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# Preface

Worldwide interest in wildlife fertility control is continuing to grow with an increasing range of contexts for application. Since the 5th International Symposium on Fertility Control in Wildlife in 2001 at Kruger National Park, South Africa (Kirkpatrick *et al*. 2002), there have been significant advances by research teams working around the world. Therefore, the time was ripe for the 6th International Conference on Fertility Control for Wildlife, held in 2007 in York, United Kingdom, to provide a forum for discussion of recent progress and future prospects.

Achieving effective, humane and environmentally sensitive management of overabundant wildlife is of increasing concern to conservation biologists, wildlife managers, policy makers and the general public. Using fertility control to reduce productivity has long been recognised as a potentially attractive approach to resolving some human–wildlife conflicts and threats to biodiversity. At the same time fertility control is also an important and necessary feature of the husbandry of wildlife in zoos and the management of feral domestic animal populations.

The themes addressed at the conference included:

- Development of fertility control tools
- Development of delivery methods
- Fertility control in captive wildlife
- Animal welfare in relation to fertility control
- Socio-political and regulatory issues in wildlife fertility control
- Wildlife management applications of fertility control
- Population level effects of fertility control

The papers in this special issue offer an overview of some of the latest developments presented at the conference.

One of the major changes in focus since the 5th Symposium in Kruger National Park has been the cessation of research on the development of viral-vectored approaches for the delivery of immunocontraceptive agents (VVIC). Consideration of the VVIC approach, under development in Australia since the early 1990s for three major overabundant introduced mammals (rabbits, foxes and wild house mice), has ceased for a range of scientific and technical reasons. These results and the reasons were summarised during the 6th Conference and have already been published in a separate special issue of *Wildlife Research* (Volume 34, Issue 7 – see McLeod *et al*. 2007; Redwood *et al*. 2007; Strive *et al*. 2007; van Leeuwen and Kerr 2007). However, studies in New Zealand (Cowan *et al*. – this issue) on the development of a parasitic nematode for dissemination of fertility control agents for the brushtail possum continue, with ecological studies showing that the parasite will spread effectively when released in the field. However, technical challenges remain with respect to the development of this parasite as a disseminating vector, regulatory issues, and international concerns regarding its release.

Nevertheless, since 2001, there has been continued emphasis on development of immunocontraceptive vaccines with considerable success in the refinement of single-injection approaches. Alongside this success there has been much greater effort towards the development of effective fertility control formulations that can be delivered orally rather than by injection.

At the previous symposium in Kruger, applications of fertility control to free-living populations had begun to emerge. However, these tended to focus on measuring effects on individual fertility rather than populations. A significant subsequent advance since this symposium has been the maturation of these studies to reveal population level effects. We are thus seeing, for the first time, practical demonstrations of population reductions using fertility control in wildlife conflict situations. Thus real data are now becoming available to address previous speculation regarding such effects, notably the occurrence and consequences of enhanced survival of infertile animals and compensatory population processes, both specific to fertility control and in common with other approaches such as culling. In this volume, Jacob *et al.*, Ballou *et al.* and Rutberg and Naugle present simulations of the effects of fertility control at a population level, offering contrasting examples of rodents, as highly fecund short-lived species, and longer-lived ungulates. The findings indicate that fertility control can and does have beneficial effects on population dynamics, with the age structure in some of these species being altered partly through the longer survival of infertile females.

Several papers present results of ongoing studies examining the short-, medium- and long-term effects of injectable vaccines against porcine zona pellucida (PZP) and gonadotrophin-releasing hormone (GnRH) in eutherian species, particularly horses and white-tailed deer (Kirkpatrick and Turner; Killian *et al.*; Botha *et al.*). Other studies in wild boar with injectable GnRH vaccine are demonstrating efficacy in terms of duration of effects, lack of impact on energy and time budgets, behaviour and overall welfare (Massei *et al.*). The importance of animal welfare is increasing as a driver for the development of fertility control tools as alternatives to less humane approaches. However, fertility control will often not be an appropriate solution on its own for management or resolution of human–wildlife conflict but may need to be used to complement other approaches including culling. Nevertheless, modest possible welfare costs of fertility control tools (e.g. injection site granulomas) need to be compared with those arising from alternative approaches in a balanced assessment of relative costs and benefits.

Coulson *et al*. describe the effects of implants of the steroid levonorgestrel on the fertility of eastern grey kangaroos, demonstrating infertility for up to four years in more than 75% of treated animals with a decline thereafter. Similarly, Bertschinger *et al*. describe the induction of infertility after repeated administration of implants of deslorelin in lions and tigers – demonstrating that treatment could be applied every 24 months to maintain infertility. These authors recognise the limitation of this approach in that, as with injectable vaccines, capture of individual animals must be undertaken to administer


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the implant. This remains a time-consuming and costly exercise if large populations are being managed using fertility control alone. Turner *et al.* are exploring controlled-release preparations for PZP proteins – again these are injectable formulations, which would have an advantage if they avoided the need to deliver one or more boosters to animals.

Regulatory issues need to be addressed early in the development of new wildlife management tools and the costs of generating the data required by regulatory agencies may constrain realisation of practical applications. However, wherever possible, arguments for the promotion of fertility control tools with respect to effectiveness, welfare, environmental impact and operator safety need to be made through comparison with the existing alternatives that are becoming increasingly unacceptable. These topics are covered in the paper by Fagerstone *et al.* describing the registration of GonaCon, the single-shot GnRH immunocontraceptive injectable vaccine for white-tailed deer management. This paper also covers the first registration of a contraceptive for Canada geese and pigeons. Duckworth *et al*. have tested the specificity of a brushtail possum ZP vaccine with respect to both birds and mice. This is an important topic for all fertility control vaccines with specificity in both the contraceptive agent and the delivery system being highly desirable, although realistically most likely only achievable for one of these elements. Humphrys and Lapidge propose a generic framework as part of the process for registration, which includes addressing the risks associated with the species to be controlled, the orally delivered agent and the delivery system, in order to meet the registration requirements for similar products being registered in different countries.

### *Challenges for the future*

Many regard the development of oral fertility control agents as a key next step in broadening the scope of potential practical application, including both chemical agents and immunocontraceptive vaccines. However, given that most approaches currently being considered for oral application are non-species-specific then specificity will need to be achieved through delivery systems that should be developed in parallel with the active fertility control agents. Welfare issues, for instance those associated with increased likelihood of wild animals reaching senescence, and the possibility of selection favouring resistance to emerging fertility control tools will continue to be researched in the next few years, particularly as population level studies mature across an increasing range of species and contexts. These studies will offer detailed evaluation of how outcome is shaped by population biology and thus how fertility control tactics can best be incorporated into practical wildlife management strategies. We look forward to these expectations being progressed, even if not fully realised, by the time of the next conference.

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