

Science in Zoos and Aquariums

Professor Gordon McGregor Reid

Director General of the North of England Zoological Society (Chester Zoo), Co-Chair of the Research Committee of the European Association of Zoos & Aquariums and President-elect of the World Association of Zoos & Aquariums

A great deal of important science takes place in leading zoos in the United Kingdom and world wide. A zoo is officially defined as any permanent establishment where living, wild animals are kept for exhibition to the public for seven or more days a year, with or without an admission charge. As well as conventional zoological gardens, this encompasses safari parks, aquariums, bird gardens, birds of prey centres, reptile and amphibian centres, butterfly or bug houses and some animal sanctuaries (private sector and charities). The precise nature of the science varies with the policy, size and resources of the organisation but the emphasis is on conservation, environmental sustainability and animal welfare both at home and abroad; and on work conducted in close collaboration with others. There is also an impetus through educational programmes to communicate advances in conservation and science to the many guests who visit zoos and aquariums each year: 125 million in Europe and 600 million globally – an audience bigger than that for football! Also, through outreach programmes, it is now possible to deliver education in conservation to schoolchildren in developing countries.

Conservation is considered to be actions that substantially enhance the survival of species and habitats, whether in nature (*in situ*) or outside the natural habitat (*ex situ*). Zoos conduct important *ex situ* work including scientifically managed “assurance” breeding programmes,

affording the potential for reintroduction of species that have become extinct in the wild. Zoo research involves benign, non-intrusive, non-invasive methods and is increasingly targeted on natural habitats. Basic and applied programmes in zoos or aquariums can embrace a remarkably large number of topics including: animal care, ageing, behaviour, biomaterials or “gene” banking, biotechnology, contraception, database management, diet, disease, DNA analysis, domestication, environmental enrichment, husbandry, identification, life histories, low temperature biology, population analysis, reproduction, studbooks, human behaviour and visitor studies. Research efforts on these topics will, in turn, typically draw on combinations of major scientific disciplines such as anatomy, biochemistry, biogeography, biotechnology, ecology, education, endocrinology, ethology, evolution, genetics, information technology, nutrition, physiology, population biology, psychology, sociology, taxonomy, and veterinary medicine.

Being zoological *gardens*, there is recent engagement with botanical and horticultural research and the breeding and management of rare and endangered species of plants. There is also increasing emphasis on indigenous as well as exotic fauna and flora. Chester Zoo has, for example, successfully reintroduced to the North West of England zoo-bred Barn Owls, Sand Lizards, Water Voles and Harvest Mice in scientifically monitored schemes; and works in partnership in



the field on conserving rare native species as diverse as Freshwater Pearl Mussel, Dormouse, Tadpole Shrimp, Limestone Woundwort, and Black Poplar.

Zoo Science in the UK

The Zoo Licensing Act 1981 (Regulations for England and Wales, amended in 2002) covers conservation measures to be implemented by zoos including “research from which conservation benefits accrue to species of wild animals”. The ZLA is administered by the Zoo Branch (WSC2) of the Wildlife Species Conservation Division of Defra, the Department for Environment Food and Rural Affairs. The ZLA and Secretary of State’s Standards of Modern Zoo Practice provide the statutory framework for public safety, animal welfare, the delivery of conservation, education, research and an ethical review process. All establishments are regularly and rigorously inspected. Among many other aspects, this covers animal welfare in relation to research, quarantine and bio-security, provision of data or samples for approved outside research, field conservation projects, publications, research grants and links with Higher Education institutions. The Health and Safety Executive publication *Health and Safety in Zoos* (2005) concerns compliance with the Health & Safety at Work etc Act, 1974 and with

ensuring the safety of the public and employees, including those who work closely with animals and conduct veterinary or scientific investigations.

There is, in addition, a Zoos Forum which acts as the Government's independent adviser on zoo licensing, safety and ethical issues and which publishes a Handbook, also available on the web (www.defra.gov.uk). Chapter 2 of the Zoos Forum Handbook is "Conservation, Education and Research" where guidance and benchmarking is provided on ZLA requirements for zoos to participate in research. There is a recommendation that larger zoos and aquariums (>400,000 visitors pa) should undertake several research projects, collaborate with local universities and colleges on research, facilitate research, offer training opportunities for students and publish papers and notes each year on the results of research and field conservation work.

BIAZA (www.biaza.org.uk) the British & Irish Association of Zoos & Aquariums, with 102 members, is well represented on the Zoos Forum and strongly advocates scientific engagement. Nonetheless, while many of the larger zoos have Scientific Officers, Conservation Biologists, Veterinarians, Nutritionists and Educational staff, science does not always achieve its full potential and the high profile that it merits. This is partly to do with limited facilities, budgets and staffing; and the current national research funding structure, which perhaps over-emphasises abstract innovation (versus practical problem solving) and which, surprisingly, does not heavily support applied research in critical areas of conservation, sustainability and animal welfare. The Government squeeze on Gift Aid to charitable zoos does not help.

The Darwin Initiative

The recent announcement of the £7 million Darwin Awards funding round for 2007 (www.darwin.gov.uk) highlights the fact that zoos can and do contribute at the highest level to research and development work in biodiversity conservation and

sustainability. A major award to the North of England Zoological Society was for "Building capacities for mitigating human-elephant conflicts in Assam". Chester Zoo leader Alexandra Zimmerman and her team are working with EcoSystems India to tackle this serious issue, where people are deprived of food, injured or killed as a result of elephant raids on crops, exacerbated by the fact that the natural habitat for elephants is shrinking and many now carry bullet wounds. This large and effective programme now employs 30 local people in Assam and involves sophisticated GIS satellite tracking and analysis of elephant migrations and attacks, alongside community level work on researching simple deterrents (such as planting peppers to keep elephants away from crops) and training for supplementary livelihoods to reduce crop dependence.

International Zoo Science

A European Zoo Directive is in force which places a strong emphasis on conservation, education and science; and this is modelled to a large extent on the UK Zoo Licensing Act. EAZA (www.eaza.net) the European Association of Zoos and Aquariums (with 46 UK members) conducted a membership survey in 2005. Among 301 EAZA institutions, as few as 25 (8.3%) indicated that they had a research department. Only about 33% have a research policy and many do not disseminate findings in a publicly accessible format, or indeed have a specific research budget. To help remedy these shortcomings EAZA will later this year launch a research strategy and action plan entitled "Developing the Research Potential of Zoos and Aquariums".

The World Association of Zoos & Aquariums (WAZA) has its headquarters in Switzerland and its motto is "United in Conservation" (www.waza.org). The mission is to "guide, encourage and support the zoos, aquariums and like-minded organisations of the world in animal care and welfare, environmental education and global conservation" – all of which involves a scientific approach. The WAZA membership

includes individual zoos and aquariums, with 12 in the UK; national federations such as BIAZA; and wider geographical associations such as EAZA. There are also WAZA affiliate members, some of whom have a specific remit in science, including the European Association of Zoo and Wildlife Veterinarians (EAZWV), the Leibniz Institute for Zoo and Wildlife Research (IZW) in Berlin, and the International Species Information System (ISIS).

World Zoo and Aquarium Conservation Strategy

WAZA published the "World Zoo and Aquarium Conservation Strategy" (WZACS) in 2005 to act as a central reference point and authoritative source of guidance to the profession and to external stakeholders. The WZACS was prepared under the aegis of an international steering committee led by Dr Jo Gipps of the Bristol & Clifton Zoological Society, UK. Chapter three of the WZACS concerns "Science and Research" – expressing the vision that "Zoos and aquariums are fully and actively integrated into the research community and into public consciousness and understanding of science, as serious, respected scientific institutions that make significant contributions and sound scientific decisions for wildlife worldwide."

The conservation and research challenges are everywhere large and daunting, from threatened Black Rhinos and Orang-utans to African cichlid fishes, Caribbean corals and Pacific Island Land Snails. There is a particularly urgent need to prevent the dramatic decline and extinction of the 9000 (described and undescribed) species of frogs, toads, newts and other amphibians of the world. They are globally threatened from the rapid spread of a lethal fungus which may be associated with climate change (and which has now arrived in Britain!). WAZA, in partnership with the World Conservation Union (IUCN) have developed a global Amphibian ARK partnership to research and address this extinction crisis and much political and financial support will be needed to galvanise effective action.