

## **Invertebrate biodiversity and ecosystem function in an African agricultural landscape**

### **Supervisors:**

**Prof Richard Wall (School of Biological Sciences, University of Bristol) – Main supervisor**

Dr Martin Hall (Natural History Museum)

Dr Sarah Beynon ('Dung Beetles Direct Ltd.')

**Host institution:** University of Bristol

**Project description:** Livestock farming is of particular importance in many parts of Africa for both small-scale pastoralists and, increasingly, in large-scale farming enterprises, with cattle providing meat, milk, and draught power. However, both ectoparasites (ticks, flies and lice), the diseases they transmit and endoparasites (worms and fluke), provide major production constraints. Without adequate parasite control, livestock losses are high and product quality low, providing a barrier to sustained production and commercialization. As a result, in much of Africa treatment of cattle with pyrethroid insecticide is currently recommended. In many cases, to be effective these compounds need to be applied once or twice a month. However, following the treatment, compounds such as deltamethrin and cypermethrin are excreted into the dung of cattle at about 0.01 to 0.1 ppm for up to about 1–2 weeks after treatment and persist in the pats for many weeks more (Wardhaugh *et al.*, 1998, Vale *et al.*, 2004). At these concentrations, the insecticide residues are sufficient to affect the dung fauna, particularly fly larvae and slow-breeding beetles. When pyrethroids are applied at the advised frequency, estimates suggest that the average mortality among beetles and flies will be about 10–30% for much of the time. Hence cattle farming with conventional insecticide treatments is likely to significantly damage dung-community biodiversity and thereby disrupt ecosystem function in agricultural landscapes. Alternative approaches to parasite control in cattle farming are essential to ensure the conservation of invertebrate biodiversity. The project will:

- quantify the ecological impact of the treatment of cattle with insecticides and parasiticides on invertebrate decomposer communities,
- Identify sustainable strategies of insecticide use and investigate alternative methods of parasite control in cattle that can reduce production costs, increase product quality and reduce environmental impacts.

The student will undertake two 3-month visits to Zambia each year, followed by work at the NHM to identify specimens collected. The project will be co-ordinated by Professor Richard Wall at UoB; Dr Martin Hall of the Natural History Museum (London), will co-ordinate taxonomic elements of the project. Dr Sarah Beynon, an entomologist specialising in dung beetle taxonomy and ecology will provide specialist advice and local contacts at field sites.

Vale, G.A., Grant, I.F., Dewhurst, C.F. & Aigreua, D. (2004) Biological and chemical assays of pyrethroids in cattle dung. *Bulletin of Entomological Research*, 94, 273-282.

Wardhaugh K.G. Longstaff B.C. & Lacey M.J. (1998) Effects of residues of deltamethrin in cattle faeces on the development and survival of three species of dung-breeding insect. *Australian Veterinary Journal*, 4 273 – 280.