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Dear Samantha,

### **Bovine Semen Scrutiny Review**

I am writing with regard to the proposed importation of bull semen into Jersey. While outside of Durrell's normal remit, I believe that, from a neutral position, the views expressed here may be usefully considered in the debate.

Importation has been suggested by two key proponents;

- Royal Jersey Agricultural and Horticultural Society (pamphlet published in February 2008)
- Draft European Communities Legislation (Implementation) (Bovine Semen) (Jersey) Regulations 200-. Lodged au Greffe on 14th March 2008 by the Chief Minister

May I respectfully draw your attention to several issues regarding the rationale behind the proposal and the implications for the pedigree of the Jersey Island cow:

- The proponents include many statements without details of the underpinning scientific evidence. "The report shows the Island herd is some 15% to 20% behind the genetics of Jersey herds internationally in terms of average milk yields." Average milk production might undoubtedly be lower in Jersey than elsewhere. However, there is urgency to consider how the available data actually demonstrate how much of this difference is caused directly by the genetic composition on the island, as opposed to husbandry or genetic versus environmental interactions. I assume that the data, the information on statistical power and the underpinning assumptions used to model genetic effects are available and will be fully considered.

- I am concerned that participants of this discussion mean different things when referring to "genetics". The proponents and popular press regularly simplify "genetics". Molecular biologists and animal breeders have different understandings of what "better genetics" might entail. Ultimately genetics is data-driven and non-aligned. Genotypes might have negative, neutral or positive effects on single traits or combinations of traits. However, interactions of genes with each other and with the

environment are highly complex, often not fully understood and normally inherently difficult to quantify. Positive impacts on some traits often are accompanied by negative impacts on other traits. It should be considered whether the improved milk yield elsewhere has impacted other variables such as fat content. It seems that improved Jersey herds produce more milk but with lower cream content. The high fat, rich creamy milk of the autochthonous Jersey herd has distinguished it from other breeds and has acted as a Unique Selling Point.

- The two proponents cite minimum threshold levels of 4,000 to 5,000 (Chief Minister's proposition) and 5,000 (RJAHS' pamphlet) "breeding females to maintain the genetic integrity of the Island breed". These numbers need to be considered very carefully. They are, by far, not as accepted amongst the scientific community as stated. The large body of literature and research on Minimum Viable Population Sizes demonstrates a very large variance in estimated threshold levels within and between species. This is essentially because there is a high sensitivity to underlying assumptions and methods used. Any estimated threshold levels must be regarded as rough approximations with a high likelihood to either underestimate or overestimate Minimum Viable Population sizes. Most captive breeding programmes, that use systematic breeding, maintain genetic variability at much lower effective female population sizes than assumed by the two propositions. Effective population sizes in many cattle breeds are in the order of hundreds or even less, and not thousands.

- The reports and the general press (e.g. BBC News, 20 April 2008: Decision on semen imports delayed) imply that the "local gene pool risks becoming too narrow", if no semen is imported. Chikhi et al. (2004) have analysed the genetic structure of the Jersey herd in Jersey and find no evidence that the Jersey herd is more inbred than comparable herds, and thus does not require the importation of semen. "Despite the increasing worries of farmers that inbreeding was accumulating across the island, our results suggest that the Jersey Island cattle is just as variable as many other breeds." The paper was published in one of the leading journals on animal genetics (Heredity by Nature Publishing Group). The panel should consider these results and their implications, with the paper's senior author, Professor Mike Bruford, who is an internationally recognized expert in animal genetics and conservation genetics (BrufordMW@cardiff.ac.uk. School of Biosciences at Cardiff University).

- The import of semen might in turn not achieve the stated goal of reducing inbreeding and of preventing reduction of the gene pool, which the proponents have highlighted as one of the aims. Conversely, inbreeding might increase as male effective population size might dramatically decline. For example, imports from Canadian populations with higher performance have negatively affected the genetic diversity of the Hereford in the British Isles.

- I suggest collecting more relevant data prior the final decision. Whilst there is a very large body of literature on the estimation of inbreeding levels within and between dairy cattle populations elsewhere, there is very restricted published data from Jersey. In particular, simulation approaches and computer programs have been developed to estimate the impact of breeding schemes on inbreeding levels and genetic diversity. They have been developed as increase of inbreeding is of real concern for performance, future adaptability and economic costs. Applications of



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these methods are strongly advised to simulate outcomes of changed breeding systems.

- Whether or not the import of semen goes ahead, I suggest considering long-term cryopreservation of genetic materials to safeguard for changes in breeding goals in the face of changing environments and climatic conditions. Both scenarios might lead to loss of genetic variability and thus adaptive potential due to what is known as "random genetic drift".

My credentials are as follows: I am an academic biologist specializing in conservation biology and conservation genetics. I have published widely scientific articles using molecular genetic tools for conservation management of rare species. Appointments have included research fellowships (Zoological Society of London), honorary research fellowships (University College of London, UCL, and Cambridge University) and visiting professorships (Chile and Puerto Rico). I am currently employed as senior conservation biologist at Durrell Wildlife Conservation Trust and I am research fellow at the Center for Applied Tropical Ecology and Conservation at the University of Puerto Rico.

Though I write here as a member of Durrell Wildlife Conservation Trust, my views must not be taken as necessarily representing the Trust.

It is my deepest desire to assist Jersey farmers to make the most informed decision on whether to import bovine semen or to continue the restrictions on importations. Such a decision must be based on scientific evidence through which it is possible to balance the complex issues of pros and cons. By doing this, we will undoubtedly instill confidence in the decision to everybody, proponents and opponents of the proposals. We are most willing to assist in this process.

Yours sincerely

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