

The
LINNEAN
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of London



Interdisciplinary Perspectives on Conservation Breeding and Livestock Genetics: In Memory of Andrew Sheppy FLS

DAY MEETING 09:30–17:00 *Friday 23 February 2018*

In memory of Andrew Sheppy FLS, the Linnean Society is organising a trans/inter-disciplinary meeting covering his research and academic interests. Talks and presentations will feature work on livestock conservation, genetics and genomics, phylogeny, and bioinformatics. This symposium will be of interest to a wide range of biologists ranging from molecular and structural themes through to conservation and physiology.

Programme

09:30 – 09:45 *Doors open*

09:45 – 10:15 **Libby Henson** (Grassroots PR)

10:15 – 10:45 **Dr Rex Walters FLS** (Livestock Genetics Ltd.; British Pig Assoc.)

10:45 – 11:15 **Dr Tim Bray** (Bristol Zoo)

11:15 – 11:35 *Coffee break*

11:35 – 12:05 **Rupika Gulati** (De Montfort University)

12:05 – 12:35 **Tom Beeston** (Chief Executive Officer, Rare Breeds Survival Trust)

12:35 – 13:30 *Lunch break*

13:30 – 14:30 **Dr Phil Sponenberg** (Virginia-Maryland College of Veterinary Medicine) [Keynote]

14:30 – 15:00 **Dr Richard Small** (Liverpool John Moores University)

15:00 – 15:30 **Dr Aylwyn Scally** (University of Cambridge)

15:30 – 16:00 **Dr Christine Ashton** (Indian Runner Duck Club)

16:00 – 17:00 *Wine reception*

End

Organisers: **Dr Philippe B. Wilson FLS** [Chair], **Dr Tim Bray** and **Dr Rex Walters FLS**

ABSTRACTS

Libby Henson (Grassroots PR)

“The importance of pedigree in livestock breeding”

From the biblical Jacob through Robert Bakewell to modern livestock breeders, pedigree recording has been an invaluable tool. We will examine ways it can be used to improve, conserve, and investigate breeds, and help conservation farmers make better breeding decisions.

Dr Rex Walters FLS (Livestock Genetics Ltd.; British Pig Assoc.)

“The genetic conservation of pig breeds, with special reference to the Oxford Sandy and Black”

Global consumption of pigmeat is greater than for any other livestock species. The meat comes from many different breeds and there is growing awareness that their successful genetic conservation is of major importance.

In the UK there are now eleven breeds which are classed as native breeds. One breed, the Oxford Sandy and Black (OS and B), nearly became extinct in the 1980s. However, largely due to the efforts of Andrew Sheppy, F.L.S., the breed was saved and a Breed Society set up in 1985 that has gone from strength to strength. The OS and B story will be outlined together with details of genetic analyses of several of the native breeds and future conservation plans.

Dr Tim Bray (Bristol Zoo)

“Farm to forest: conservation genetics of domestic animals and captive populations”

A population genetics approach has given us ever more detailed insight into the dynamics of populations, from domestic to wild. Of particular interest are the consequences of captive breeding on genetic diversity and relationships between populations. We can use this information to look into historical events such as changes in population size and levels of gene-flow. This can help contemporary breeding programmes for both domestic breeds and species under conservation breeding management. Here I will discuss some of the issues considered from rare cattle to endangered pheasants.

Rupika Gulati (De Montfort University) [PhD Student of Philippe Wilson]

“Uncovering the secrets of the eggshell: answering the age-old question”

What came first? The chicken, or the egg? Academics have been striving to answer, let alone appreciate the nature of this question for centuries. However, how close are we to robustly understanding the structure, formation and properties of eggshells? Eggs and derived products form an integral part of the food chain. Hence, research into egg structure, function, and production is prevalent. The past decade has seen more than two thousand papers published in relation to avian egg science, these works supplementing our understanding of the nature of the avian egg, and its biological, chemical, and physical properties. Eggshell colour, strength and chemical composition, poultry nutrition, and genetics and have all been intensively studied recently, with significant progress being made in a number of these areas. Indeed, with the prevalence of robust theoretical techniques, it is now commonplace to combine experimental investigations with theory, providing a balanced and interdisciplinary perspective. There is, however, still a gulf of understanding in terms of the structure and formation of the avian egg. In particular, the manner in which the shell itself begins to form on the outer albumin, and the fascinating properties it exhibits.

Tom Beeston (Chief Executive Officer, Rare Breeds Survival Trust)

“Conservation Breeding and Livestock Genetics: Is the UK achieving its goals?”

The first dilemma is defining the goals, industry, civic society and government have minimal and in some instance no targets. The second dilemma being the homogenisation of some of the breeds. The third is that measurement can be difficult, and defining if genetic traits have been lost is not readily apparent. Since the 1970s in the UK we have not lost a breed, however present trends for native and rare breeds show a decline of 5% or more by breed for around half of the 120 plus so livestock breeds, excluding poultry for which there are few numbers available. It is hoped given genomic research advances and an increased pressure for greater provenance and transparent supply chains will lead to an improved understanding of our genetic resources and an increased demand leading to increased breeding numbers.

KEYNOTE:

Dr Phil Sponenberg (Virginia-Maryland College of Veterinary Medicine)

“Conservation Genetics – Theory meets Field”

The science of genetics is increasingly molecular, with the original foundations of field observations and Mendelian genetics often relegated to nostalgic footnotes. Effective conservation of genetic resources interacts with both spheres of genetics and field work, and each has unique contributions to make the overall success. Field experiences and observations can work hand-in-hand to strengthen the results and directions of molecular genetic studies. Field results and genetic results in turkey conservation in the USA are one example of the fruitful ways these can interact. Other breeds for which field work and genetics have served well include Dexter cattle, Milking Shorthorn cattle, and a host of New World breeds coming from an Iberian origin. Effective conservation combines phenotype, history, cultural definitions, and finally genotype.

Dr Richard Small (Liverpool John Moores University)

“Conservation Grazing – delivering habitat management for conservation with native breeds”

Although native breeds had been used in management of some nature reserves since the 1960s, over the past 20 years conservation grazing has become one of the preferred methods of managing habitats for biodiversity. On most sites native breeds of livestock are preferred for a variety of reasons. Andrew Sheppy was amongst the first to recognise the opportunity this presented for native breeds; amongst the breeds that have developed a particular reputation as conservation grazers are Hebridean sheep and Dexter cattle, breeds supported by Andrew from the early days of the Rare Breeds Survival Trust. The talk will explore the reasons for using native breeds in this role with examples of the benefits to those breeds.

Dr Aylwyn Scally (University of Cambridge)

“Evolutionary genomics of survival and extinction in the great apes”

The non-human great apes, our closest evolutionary relatives, survive today only as endangered and fragmented populations in equatorial forest refugia. I will discuss our understanding of the evolution of these species and the genetic relationships between them, including when and how they diverged. I will also describe recent population genomic studies of some of the most critically endangered populations, including the Mountain gorillas of central Africa, which have shed light on their past and current demography and their prospects for survival.

Dr Christine Ashton (Indian Runner Duck Club)

“The mallard duck from the hobbyist perspective”

Most breeds of the domestic duck derive from the common mallard (*Anas platyrhynchos*). In hunter-gather communities where human populations are sparse and wild produce is readily available there was little need for livestock farming of ducks. This tradition of trapping wildfowl in Europe continued even into the 1800s, when it was ultimately replaced by larger, white, farmed table-birds. In the Far East the same species was domesticated at least 3000 years ago. By the Ming Dynasty (1368–1644) the white Pekin duck had become a specialised meat breed in China, whilst the paddy field ducks of the East Indies were generally lighter in weight, more varied in colour, and prolific egg layers. Evidence of their early specialisation is found at a world heritage site on Java. Upright ducks today are still used in low-cost, symbiotic farming systems where local breeds outperform introduced varieties in low in-put systems. Key to their success is the behaviour of the birds.

The transport revolution around the globe from about 1600 onwards allowed the spread of these landraces from Asia to Europe. Evidence from Dutch art shows that trade with the East introduced new morphotypes and colour varieties to Europe. These were often regarded as curiosities in the 1600s and they do not seem to have been developed on a commercial scale until 18th century urbanization and population growth. The nineteenth century witnessed a massive change when transport innovations allowed many more imports of livestock. Indian Runners are arguably the catalyst for cross-breeding for egg production. The Pekins imported in 1872/3 enhanced the meat production of Europe and America. Genetic diversity and

novelty were key factors. The fashion for colour mutations was seen most strongly in the egg-layers and these acted as breed labels.

Much intensive rearing of ducks now tends to favour white birds (white down and pale carcasses) but brings with it concentration of production into fewer hands and possibly less genetic diversity in the flocks. Gone are the demands of the farm yard and paddy field. Gone are the needs for healthy perambulatory flocks. Also gone are the foraging capabilities. Modern ducks are fed on specially balanced foods, bred indoors with enhanced lighting. The environments are less varied and, should there be major climatic or disease changes, the domestic flocks may lack adaptability. This is where odd pockets of rare breeds could provide a buffer against genetic drift brought by intensive specialization.

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