

given of advances in the first field, and it was also indicated that the determination of selection criteria could be assisted by more basic physiological study, one particular example being potassium-levels in the blood.

To a large extent, the cattle population of the arid area and to a lesser extent the sheep population, exist as a series of wild herds and flocks. While property management aims at bringing them under better control, management practices are introduced against a background of almost complete lack of quantitative information on the ecology of the herds and flocks, their drinking and grazing habits, reproductive patterns, the nature and time of mortalities, and their individual, group and herd behaviour. It was recommended that a detailed study of these, using ecological and behavioural approaches developed by wild-life ecologists, should be encouraged.

Sessions 4-7 dealt with aspects of water and included a review paper (R. Powles, Soil Conservation Service, Condobolin) and contributed papers on soil and water conservation, underground water, irrigation and special aspects such as the suppression of evaporation from water storages, the sealing of earth dams, demineralization, and the significance of advection phenomena in arid zone irrigation areas. The importance of evaluating quantitatively the distribution and nature of occurrence of the limited water resources was emphasized. For maximum effectiveness it was suggested that such an inventory should reveal the dynamic characteristics of individual aquifers and catchments, and since it is impossible, at present, to envisage the appraisal of all water resources in this manner, it was proposed that a

systematic approach should be adopted in which selected type situations within defined landscape patterns (land systems) could be studied and the results extrapolated as widely as possible.

Session 8 dealt with human settlement in arid regions and included contributions on demography (W. D. Borrie, Australian National University, Canberra), human function (W. V. Macfarlane, Australian National University, Canberra) and human organization (R. K. Macpherson, University of Sydney) in the Australian arid zone. It was apparent that there is a tendency in Australia to take arid zone environments for granted with all their physical disabilities and other stresses on human beings. The conference stressed that much could be done to make living conditions more acceptable.

The conference was impressed by the advantages following from the combined discussion of arid problems by the representatives of many different disciplines and stressed the need to define, in biological terms, the problems of plant and animal production specific to the arid zone ecosystem. Perhaps the main impression gained was a general confidence among delegates that research would achieve more efficient production from arid and semi-arid areas. There was much evidence of research having entered a phase in which quantitative data were becoming available to replace subjective estimates. This particularly applied in such fields as mineral resources, hydrology, microclimatology, geomorphology, plant and animal physiology, animal breeding, economics and human physiology.

C. S. CHRISTIAN
R. O. SLATYER

FUTURE OF NATURAL FAUNAS

THE twenty-sixth annual meeting of the Association of British Zoologists was held at the Zoological Society of London on January 7 under the presidency of Prof. C. M. Yonge. The theme of "Looking Ahead—The Future of Natural Faunas" was introduced by Sir Julian Huxley, who described and illustrated, by means of colour slides, what he had seen on his recent visit to East Africa. The central problem there, he said, was essentially one of human ecology. The fauna was a relic of the pre-human ecological climax and still presented a unique array of types in which some twenty-five or more species appeared to be collaborating in exploiting a number of exceptionally brittle habitats. The advent of pastoralism had brought many problems in its train and the situation was aggravated by the African, who thought of cattle as a symbol of wealth and prestige rather than as a source of protein. Recent studies by a number of investigators, including Fulbright Scholars, had shown that the land could be induced to yield more protein per acre from game than from cattle. In South Africa, a depleted fauna was being given some encouragement in game 'farms' from which there was a large demand for animals for re-stocking purposes. Sir Julian emphasized the importance of the tourist trade as an economic factor of conservation and he pointed out that parks were already being recognized as a source of tribal pride. The future of the fauna of East Africa was certainly in the balance, but the situation was not nearly as bad as he thought it would

be when he went out there. Sir Julian concluded by directing attention to the conference at Arusha in Tanganyika in September, which was being organized by the International Union for the Conservation of Nature and other agencies with the object of influencing African public opinion towards conservation and the wise use of natural resources, including wild life.

Mr. Max Nicholson (director-general, Nature Conservancy) said that apart from the virtually unpredictable effects of human population pressure during the next forty years, the future of the British fauna depended to a great extent on climatic changes. These might include some brought about by the agency of man such as a barrage across the Bering Strait, the break-up of Arctic pack-ice by atomic means, the reversal of flow of some of the big Russian rivers and the flooding of depressions in the Sahara. The consequent rise in ocean-levels and the effects on the course of the Gulf Stream might well induce a Mediterranean type of climate in Britain. Birds could be regarded as sensitive indicators of climatic change, and it was significant that the rook and green woodpecker were steadily moving north. Although it was possible that no species would be lost in the next forty years, there was a tendency towards the replacement of a broad range of specialized species by a narrow range of adaptable species. Among the outstanding hazards to which the fauna was subject were the exploitation of waterways, marshland and estuaries, pollution by oil and toxic

chemicals, mortality on fast highways, the burning of heathland and the sprawling out of cities. Isolation was becoming increasingly difficult to find and the time might well be coming when it would have to be administratively regulated. Referring to the work of conservancy in managing and studying what he hoped would eventually be some 150 reserves in Britain, a number representing the full spectrum of the country's natural habitats, Mr. Nicholson said that people were getting away from the sentimental idea that reserves were places where nothing was killed. The cropping of vertebrate resources might prove to be the best form of land management.

Dr. L. Harrison Matthews (scientific director of the Zoological Society of London) said that of the three orders of marine mammals, the Cetacea, the Pinnipedia and the Sirenia, the future of the whales was unquestionably precarious, but as the future of whaling was precarious too, the two facts might cancel each other out. There had been a virtual break-down in the international control of the situation; populations of the blue whale might be at a minimum for recovery and the overall length of the fin-whale was getting smaller. However, with the advent of pelagic factory-ships, whaling as an economic proposition might stop long before the whales were killed off, although the Japanese, who hunted for meat, might well go on. He thought that if carefully managed the future of the seals was reasonably secure; the elephant seal was now re-colonizing its former haunts in the Antarctic and the walrus seemed to be holding its own. Less, however, could be said about the future of the sirenids, the dugongs and manatees. The latter were now less common than they were in the Caribbean, but were reasonably plentiful in northern South America. Recent trials had shown that the manatee had an unusual appetite for grasses and aquatic herbs, and if it could be successfully introduced into weed-choked waterways it might become a useful and important animal in the ecology of the tropics.

Mr. P. H. Greenwood (British Museum (Natural History)) said that the freshwater fauna of tropical Africa, particularly the fishes, posed numerous evolutionary, zoogeographical and ecological problems. Each lake was characterized by a high degree of endemism, especially among the Cichlidae, which had undergone extensive adaptive radiation in the past ten million years. Likewise, each river

system was characterized by its own assemblage of species co-existing with others of a more general distribution. The danger, he thought, was in the widespread introduction of species from one system or lake to another where it was not endemic. These actions were partly the consequence of steps taken to counter-balance the threat or the fact of the over-fishing of the endemic species. The results were unpredictable because so little was known about the overall ecology of the waters, but they might well upset the bionomy of the lakes. Mr. Greenwood pointed out that some species were known to run up rivers and temporary flood streams to spawn in areas inundated during the biannual rains. Such species were particularly vulnerable to the effects of flood control and irrigation projects. As the future of the two British freshwater stations in Uganda and Rhodesia was by no means assured, he hoped that every effort would be made to ensure their continued existence.

Dr. Peter Crowcroft (British Museum, (Natural History)) reviewed what little information was available about changes in the status of Australian mammals, particularly the small marsupials and native rodents which had been replaced over immense areas by the introduced house mouse and ship rat. The introduction of the European fox constituted one of the greatest threats to many terrestrial forms, but the available evidence suggested that the arboreal marsupials were in no danger. It was noteworthy, too, that both the Monotremes, the spiny anteater (*Tachyglossus*) and the duck-billed platypus (*Ornithorhynchus*) were widespread and abundant in the eastern States. Although Tasmania possessed less species, it appeared to have a better chance of preserving them, particularly as the fox had not been introduced. The fate of the thylacine or Tasmanian 'tiger' remained in doubt, but the Tasmanian devil (*Sarcophilus*) was abundant. An important new factor in conservation was the recently formed Australian Mammal Society, which was stimulating research and co-ordinating survey work. This should enable further changes to be assessed with far greater accuracy. The paucity of information about the distribution and numbers of Australian mammals in the last century made it difficult to distinguish between those changes caused by settlement and those which were already proceeding naturally, perhaps as a consequence of climatic changes.

JOHN HILLARY

COLONIAL RESEARCH, 1959-60

COLONIAL RESEARCH, 1959-60*, follows the pattern of recent reports. It is slightly shorter, due in part to the disappearance of a report from the disbanded Colonial Products Council, which is replaced by a brief report from the Tropical Products Institute of the Department of Scientific and Industrial Research on work done on behalf of Colonial territories. It also includes the fifteenth annual reports of the Committee for Colonial Agricultural, Animal Health and Forestry Research and the Colonial Medical Research Council, the sixteenth annual report of the Colonial Social Science Research

Council, the thirteenth annual reports of the Colonial Economic Research Committee and the Colonial Pesticides Research Committee, the fifth annual report of the Colonial Road Research Committee, the annual report on fisheries research of the Colonial Fisheries Advisory Committee and reports from the Tsetse Fly and Trypanosomiasis Committee and the Director of the Anti-Locust Research Centre. Besides the annual report on Colonial research, there is a section dealing with research matters not covered by the reports of the specialist advisory bodies, and this refers to building and housing research, industrial and engineering research, meteorology, and geological surveys, as well as to the work of the Falkland

* Colonial Office. *Colonial Research, 1959-60*: Pp. 381. (Cmnd. 1215.) (London: H.M. Stationery Office, 1960.) 17s. net.