

- SALAS, C. de las & FÖLSTER, H. (1976). Bioelement loss on clearing a tropical rain-forest. *Turrialba*, 26, pp. 179-86.
- TOKY, O. P. & RAMAKRISHNAN, P. S. (1981). Cropping and yields in agricultural systems of the north-eastern hill region of India. *Agro-Ecosystems*, 7, pp. 11-25.
- VIRO, P. J. (1974). Effects of forest fire on soil. Pp. 7-44 in *Fire and Ecosystems* (Ed. T. T. Kozlowski & C. E. Ahlgren). Academic Press, New York, NY, USA: xii + 542 pp., illustr.
- WELLS, C. G. (1971). Effects of prescribed burning on soil chemical properties and nutrient availability. Pp. 86-97 in *Prescribed Burning Symposium*, U.S.D.A. For. Ser. South-eastern For. Expt Stn, Asheville, NC, USA: 160 pp., illustr.
- WENT, F. W. & STARK, N. (1968). Mycorrhiza. *BioScience*, 18, pp. 1035-9.

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Elephant and Rhino Experts Plan Survival Strategies

An international group of specialists met at Wankie in Zimbabwe (formerly Rhodesia) on 31 July 1981 to finalize action plans to conserve elephants and rhinos in the light of loss of habitat and fears that recent exploitation, especially of rhinos, has been excessive. The week-long meeting was the climax to several years of intensive study of the situation confronting elephants and rhinos in Africa, and of the international trade in ivory and rhino horns. The surveys were sponsored by the International Union for Conservation of Nature and Natural Resources (IUCN), World Wildlife Fund (WWF), New York Zoological Society (NYZS), and the US Fish and Wildlife Service.

African Elephants

Early assessments during the survey of African Elephants (*Loxodonta africana*) had indicated that there were probably at least 1,300,000 Elephants in Africa—a figure which has been widely quoted. As a result of later surveys, the specialists concluded at Wankie that the total African Elephant population could range from a minimum of 1,100,000 to some 2,600,000.

The uncertainty arises mainly from the extreme difficulty of assessing Elephant numbers in the vast and dense forests of the central African basin, which cover about one-third of the potential elephant habitat—much of it in Zaire. Some 600,000 Elephants have been accounted for in detailed surveys—principally in savanna lands in eastern and southern Africa. In unsurveyed areas sample surveys made by air and on foot, combined with assessments of Elephant numbers based on extrapolation (using an index of elephants per square kilometre of suitable habitat) and informed guesses, led to the conclusion that there were at least another 500,000 Elephants, or possibly 2,000,000, to add to the 600,000 of the 'accurate' surveys.

High priority is being given to detailed surveying of the central African basin in order to arrive at a reasonably accurate figure.

Although overall numbers are high, it was agreed that Africa's Elephants are declining in almost all of the 34 countries in which they are still found, and especially where they are easily accessible to poachers or where their habitat is being taken over by expanding human populations. Reasonably stable African Elephant populations exist only in Gabon, Ivory Coast, Malawi, Namibia, Nigeria, Rwanda, and South Africa, but they represent only a very small proportion of the overall population. In addition, Zimbabwe is notable for its 47,000 Elephants whose population growth is kept in check by regular culling to protect the habitat.

African Rhinos

The Wankie meeting found that the northern subspecies of the White Rhinoceros, *Ceratotherium simum cottoni*, was in a critical situation, with fewer than 700 surviving in the wild—almost all of them in southern Sudan and northern Zaire.

The Southern White Rhino, *C.s. simum*, which was thought to be extinct until a few were found in Natal at the turn of the century, has thrived under protection and there are now over 2,500 in South Africa and 300 in other countries of the region, apart from a considerable number sent to zoos in other parts of the world.

Black Rhinos (*Diceros bicornis*) have suffered massive declines in numbers in the past decade—for example, they have probably decreased by 90% in Kenya alone. It is estimated that there are now between 15,000 and 18,000 Black Rhinos surviving in 18 countries, with the largest concentrations in Tanzania and Zambia. Almost everywhere they are being heavily poached for horn, which goes to the Yemen Arab Republic to make dagger handles, and to the Far East for medicinal use.

Conservation Measures

The Wankie meeting recommended conservation measures based on the biological importance of various elephant and rhino populations, their conservation status, and the economic and national factors, such as human population expansion, impinging on them.

High priority was given to building up the small breeding herd of northern White Rhinos at the Dvur Kralove Zoo in Czechoslovakia, and another group at San Diego in the southwestern United States. Protection of the wild survivors needs to be improved in the Garamba National Park in Zaire, and also in southern Sudan.

To save the Black Rhino, anti-poaching measures also need to be stepped up and translocation undertaken of animals to protected areas from ones where they are exposed to poaching. Special attention was recommended for *D.b. longipes* in Cameroon and the Central African Republic, for *D.b. michaeli* and *D.b. ladoensis* in Kenya, and for *D.b. minor* in Tanzania and Zambia.

Recommended priorities for Elephant conservation, in addition to the status survey in the central African basin, include the small desert herds in the Kaokoveld in Namibia and in the Gourma area of Mali; the fragmented and beleaguered forest populations of West Africa; and the savanna ones in Niokola Koba, Senegal, and the W National Park (which is divided between Niger, Benin, and Upper Volta)—also those of Selous in Tanzania, Garamba in Zaire, and in the Central African Republic.

The meeting also recommended that IUCN/WWF should make representations to governments and traders to achieve effective controls and conservation measures. It was agreed that the future of rhinos would remain in jeopardy as long as trade in their horn continued, and so special efforts were recommended to divert users in Yemen and eastern Asia to substitutes.

Great importance was given to achieving universal acceptance and effective application of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).^{*} It was suggested that their secretariat should be expanded.

Summing up the results of the Wankie meeting the Chairman, Dr David Cumming, Chief Ecologist of Zimbabwe's National Parks and Wildlife Department, said: 'Although so much has to be done all over Africa, our meeting has identified a small set of priorities which requires strong and immediate action. There is no doubt that the Northern White Rhino in Sudan and Zaire is in an extremely precarious position. But the success in saving the Southern White Rhino shows that dedicated efforts now could certainly save the northern form from extinction.'

'The Black Rhino is declining at an alarming rate, and the major focus for action is to arrest the trade in rhino

horn, as well as to secure key Black Rhino populations in Tanzania and in the Luangwa Valley in Zambia.

'There will inevitably be a continuing reduction in the number of Africa's Elephants as a result of increasing human population and the demand for land. The key issue is to focus on conservation of Elephants in a wide range of habitats throughout the continent. This is why we stressed the importance of the West African Elephants. Overall, careful thought needs to be given by African governments [as] to what land and habitat should be conserved before their options are closed.'

The finalized action-plans are being presented to African leaders as the basis on which they can plan the future integration of conservation of wildlife resources with economic development.

'If the right decisions are taken and implemented now, Elephants and Rhinos can continue to play their traditional roles as sources of meat, ivory, and other products, and as part of the living culture of the people of Africa. The international community has a duty to help with funds and expertise', the Director-General of IUCN, Dr Lee M. Talbot, declared already before the meeting. It is towards such ends that WWF/IUCN are continuing to strive.

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^{*}See the account by their Acting Secretary-general, Jaques Berney, of their recent third meeting published on page 251 of our Autumn issue.—Ed.

Astronomers Discover Largest 'Hole' in Space

Astronomers conducting a broad survey of galaxies have discovered a puzzling region of empty space which is so vast that, ordinarily, some 2,000 galaxies the size of the Milky Way would be found within its boundaries. The Milky Way, the galaxy in which the solar system is located, has a diameter of about 100,000 light-years.

The finding is considered particularly important because the huge void offers astronomers a major new clue to the nature of the early universe and its evolution to the present day. The astronomers said they are surprised by the vastness of the 'empty' region—about 300 million light-years in diameter—and by the fact that it appears to be almost totally devoid of galaxies.

The research workers, who are studying the large-scale structure of the universe, said the diameter of the newly-discovered region amounts to about one per cent of the entire observable universe, and is very much bigger than any previously-discovered 'empty' regions and bigger than the largest known clusters of galaxies.

While astronomers have long known that galaxies in space tend to clump together into clusters and super-clusters, limited attention has been paid, until this programme, to the vast regions outside the clusters. The programme is being carried out by Dr Robert Kirshner, of the University of Michigan, Dr Augustus Oemler, Jr, of Yale University, Dr Paul L. Schechter, of Kitt Peak National Observatory, and Dr Stephen A. Shectman, of the Mount Wilson and Las Campanas Observatories whose headquarters are in Pasadena, California. A portion of the research was financed by the National Science Foundation which also supports Kitt Peak National Observatory.

The clue offered to astronomers about the nature of the universe involves a theory among cosmologists that both clusters and voids grew from what was once a smooth population-density of galaxies. As time evolved, the population-density increased in denser regions to form clusters and decreased in less-dense regions to form voids. 'When the universe was only one ten-thousandth of its present age, the density of stars and galaxies may have been nearly equal in the two kinds of regions', according to Dr Schechter: 'It's a case of the rich getting richer and the poor getting poorer'.

The astronomers made their surprising discovery when they turned their telescopes to the direction of the constellation Bootes, where they found the population-density of galaxies to be at least 10 times less than expected. 'To have found a population-density of less than three times the average would have been a rare find', Dr Schechter said, 'but finding that the density is about 10 times less than the average is exceedingly hard to understand'.

The investigators are now trying to determine the boundaries of this void region more precisely. They are also investigating the possibility that matter is present there in some form other than galaxies—perhaps in tenuous gas or in unusually small galaxies which are too faint to have been detected in their survey.

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