



**LIVECORP**  
THE AUSTRALIAN LIVESTOCK  
EXPORT CORPORATION



## RESEARCH SUMMARY

# Interpreting animal welfare



Providing the science to interpret animal welfare data collected on livestock export voyages to help improve welfare outcomes

## HIGH LEVEL OVERVIEW OF THE PROJECT

- Assemble a multi-disciplinary team of experts.
- Establish a consultative committee with industry representatives to ensure practical outcomes.
- Review and refine the existing set of welfare indicators by identifying which provide the most useful information and how they relate to each other, as well as their impact on animal welfare (see breakout on the Bayesian approach).
- Develop an animal welfare system to generate an objective score(s).
- Conduct on-board data collection to validate the system.
- Integrate the system into the industry's data platform LIVEXCollect.
- Develop training material needed to support the system.

**PROJECT CODE:** LC.RDE.0028

**DATE:** September 2024

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*Front cover image: The Livestock Collective*

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### THE LIVESTOCK EXPORT PROGRAM

The livestock export supply chain directly benefits both producers and licensed exporters. LiveCorp & Meat & Livestock Australia (MLA), as the relevant research and development corporations, run a joint program known as the Livestock Export Program (LEP) to ensure that all stakeholders benefit from industry research.

The LEP RD&E Program focuses on strategic investment to:

- Improve animal health and welfare outcomes across the supply chain
- Improve supply chain efficiency and regulatory performance
- Enhance market access conditions for existing and new markets

LiveCorp and MLA acknowledge the contribution from the Commonwealth of Australia to research and development undertaken in the LEP RD&E Program.

# INTERPRETING ANIMAL WELFARE

## Executive summary

A pioneering initiative is underway to create a system capable of interpreting the animal welfare data being collected on livestock export vessels and providing insights to help inform real-time decision-making to improve welfare outcomes.

Since 2013, the livestock export industry has actively pursued the identification of animal welfare indicators to complement mortality as a measure of performance. A key piece of early research identified an array of indicators affecting health and welfare, related to the environment, the provision of critical resources, and the class of animals. Further work refined these indicators and developed measurements, data collection procedures, and analysis processes for shipboard animal welfare surveillance. The majority of elements included in the resulting procedures have been incorporated into regulation, forming part of reporting requirements for the Australian Standards for the Export of Livestock (ASEL).

However, the challenge remains on how best to weight and combine these indicators. Welfare is inherently

multifaceted and subjective, ranging over a large spectrum from negative to positive. The impact of different indicators can also vary from animal to animal.

To undertake the latest project, a strategic collaboration has been formed between the Livestock Export RD&E Program and a research group led by the University of Western Australia (UWA).

If successful, the system being created will produce an objective score(s) that will support decision-making by exporters and their on-board teams, based on real-time data on the welfare status of their livestock. It will also enable post-voyage evaluation of welfare outcomes and the creation of a benchmark to let exporters' assess their relative performance, while also providing another avenue for transparent reporting of conditions on vessels to the public.

Once in operation, there is potential for the welfare indicator system and the learnings from its development to be adapted and adopted by the wider livestock sector and other animal industries. This is another example of how the livestock export industry is at the forefront in developing innovative methods to further measure, understand and to enhance animal welfare.







## Project outline

Animal welfare is a complex, multifaceted field, as the placement of any single animal or group on a spectrum from positive to negative welfare is subjective and therefore difficult to measure consistently. It is also contextual, can vary by the class and type of animal, has degrees in multiple dimensions (e.g. severity and duration), and multiple indicators can interact to determine an animal's actual welfare state.

The interpretation of animal-based indicators to set a threshold on that spectrum where welfare is considered 'acceptable' (or not) is a human concept and, by necessity uses a combination of science, ethics and community sentiment. Even expressing a welfare threshold effectively requires consideration of various dimensions, such as X% of animals showing Y welfare outcome for Z amount of time, in the context of the animal's environment.

This project will take a unique approach by bringing together a diverse group of academics with expertise in subjects in addition to animal welfare science, including statistics, thermal physiology, endocrinology and neural science. Led by the team at UWA, these experts come from the University of Queensland, University of Adelaide and University of Newcastle.

Alignment with the livestock export industry is pivotal to the success of this project, and the research team will collaborate with a skills-based industry consultative committee to glean insights and practical advice. The group will comprise an independent Chair and technical scientific advisors, along with representatives of exporters, shipboard veterinarians and LiveCorp.

This ensures that the project's design and outcomes not only align with commercial operating conditions but also address the specific needs of the industry.

This is one of the key investments by the LEP RD&E Program, running from 2024 to 2026, and the seniority of the team being led by UWA underscores the commitment of both sides to advancing the project's goals.

## What are the benefits?

The project aims to introduce an innovative, science-driven system that steers away from traditional binary measurements and serves as a cornerstone for continuous welfare improvement.

It would improve the industry's ability to evaluate risks by focusing on the indicators that have the greatest impact on welfare. For exporters, this will come through an overall score(s) of the welfare outcomes of their individual consignments and the ability to dive into more granular detail. Ultimately, the aim is to alert shipboard personnel of potential issues they may not have noticed are developing.

Shipboard data collection should become more efficient, with standardised procedures continuing to enhance overall operational efficiency.

The system developed through this project will also help to provide evidence-based reporting on the welfare condition of animals on export voyages. This promises to provide industry with an additional method to deliver transparent reporting of its performance to the community, to demonstrate that it is meeting and exceeding animal welfare expectations.

## Key drivers

The long-running work to develop animal welfare indicators demonstrates the livestock export industry's commitment to continuous improvement of its welfare performance over time, and a willingness to trial new mechanisms to further understand and improve outcomes. This next step will investigate methods to advance beyond the current focus on individual animal welfare indicators, considering the variability of each voyage

### There are five key drivers of the project:

1. Individual versus group assessments – welfare science focuses primarily on individual animals, which poses difficulties when assessing large numbers of animals as found in feedlots and on livestock export vessels. The project aims to predict welfare risks to individuals, using measures taken at a population level, to help decision-making.
2. Lack of techniques for combining variables – the current approaches generally look at each welfare observation and environmental condition in isolation. New techniques are required to deal with the complexity of combining different variables into summary statements about group welfare.
3. Data overload and accumulation – automation is driving the addition of more conditions and indicators in welfare assessments, which is adding unnecessary complexity. The development of analytical techniques that demonstrate the relationships between indicators will simplify data collection while strengthening the welfare relevance of each indicator.
4. Single outliers – focusing on a single outlier measure can result in a misleading welfare assessment, particularly when relying on automated data collection. To mitigate that effect, this study will use a statistical approach that combines prior information about a population to put that outlier in context and get a better overall picture (see break out on Bayesian approach).

5. Moving away from binary systems – binary systems (yes/no, black/white) pose challenges in determining the point where welfare starts to decline. These binary systems assess only specific aspects of an animal's experience, making it difficult to gauge the interactions of multiple indicators. The development of integrated scores based on previous data and current data will generate a continuous scoring of shipboard animal welfare that predicts the evolution of the welfare states along a voyage.

### Bayesian approach weighs up both prior knowledge and new evidence to continually update assessments about the likelihood of events.

For instance, if you look at the form guide to inform your day's bets on the horse racing, you may be inclined to back Horse A, as it has won more times than Horse B. However, it rained last night and Horse B has won in the wet more than Horse A. This additional information may lead you to change your bet.

Bayesian methodology offers a way to address the challenges of measuring multiple variables and assessing various events, while acknowledging the inevitability of contradictions or outliers. It also ensures that outliers don't influence decisions unless those decisions are supported by other findings, which provides a weight-of-evidence approach.

The result is a more adaptable method of assessment and the advantage of being able to create a moving average or target based on the latest data.



## Methodology

The pioneering method of interpreting animal welfare used in this project has never been attempted before, attempting to mirror human cognitive processes and provide succinct, consequential outputs.

The project is comprised of several key stages, and will progress only if the step before is successful:

1. Identify and refine a set of indicators which, in combination, have the most impact on animal welfare to support informed decision making.

A diverse spectrum of information will be reviewed, including previous industry research, academic studies, public datasets, and industry-specific sources such as the regulatory reporting platform LIVEXCollect.

In collaboration with a dedicated industry working group, Bayesian methodology will be used to build on these insights through a systematic approach to identify a concise set of indicators which, when considered together, provide a comprehensive and meaningful interpretation of animal welfare.

These will be refined to enhance their relevance and accuracy, and thresholds established to create a robust foundation for the assessment of animal welfare.

2. Develop a system that combines multiple indicators to generate an objective score(s).

The Bayesian approach will be used to consider the dynamic nature of multiple independent variables,

within their specific context, and create a system capable of calculating an objective score(s) for overall animal welfare outcomes. This approach will result in a more responsive and reflective evaluation of the welfare data. It will allow for both real-time assessment during the voyage and analysis at a later date of a comprehensive summary of animal welfare conditions.

3. Conduct on-board data collection to validate the system.

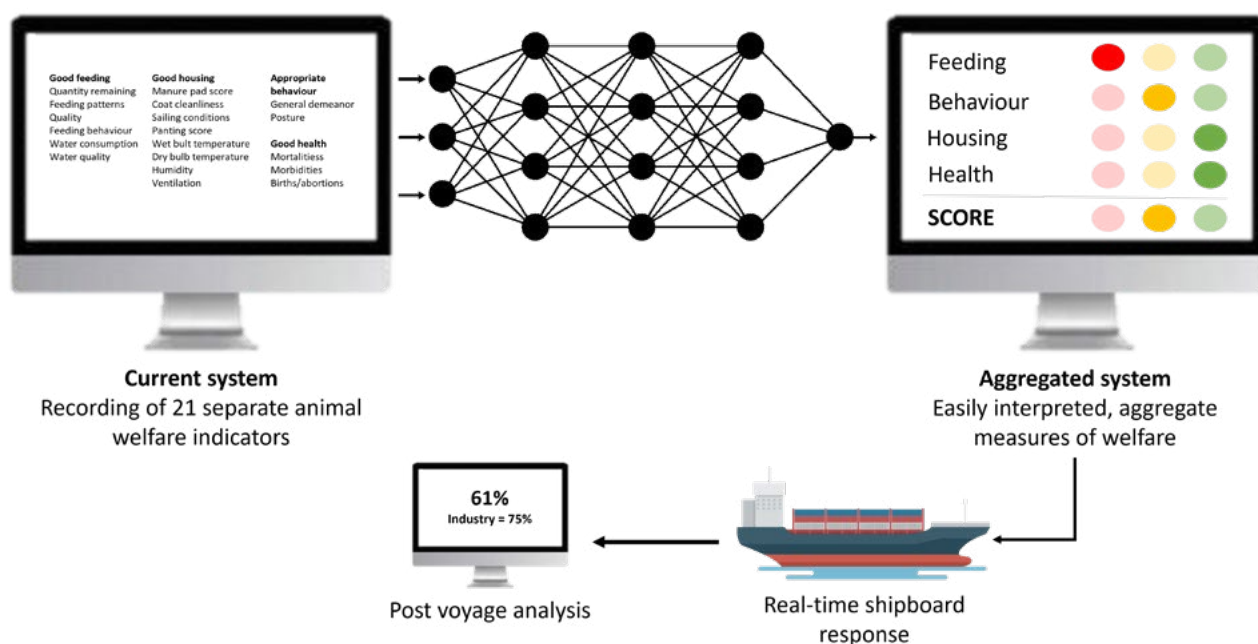
Shipboard trials will help to validate the efficacy and reliability of the system and its thresholds for animal welfare indicators, as well as the practicality of data collection processes.

4. Development and integration of the system.

Once validated, the system will form the foundation of a functional (software) system that can integrate with LIVEXCollect (or other systems). Ultimately, the aim is to provide additional tools to help alert shipboard stockpersons about factors influencing animal welfare and performance during a voyage.

5. Develop tailored training modules to facilitate on-board data collection.

As a key outcome of the project, any new or updated data collection methods will be introduced into LiveCorp's shipboard stockperson training course and ongoing professional development modules developed for existing stockpersons. This will help further to improve the daily monitoring and reporting of animal welfare data on vessels.





# MEET THE TEAM

The research team for the Interpreting Animal Welfare project



**Professor Shane Maloney**  
University of Western Australia

## SPECIALITIES

Internationally recognised scientist in thermoregulation and energetics in large mammals



**Associate Professor Dominique Blache**  
University of Western Australia

## SPECIALITIES

Well-known animal welfare scientist, key research areas focusing on animal physiology and behaviour



**Dr David Walker**  
University of Western Australia

## SPECIALITIES

Considerable expertise in complex systems theory, machine learning, Bayesian approach and network statistics



**Professor Alan Tilbrook**  
University of Queensland

## SPECIALITIES

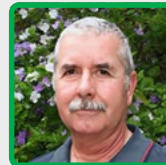
Global leader in animal welfare science, key research areas focusing on animal and biomedical science



**Dr Angela Lees**  
University of Queensland

## SPECIALITIES

Internationally recognised scientist, key research area focusing on heat stress physiology in large mammals



**Professor John Gaughan**  
University of Queensland

## SPECIALITIES

Highly-prolific academic, key research areas focusing on heat stress, animal welfare and nutrition



**Professor Mark Hutchinson**  
University of Adelaide

## SPECIALITIES

Diverse expertise across human and animal research, focusing on complex data analytics



**Professor Rohan Walker**  
University of Newcastle

## SPECIALITIES

Highly-prolific academic, heads the Centre for Advanced Training Systems

