the British association for the advancement of science, appointed for the purpose of obtaining observations on the migration of birds at lighthouses and lightships, and of reporting on the same. (From *Nature*.)

of Orfordness, reports, that, on the night of Oct. 6, larks, starlings, tree-sparrows, titmice, common wrens, red-breasts, chaffinches, and plovers were picked up on the deck, and that it is calculated that from five hundred to six hundred struck the rigging and fell overboard: a large proportion of these were larks. Thousands of birds were flying round the lantern from 11.30 P.M. to 4.45 A.M., their white breasts, as they dashed to and fro in the circle of light, having the appearance of a heavy snow-storm. This was repeated on the 8th and 12th; and on the night of the 13th a hundred and sixty were picked up on deck, including larks, starlings, thrushes, and two red-breasts. It was thought that a thousand struck, and went overboard into the sea. It is only on dark, rainy nights, with snow or fog, that such casualties occur: when the nights are light, or any stars visible, the birds give the lanterns a wide berth.

Undoubtedly the principal feature of the autumn migration has been the extraordinary abundance of the gold-crested wren. The flights appear to have covered not only the east coast of England, but to have extended southward to the Channel Islands, and northward to the Faroes (see report, East coast of Scotland). On the east coast of England they are recorded at no less than twenty-one stations from the Farne Islands to the Hanois lighthouse, Guernsey, and on the east coast of Scotland at the chief stations from the Isle of May to Sunburgh Head; at which latter station they have rarely been seen in previous years. Mr. Garrioch, writing from Lerwick, says, "In the evening of Oct. 9 my attention was called to a large flock of birds crossing the harbor from the Island of Bressay; and, on coming to a spot on the shore where a number had taken refuge from the storm, I found the flock to consist of gold-crests and a few fire-crests amongst them. The gold-crests spread over the entire island, and were observed in considerable numbers till the middle of November." The earliest notice on the east coast is Aug. 6; the latest, Nov. 5, or ninety-two days. They arrived somewhat sparingly in August and September, and in enormous numbers in October, more especially on the nights of Oct. 7 and 12, at the latter date with the woodcock. This flight appears to have extended across England to the Irish coast; for on the night of the 12th a dozen struck the lantern of the Tuscar Rock lighthouse, and on the night of the 13th they were continually striking all night. During the autumn, enormous numbers crossed Heligoland, more especially in October. On the night from the 28th to the 29th, Mr. Gätke remarks, "We have had a perfect storm of gold-crests, perching on the ledges of the window-panes of the lighthouse, preening their feathers in the glare of the lamps. On the 29th all the island swarmed with them, filling the gardens and over all the cliff, — hundreds of thousands. By 9 A.M. most of them had passed on again." Not less remarkable was the great three-days' flight of the common jay, past and across Heligoland, on Oct. 6, 7, and 8. Thousands on thousands, without interruption, passed on overhead, north and south of the island too, — multitudes like a continual stream, all going east

to west in a strong south-easterly gale. It would have been interesting if we had been able to correlate this migration of jays with any visible arrival on our English coast, but in none of the returns is any mention made of jays. Subsequently we have received numerous notices of extraordinary numbers seen during the winter in our English woodlands. This seems especially to have been the case south of a line drawn from Flamborough Head to Portland Bill in Dorset. Additions and unusual numbers were also observed at Arden on Loch Lomond side.

The returns show very clearly that the spring lines of migration followed by birds are the same as those in the autumn, but of course in the reverse direction, — from west and north-west to east and south-east. Another point worth noting is the occurrence of many species in spring at the same stations frequented by the species in autumn: thus double records occur at the Mull of Galloway, Bell Rock, Isle of May, as well as at some English spots.

As this is the fourth report issued by the committee, we may, perhaps, with the mass of facts at our disposal, be expected to draw deductions which, if they do not explain, may serve at least to throw some light on the causes influencing the migration of birds. We might reasonably reply that the work undertaken by us was not to theorize, or attempt explanations, but simply to collect facts, and tabulate them. This we have endeavored to do in the shortest and simplest manner consistent with accuracy of detail. There is, however, one circumstance which can scarcely fail to present itself to those who have gone carefully into the reports issued by the committee; namely, the marvellous persistency with which, year by year, birds follow the same lines, or great highways of migration, when approaching or leaving our shores. The constancy of these periodical phenomena is suggestive of some settled law or principle governing the movement. It is clearly evident, from the facts already at our disposal, that there are two distinct migrations going forward at the same time, — one the ordinary flow in the spring, and ebb in the autumn, across the whole of Europe. A great migratory wave moves to and from the nesting-quarters of the birds, in the coldest part of their range, — north-east in the spring, and south-west in the autumn. Quite independent of this, there is a continual stream of immigrants, week by week and month by month, to the eastern shores of these islands, coming directly across Europe from east to west, or more commonly four points south of east to north of west, and the reverse in the spring. These immigrants are mainly composed of those common and well-known species which annually make these islands their winter quarters, and, as a rule, take the place of our summer birds. They come in one broad stream, but denser on some special lines or highways than others. Cutting the line of ordinary migration at nearly right angles, one flank brushes the Orkney and Shetland Isles, pouring through the Pentland Firth, even touching the distant Faroes. The southern wing crosses the Channel Islands, shaping its course in a north-westerly direction to the English coast.