

double-spiking (for crabs), whole-body splitting (for lobsters), and electrocution using specially designed devices.

A further concern is the developing practice of commercially farming octopus, as the authors conclude that it is impossible to achieve good welfare in such systems and suggest the UK government should consider a ban on imported farmed octopus and to prevent the setting up of any such farms in the UK.

Lastly, they lay out areas where knowledge is lacking and where research is needed.

In response to the report, the UK's Minister for Animal Welfare, Lord Goldsmith, announced that forthcoming legislation has been extended to recognise lobsters, octopus and crabs and all other decapod crustaceans and cephalopod molluscs as sentient beings.

"The UK has always led the way on animal welfare.... The Animal Welfare (Sentience) Bill provides a crucial assurance that animal wellbeing is rightly considered when developing new laws. The science is now clear that crustaceans and molluscs can feel pain and therefore it is only right they are covered by this vital piece of legislation."

Review of the Evidence of Sentience in Cephalopod Molluscs and Decapod Crustaceans (November 2021). A4, 107 pages. Report by Jonathan Birch, Charlotte Burn, Alexandra Schnell, Heather Browning and Andrew Crump available at: <https://www.lse.ac.uk/business/consulting/reports/review-of-the-evidence-of-sentiences-in-cephalopod-molluscs-and-decapod-crustaceans>.

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Genome editing and farmed animal breeding: social and ethical issues

The Nuffield Council on Bioethics has published in December 2021 their most recent report on the social and ethical issues associated with the use of genome editing in farm animal breeding. The Nuffield Council on Bioethics is an independent body based in the United Kingdom that examines and advises on ethical issues arising from developments in bioscience and health. The Council is made up of around 15 members and 12 executive staff. It was established by the trustees of the Nuffield Foundation in 1991, is funded jointly by the Nuffield Foundation, the Medical Research Council and Wellcome. One of their terms of reference is to identify and define ethical questions raised by recent developments in biological and medical research that concern, or are likely to concern, the public interest; and the Council reviews the available evidence with a view to report on these matters and to make recommendations relating to policy and practice.

In the report, the Council seeks "to identify and examine ethical questions relating to the impact of genome editing technologies on the production, use and welfare of animals for direct human consumption (or for the production of goods for human consumption)". The first chapter covers domestication and farmed animal breeding from the Stone Age to the present day, which is no small feat in 20 pages. This is followed by an outline of the five societal challenges to the current food and farming system. These relate to: (i) animal health and animal welfare; (ii) human health; (iii) demand and supply; (iv) social, cultural, and political challenges; and (v) environmental and ecosystem challenges. It is acknowledged that "the challenges are interconnected so that interventions to ameliorate some may ameliorate or potentially also aggravate others." This also leads to the conclusion that that it will not be possible to respond to one challenge without having some effect on the others. In Chapter 3, the Council propose an ethical standard to guide and evaluate interventions in food and farming systems. In terms of animal welfare, the Council express the view that sentient, non-human animals have morally relevant basic interests. They are dependent on food and farming systems for the conditions that enable them to live good lives.

The subsequent chapter tackles the prospective breeding interventions resulting from innovations in breeding technology. Some aspects of potential welfare benefit to the animal are mentioned, such as the introduction of polled (hornless) genes to prevent disbudding, and increased disease resistance. However, this is followed by the warning that it would be unacceptable to adapt animals purely so that they may endure conditions of low welfare without showing the associated adverse health effects. Indeed, in one section the Council asks the reader to imagine the breeding of tail-less pigs to eliminate the need for tail docking as a way to explore the limits of the desirable uses of biotechnology. In the next two chapters, the report investigates first the attitudes of consumers and the public to biotechnologies and novel foods, before describing existing legal and regulatory controls governing the adoption of new breeding technologies, mainly from a UK perspective.

Overall, the report is a valuable source of information on a difficult subject, containing more than 800 references, and a very useful glossary section. The Nuffield Council on Bioethics has published a two-page overview which is available along with the full report, and a shorter, 16-page summary outlining the main themes, findings, and recommendations.

Genome Editing and Farmed Animal Breeding: Social and Ethical Issues (December 2021). A4, 223 words. Published by the Nuffield Council on Bioethics and all versions are available for download at: <https://www.nuffieldbioethics.org/publications>.

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