



SCIENTIFIC MEETING

## **ALTERNATIVE REPRODUCTIVE STRATEGIES IN ANIMAL SOCIETIES**

Tuesday, 11 December 2007

The Meeting Rooms, The Zoological Society of London, Regent's Park, London NW1 4RY

**Chair: Professor Tim Coulson,  
Reader in Population Biology, Imperial College London**

### **Reproductive strategies in primitively eusocial insects**

*Professor Jeremy Field, Sussex University*

Helpers in primitively eusocial and cooperatively breeding animal societies forfeit their own reproduction to rear the offspring of a queen or breeding pair, but may eventually attain breeding status themselves. A conspicuous general feature of such societies is the enormous variation between individuals in behaviour. Initial attempts to understand this variation focused on variation in genetic relatedness as an explanatory variable, but with mixed results. I will discuss an alternative explanation based on the fundamental trade-off between current and future fitness, including the results of experimental tests. The conclusion is that variation in social traits is best understood from a life-history perspective.

### **Mother's little helpers: strategies of maternal care in a cooperatively breeding bird**

*Dr Rebecca Kilner, Department of Zoology, University of Cambridge*

The superb fairy-wren is a small, common songbird native to south-east Australia. In common with roughly 10% of the world's birds, it shows cooperative breeding: some breeding pairs in the population are assisted in rearing young by non-breeding helper males. We investigated how breeding females benefit from the presence of helpers at the nest. We found that after hatching, helpers boost the amount of food delivered to nestlings by such an extent that females can afford to relax their contribution to care, and work less hard to look after their chicks than their counterparts raising young without help. However, although nestlings reared by groups of adults receive more food than broods reared by unassisted pairs they do not attain a greater mass. To understand why this should be, we examined clutches laid by females breeding in groups and those breeding in pairs. We found that females breeding in groups laid smaller eggs, of lower nutritional content, that yielded lighter chicks. Helpers therefore allow females to skimp on nourishing their

offspring both before and after hatching, by compensating for the shortfall in female effort. By putting less effort into rearing young, females are more likely to survive to breed again the following year.

## **Ungulate mating systems and the disadvantages of being too macho**

*Dr Loeske Kruuk, University of Edinburgh*

Intense competition between males for access to females can drive the evolution of extreme sexual dimorphism in species. In many polygynous ungulates, males with large body size, high levels of testosterone and large weaponry (such as antlers) can expect high breeding success, such that it is puzzling as to why less successful types persist at all. However, recent evidence suggests that there may be disadvantages associated with a typically “macho” phenotype.

Long-term data from a feral population of Soay sheep on the islands of St Kilda, Scotland, show that heavy investment in weaponry is a risky strategy that will only pay off under certain environmental conditions. Rams that invest heavily in early horn growth have increased breeding success but during years of low food availability they are also more likely to die over winter. Furthermore, using records from a wild population of red deer on the island of Rum, we have found that good genes for males are not necessarily also good genes for females. In this study, stags with relatively high fitness fathered, on average, daughters with relatively low fitness, thus generating a negative genetic correlation between estimates of breeding success in males versus in females.

In both of these studies, the selection pressures on the genes determining male breeding success are therefore reversed entirely when expressed in different environments or different sexes. Antagonistic selection pressures such as these may play an important role in maintaining genetic diversity: being overly macho isn't always an evolutionarily winning strategy for maximising representation of genes in future generations.

## **Maximising fitness through cooperation: altruism, infidelity and grandparents in the Seychelles warbler**

*Dr David S. Richardson, University of East Anglia*

In vertebrate cooperative breeding systems, adult individuals other than the breeding pair assist in rearing offspring from a breeding attempt. This provides an apparent paradox for evolutionary thinking. Namely, why should individuals care for young that are not their own genetic offspring. Kin selection, where individuals gain indirect (genetic) benefits by helping related individuals to reproduce, has been proposed as the answer to this paradox. However, there is still much debate about the relative importance of indirect benefits. Over the last 10 years I have investigated the evolution of cooperative breeding in the Seychelles warbler, *Acrocephalus sechellensis*. In this system, high levels of subordinate maternity increase the direct benefits of being a subordinate, but female infidelity

drastically reduces the possibility for indirect benefits<sup>1, 2</sup>. Female subordinates are able to maximise the indirect benefits they gain by directing their helping effort to related individuals using associative learning cues (i.e. the continued presence of their putative parents within the territory)<sup>3</sup>. However, because of high levels of infidelity, subordinates cannot trust their legitimacy through the male line; consequently they only use the continued presence of the putative mother, but not the putative father, as a reliable cue to determine when to feed related nestlings<sup>4</sup>. Finally, I report new data investigating the adaptive significance of 'grandparent' helpers in the Seychelles warbler, the first bird species in which this phenomenon has been observed<sup>5</sup>. These findings show that a variety of different reproductive tactics can occur within, as well as across, taxonomic units.

**Further Reading & References:**

<sup>1</sup> Richardson, D.S., Jury, F.L., Blaakmeer, K., Komdeur, J. & Burke, T. (2001) Parentage assignment and extra-group paternity in a cooperative breeder: the Seychelles warbler (*Acrocephalus sechellensis*). *Molecular Ecology* **10**: 2263–2273.

<sup>2</sup> Richardson, D.S., Komdeur, J. & Burke, T. (2002) Direct benefits and the evolution of female-biased cooperative breeding in Seychelles warblers. *Evolution* **56**: 2313–2321.

<sup>3</sup> Richardson, D. S., Burke, T. & Komdeur, J. (2003) Sex-specific associative learning cues and inclusive fitness benefits in the Seychelles warbler. *Journal of Evolutionary Biology* **16**(5): 854–861.

<sup>4</sup> Richardson, D.S., Komdeur, J. & Burke, T. (2003) Altruism and infidelity among warblers. *Nature* **422**: 580.

<sup>5</sup> Richardson, D. S., Burke, T. & Komdeur, J. (2007) Grandparent helpers: the adaptive significance of older, postdominant helpers in the Seychelles warbler. *Evolution* **61**(12): 2790–2800.