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REPORT ON B.O.U. EXPEDITION TO LAKE CHAD, NORTHERN NIGERIA MARCH-APRIL 1967*

Dr. J.S. Ash, I.J. Ferguson-Lees and Dr. C.H. Fry

The Research and Special Publication Fund of the British Ornithologists' Union supported an expedition to the western shore of Lake Chad, in Bornu Province, Northern Nigeria, in March and April 1967. The main objectives were to make preliminary investigations into the distribution and relative density of Palearctic and Ethiopian species of birds in the several main habitat zones: to assess the importance of the area, particularly in terms of available food resources, to Palearctic migrants preparing to cross the Sahara on their way North to breed; to consider the feasibility of establishing an ornithological or biological research station in the area; and to outline potential research projects,

The only full-time members of the expedition were the three signatories of this report, J.S.A. and I.J.F.-L. travelling out from the United Kingdon and C.H.F., who acted as leader, joining them from Ahmadu Bello University, Zaria, Nigeria. Other ornithologists who assisted for part of the time were Mr. A.J. Hopson of the Federal Fisheries Research Station, Maiduguri, Lake Chad, and R.E. Sharland of Kano. In addition, J.C. Deeming, entomologist, of the Institute of Agricultural Research, Samaru, and C.H.N. Jackson, botanist, of Ahmadu Bello University, gave valuable assistance during the second half of the expedition over broad ecological problems and, in particular, the identification of insect and plant foods eaten by the birds. The expedition was based at Malam Fatori, which is in the extreme north-east corner of Nigeria, and accomodation, laboratory and other facilities were kindly provided in the modern buildings of the newly constructed Fisheries Station there by Mr. Hopson and his wife, Dr. Jane Hopson, with the agreement of the Nigerian Federal Fisheries Service. Grateful acknowledgement is due to them and also to Professor A.P. Mead and the Zoology Department of Ahmadu Bello University for various kinds of help and equipment. The expedition also owes an incalculable debt to Professor J.H. Elgood, recently Professor of Zoology at Ibadan University, Nigeria, to R.E. Moreau and Sir Landsborough Thomson, former Presidents of the B.O.U., and especially to Dr. James F. Monk, now Honorary Secretary of the B.O.U., for unlimited advise and assistance in its

* See footnote opposite.

preliminary planning.

The main team of three were at Malamfatori from 21st March to 12th April inclusive. The Fisheries Station, in the vicinity of which most of the work was carried out, lies on the western shore of Lake Chad, about four miles south of the 'delta' of the River Yobe, which forms the boundary with the Republic of Niger. Observations were also made in a wider area north to the Yobe, west to Abadan, Yo and Daya, and south to Arege and the former south of the Yobe south of Kurkawa, on a radius of approximately four miles to the north and ten or twelve miles to the west and south.

GENERAL DESCRIPTION OF THE AREA

Much of the edge of the shallow freshwater lake is characterised by dense Papyrus growth, but in the Malamfatori area open sandy shores are backed merely by a discontinuous and narrow belt of Typha and Phragmites, interspersed in places with open pools and broken up by impoverished cultivation. The land rises quickly from the shore at Malamfatori to a height of 15 to 45 feet and the first dune-ridge from about half-a-mile to a mile from the shore carries a belt of almost pure saltbush Salvadora persicaup to ten or twelve feet high. Further inland, to the north and west, lies the Yobe inundation zone. The annual rainfall of the area, which is the driest part of Nigeria, varies between six and 16 inches and occurs mainly as isolated downpours in late July and August. The inundation zone is then flooded by the rising waters of the river and lake, and usually does not completely dry cut until May or June. At the moment, however, the level of the lake is lower than normal as a result of several years of small rainfall and, consequently, the inundation area was dry well before our visit. The whole of this part is intensively cultivated and grazed, leaving islands of Salvadora, Balanites aegyptica and Acacia nilotica, as well as patches of tall grasses Echinochloa, thicker on the ground which is subject to flooding.

Further inland, Acacia raddiana woodland, typical of sahel savannah, extends westwards across the country. To the south, fixed dunes are covered by Acacia raddiana, Leptodenia spartina and Salvadora. Salvadora is commonest

within two or three miles of the lake and in sheltered places forms thickets up to 15 feet in height. Other habitats of smaller area, but of no little importance, are provided by the ten or more square miles of permanent marshland with extensive beds of Typha, Phragmites and Papyrus, interlaced with channels and lagoons, where the River Yobe enters the lake; by marshy pools and ox-bows amongst the riveraine Acacia nilotica woodland; and by the widespread presence of dum palms Hyphaene in sandy area around Yo and elsewhere. Ten miles west of Malamfatori, near the Yobe at Daya, there is a pilot irrigation scheme for wheat, with 3,000 acres under rotational cultivation. Another 1,600 acres are being prepared for similar cultivation three miles south of Malamfatori.

The human population is already high and the area is likely to be subjected to ever heavier cultivation and grazing pressure than hitherto. A surfaced road under construction from Maiduguri 140 miles to the south has already advanced north for over 50 miles and will inevitably open the region up to a great deal more intrusion. The commercial exploitation of fish will then be a likely development in a protein-hungry country.

PRELIMINARY STATEMENT OF RESULTS

The data and specimens collected are still being analysed and it is too early to give more than a brief mention here of some of the main results. The whole area, including not only the lake shore, the environs of the river and the rich Salvadora belt, but also the cultivated parts and even the Acacia raddiana woodland, was extremely rich in birds. In particular, Palaearctic migrants were in unexpected and remarkably large numbers. Of the total of 230 species recorded in the area during the course of the expedition, no less than 57 were certainly Palearctic and up to eight more probably were.

Three of these Palaearctic species were present in numbers that can only be described as astonishing, and were probably far more numerous in the area than any Ethiopian species with the possible exception of the Red-billed quelea Quelea quelea. In fact, the largest roosting flights of Quelea seen totalled only about 25,000 birds, whereas counts of Sand Martins Hiparia riparia moving north in the late afternoon and evening often exceeded 100,000 per hour and on the day reached 175,000 in an hour; that day the dense belt of Sand Martins feeding and flying along the shore may have exceeded a million birds in all, but it is not known to what extent these movements represented genuine migration or

roosting flights. Ruffs Philomachys pugnax, which were feeding in the wheat area by day and flighting down to the shore of the lake to roost each evening, were also estimated at 500,000 in one area and, again, there may have been as many as a million within a 15-mile radius of the mouth of the River Yobe. The third strikingly abundant Palaearctic species was the Yellow Wagtail Motacilla flava, mainly nominate flava, feldegg and intergrades between the two; counts of longshore roosting flights each eveining totalled up to 4,000 per minute and the most economical reckoning produced a total of 50,000 in an evening, while the impression was that there might be many times this number in the inaccessible reed-beds of the River Yobe. The Yellow Wagtail is a useful indicator species because of the distinct plumages of its races. Although the numbers changed di daily in the census area, one might have had the impression that these were simply local fluctuations, were it not for the fact that all the feldegg suddenly disappeared on 11th and 12th April. Incidentally, the feldegg had noticeably been confined to the marshy parts adjacent to the shore, whereas the nominate flava were widespread a long way from the shore and were even seen near villages miles from open water.

The numbers of the Sand Martins, Ruffs and Yellow Wagtails, and other species in the open by the lake, were estimated from daily counts along a fixed mile of shore in one hour and by periodic observations of the evening roosting movements from various points. The distribution and relative abundance of cover-seeking species in the other main habitat zones were assessed by mist-netting. Sample areas were netted daily in Salvadora and Typha/Pharagmites, using about 600 feet and 400 feet respectively of permanently erected four-shelf netting, and were thought to reflect with considerable accuracy the relative abundance of passerines in these habitats. Here again a Palaearctic species, the Whitethroat Sylvia communis was easily the most numerous, over 1,000 being caught. The next most common were two more Palaearctic birds, the Sedge Warbler Acrocephalus schoenobaenus and the Reed Warbler A. scirpaceus, with about 400 and nearly 300 respectively trapped. The most numerous Ethiopian species caught in the mist-nets were Red-billed Queleas, Black-headed Weavers Ploceus capitalis, Vitelline Masked Weavers P. vitellinus and Golden Sparrows Passer luteus in that order, all in the 150-250 range. About 250 each of Sand Martins and Yellow Wagtails were also trapped.

The exact numbers of each species caught in each sample habitat are still being calculated, but a grand total of 3,550 birds of 87 species were ringed and released. In fact, many more Palaearctic birds than Ethiopian ones were caught by this random netting and, although the majority of the birds collected were Palaearctic (see below), this is still reflected in the ringing totals; 2,114 Palaearctic birds of 30 species and 1,436 Ethiopian birds of 58 species (the actual total of species being one less than these figures combined because the Olivaceous Warbler Hippolais pallida was represented in each group by the migratory race opaca and the locally breeding laeneni, which are quite distinct).

Distinct habitat preferences were shown by some of the Palaearctic migrants, and also by African migrants and residents. For example, Whitethroats were abundant in the Salvadora and relatively infrequent in the Typha/Phragmites, though this was the one Palaearctic species which was at all widespread in the arid AcaciaTraddiana, at many as 32 being noted in an hour's sample walk. By contrast, Sedge Warblers were almost confined to the Typha/Phragmites, but Reed Warblers occurred in both Salvadora and Typha/Phragmites.

A large series of Sand Martins, Yellow Wagtails, Sedge Warblers and Whitethroats were collected and preserved in 70% alcohol for lipid estimates, stomach analysis and gonad examination. Specimens were selected over the range of weights within each millimetre of wing-length. A long series of over 400 retraps (300 of them of Palaearctic birds), as well as fat-depot estimates for all live birds handled, provided data on weight changes during the period. Some Palaearctic migrants were so heavy that they had difficulty in getting under way when flying off, and it was perhaps significant that a Pallid Harrier Circus macrourus which was trapped clutching a Yellow Wagtail proved to have provided us with our heaviest specimen of the latter species. Moult data were also collected for every bird caught; this applied chiefly to African species, but some Palaearctic individual had more freshly moulted wings than others, while some Sedge Warblers and Sand Martins; for example, still had the outermost primari s in moult.

The main sources of food for Palaearctic migrants (and many Ethiopian species as well) appeared in the Typha/Phragmites zone to be green midges (Chironomidae, Diptera) which emerged from the lake to fly inshore in vast numbers, concentrations of the looking at times like green smoke, they coated the stems

of the aquatic vegetation and, incidentally, there was no evidence of any fall-off in numbers between lunar peaks as has been found for some species of Chironomidae. In the Salvadora it was at first thought that the flowers and softer fruits of this bush were providing the main food, but preliminary stomach analyses showed that insect matter was well represented and the Salvadora bushes were, in fact, found to be shelter zones for insects of various sizes from lesser numbers of Chironomidae upwards . (They even included, one day in particular, a large-scale invasion of locusts (Acrididae, Orthoptera) which attracted a number of Black Kites Milvus migrans and other larger birds.) The stomach analyses may show that insects were playing an important part in the Salvadora feeding as well. Nevertheless, either Chironomidae or Salvadora fruits and flowers, or both, were seen to be exploited by each of the four species which were collected in series for analysis. Samples of these foods were obtained for calorific value estimates, so that the determination of the birds' stomach contents will provide useful indications of the sources which enable them to lay down large fat reserves in, at least in some cases, a very short time. Such fat reserves are essential as fuel in long trans-saharan flights.

In relation to the whole West Africa arid zone some on a similar latitude, the western shore of Lake Chad and the lower reaches of the River Yobe clearly, provide an abundance of food for many species. This statement is made advisedly, since not only such soft-billed birds as Yellow Wagtails, Red-throated Pipits Anthus cervinus and Tawny Prinias Prinia subflava, but also Golden Sparrows, Red-billed Firefinches Lagonosticta senegala Black-rumped Waxbills Estrilda troglodytes and bishops Euplectes spp., as well as the Ruffs and at least six other species of waders, were clearly observed to feed extensively on the abundant Chironomidae; Ruffs were watched running the open beaks up stems coated with these midges. The Malamfatori area gives the impression, with its green herbage and abundant insect life, of providing enough food for a large migrant population to put on fat; but only two or three miles away from the immediate influence of the lake, as we have seen, the countryside assumes the characteristically arid appearance that it has throughout much of the sahel savannah zone between Senegambia and Lake Chad, and then again eastward. In typical Acacia raddiana woodland ten miles from the lake, Whitethroats were found to be fairly widespread, as already mentioned, and few other Palaearctic species were noted, but there were noticeably scarcer than nearer the shore, whereas Ethiopian species were not

much less common there than in the lakeside dune area of Malamfatori.

The vicinity of the lake is also of importance to a wide range of African breeding birds, notably such aquatic species as the White-faced Whistling Duck Dendrocygna viduata and various herons, storks, ibises and cranes. For example, twelve species of herons (including up to 200 Great White Egrets Egretta alba) and six species of storks were recorded by the expedition. Other well represented groups in the area as a whole were eight species of ducks and geese (up to 750 White-faced Whistling Ducks and up to 200 Pygmy Geese Netapus auritus): 24 of birds of prey (mostly in small numbers, but including concentrations of between 30 and 75 of three species of vultures): 26 waders (including, apart from the Ruffs, numbers of Little Stints Calidris minuta, Wood Sandpipers Tringa glareola and Spur-winged Plovers Vanellus spinosus): eight of gulls and terns (including up to 1,750 White-winged Black Terns Chlidonias leucopterus): nine of pigeons and doves; many bee-eaters of four species; six species of shrikes; 14 of Palaearctic warblers and eleven of Ethiopian warblers; and some 25 species of Ploceidae, Viduidae, Estrildidae, Fringillidae and Emberizidae.

Since Mr. Hopson and his wife first went to Malamfatori in August 1962, they have kept records of the birds seen and the total of species now known to have occurred in the Malamfatori area now stands at over 280. About a dozen of the species recorded by the expedition were new to the area and a captured Savi's Warbler Locustella luscunioides was the first recorded in Nigeria (and among the first in West Africa as a whole, apart from five wintering records for Senegal). Other unexpected birds included a Demoiselle Crane Anthropoides virgo and an interesting passage of Turtle Doves Streptopelia turtur. Most interesting of all in this direction, however, was confirmation of the occurrence, previously reported by Mr. Hopson, of Blyth's Reed Warbler Acrocephalus dumetorum; one specimen was obtained by the expedition and five others were ringed and released. With others caught previously by Mr. Hopson, it seems reasonable to suppose that small numbers of this species now winter at Lake Chad, even though there seem to be only two other African records and most Blyth's Reed Warblers winter in south-east Asia from India to Burma ; it is tempting to speculate that this totally discrete wintering area may be connected with the marked spread of the species from north European Russia into

Finland in the last 20 - 30 years.

FUTURE WORK

The short duration of the expedition inevitably imposed limitations on its work. In particular, it was felt that immediate continuation of routine netting for retraps, weights and fat estimates was essential. Fortunately Mr. Hopson has willingly agreed to continue netting the Salvadora zone weekly and he is using a 200-feet line of nets left by the expedition, but no other ornithologist in Nigeria has been able to make the journey to Malamfatori to assist him during April and May.

Malamfatori is an important location for the study of avian ecology for three distinct reasons. Firstly, there is cause to believe that Lake Chad concentrates northbound migrants wintering between wide longitudinal limits to the south, and that the western shore of the lake is a more important migration route than the eastern one; this Malamfatori is a singularly favourable location for studying Palaearctic species wintering in Africa. Secondly, typical sahel savannah, the zone in which substantil proportions of Palaearctic migrants to West Africa are thought to winter, in within easy access, and ecological work on resident and migratory African species and wintering Palaearctic species of this zone could be carried out effectively from Malamfatori. Thirdly, as noted above, an exceptional concentration of Ruffs occurs on the irrigation scheme for wheat and the real possibility of this species becoming an economic pest urgently requires investigation. One wonders how large a part of Europe or Asia would be denuded of Ruffs if any campaign of wholesale slaughter were to be waged on the half million or more wintering there! Indeed, the great importance of this north-east corner of Bornu Province to a large number of birds of many species needs to be safeguarded especially with regard to the proposed fishery, forestry and agricultural development in the region.

It would be of the greatest interest to find solutions to the following problems and many others, although several would ideally require round-the-year study:

(1) How rapidly is fat accumulated by individual birds of different species ?

(2) To what extent is fat deposition independent of feeding success and is there a physiological stimulus rather than an environmental one ?

(3) Do soft-billed passerines exhaust part of their food supply, and is there any correlation between time and duration of passage and local abundance of food ?

(4) Have any Ethiopian species marked seasonal weight fluctuations and, if so, is there any correlation with local availability of food ?

(5) What species, Palaearctic and Ethiopian, are fully resident in arid woodland for the whole dry season/northern winter ?

(6) Are there any adaptations, behavioural or otherwise, for obtaining and conserving water ?

(7) At what latitude do passerines take off to cross the Sahara in spring ?

(8) Do passerines fly over or pass rapidly through the savannah zone in spring in order to reach the watland chain of the Senegal and Gambia rivers, the bend of the River Niger, the Sokoto and Yobe rivers and adjacent lakes lying approximately between 12°N and 16°N, which may be supposed to be a more attractive environment than thorn bush ?

(9) To what extent is the western shore of Lake Chad a leading line ?

(10) Why in the case of pairs of species which might be supposed to occupy similar niches (e.g. Beautiful Sunbird Nectarinia pulchella and Pygmy Sunbird, Hedydipna platura; and African Rock Bunting Emberiza tahapisi and Yellow-billed Bunting E.flaviventris) is one migrant and the other resident ?

(11) To what extent do weavers Ploceus spp. compete ?

(12) What is the significance of the fact that several insectivorous species (e.g. Long-tailed Nightjar Caprimulgus climacurus, Olivaceous Warbler Hippolais pallida and Black Bush Chat Cercotrichas podobe breed at the height of the dry season ?

The last three are problems of African ecology which are legion. The Malamfatori area is, as we think we have shown, an ideal centre for the establishment of a biological or ornithological research station. Already a good deal of research is being actively pursued by the fisheries officers, and Jane Hopson, and some of this is of direct interest to

ornithologists (e.g. the emergence of Chironomidae). There is a meteorological station, an electricity supply, a mechanical workshop and several small boats, and the use of these could almost certainly be negotiated with the Federal Fisheries Service. Accomodation and working space for two ornithologists is available for immediate use. A more extensive programme would require additional buildings, but there is plenty of space for these within the boundaries of the Fisheries station and grass huts, for example, are remarkably solid structures which can be erected relatively cheaply.

After the specimens and data collected by the expedition have been processed and analysed, the results will eventually be submitted for publication in the Ibis. One or two shorter communications will probably be prepared in advance of the main work.

BIRD RINGING IN NIGERIA 1966

NINTH ANNUAL REPORT

R.E.Sharland.

During 1966 ringing of Yellow Wagtail Budytes flavus roosts was carried on both in Kano and in Vom. V.W.Smith left Nigeria in March but his work was carried on by P.J.E.Woods and a fresh team of ringers.

Once again no Wagtail ringed in Kano was caught in the Vom roost and no Vom wagtail was caught in Kano. On the other hand a wagtail from each roost was caught on the same day in the same place in Italy. Recoveries are summarised in Schedule IV; three wagtails have now been recovered in Southern Europe in the winter months, two in Greece and one in Turkey.

Birds ringed for the first time included Shoveler Spatula clypeata, Pintail Anas acuta, Hottentot Teal Anas capensis, Bluethroat Cyanosylvia svecica, Blue Rock Thrush M. solitarius and African Spoonbill Platalea alba.

On 26th November 1966 I caught a Wood Sandpiper bearing an Italian ring and P.J.E.Woods caught a Yellow Wagtail bearing an Italian ring (the second to be caught there).