ANIMAL WELFARE ALONG THE SEA TRANSPORT SUPPLY CHAIN

Image source: https://www.rta.net.au/services/livestock-transport

Dr Renee Willis

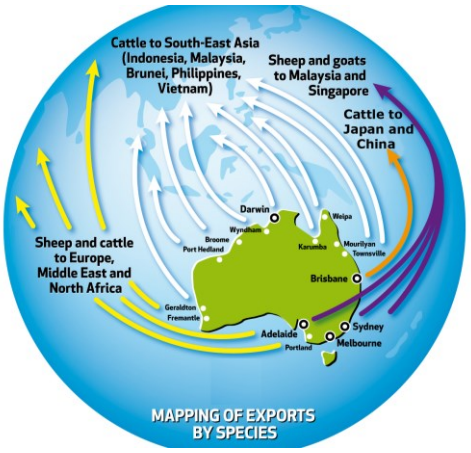
1

My Background:

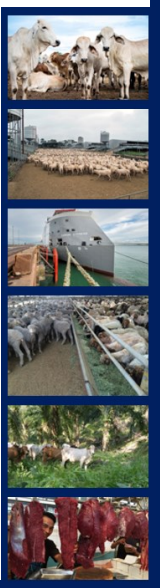
- Graduated from Sydney University in 2005, worked in rural mixed practice and as an equine veterinarian.
- Began working on livestock carrier vessels as an Australian Government Accredited Veterinarian (AAV) in 2015.
- Completed a PhD project through Murdoch University in 2021 investigating animal welfare indicators for the Australian livestock export supply chain.
- Worked with UN Food and Agriculture Organization in Bangkok on African swine fever emergency responses 2021-2023
- Now work as a researcher and animal welfare consultant with Impetus Animal Welfare.

2

Australian Export Statistics - 2025

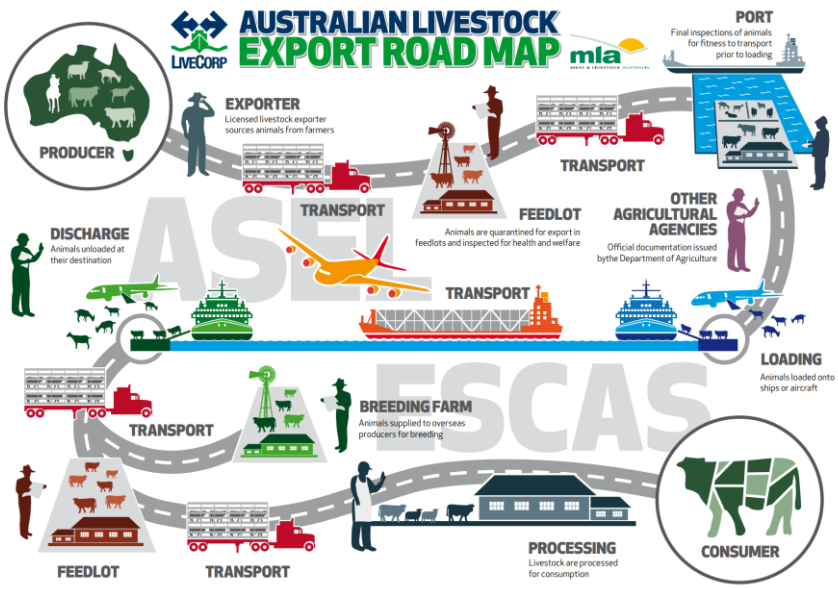


- Sea transport to 18 COUNTRIES
  - 663,375 CATTLE
  - 7,284 BUFFALO
  - 272,731 SHEEP



Source: https://www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/live-animal-export-statistics/livestock-exports-by-market

3



4

The Australian livestock export industry involves the transport and intensive management of large numbers of animals. A single shipment of cattle can range between 1,500 – 15,000 head and a consignment of sheep can involve up to around 50,000 animals per shipment.

The supply chain has many stakeholders and extends from farms in Australia to consumers in importing countries.

Along the supply chain, livestock are transported both by land and sea and often across hemispheres and environmental seasons. Animals are mixed with others from various sources, they encounter multiple facilities, changes in environmental conditions, feeding practices & handling techniques.

Events at the beginning of the supply chain, whether they are positive or negative, will often trickle down and affect welfare for the rest of the journey. Although it's our human tendency to look at individual areas of the supply chain separately, from an animal perspective, we should be taking a whole of supply chain approach to welfare assurance.

Livestock exports are a heavily regulated industry – the regulatory framework involves: Australian Standards for the Export of Livestock (ASEL) covering preparation and sea transit; and the Export Supply Chain Assurance System (ESCAS) outlining the responsibility of the exporter for ensuring the welfare of animals after discharge from the vessel up to the point of slaughter.

5

Sourcing of livestock






6

Sourcing of livestock

When sourcing livestock, they must be appropriate for:

- the demands of the foreign consumer and the market
- The importing country biosecurity requirements
- the journey they will undertake
- the facilities and infrastructure available during transport and at their destination
- disease status and vaccination history
- market availability

7

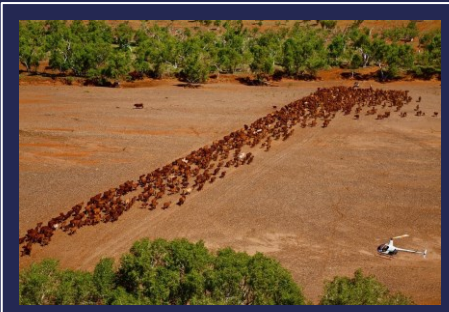


Image source: https://fortescuehelicopters.com.au/aerial-mustering

8

Sourcing and selection of livestock

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In extensive Australian production systems, cattle and sheep may travel **long distances on foot during mustering**, which can contribute to **stress and fatigue** prior to transport.

Animals are **assessed on-farm before land transport** to confirm they are:
- In **good body condition** (e.g., Body Condition Score suitable for export)
- **Fit and healthy** for all stages of the export supply chain

Effective preparation depends on the knowledge and capability of those selecting animals, including:
- **Good stockmanship and low-stress handling,** which can:
  - Reduce fear responses and injuries
  - Improve animal calmness and tolerance of handling
  - Support better monitoring and individual care when required
- **Disease control and health management,** including awareness of the farm's health status and biosecurity risks

In some cases, additional preparation may occur before transport, such as:
- **Shearing** (for sheep)
- **Pre-conditioning** to diets/feeds that may be used later in the supply chain
- **Habituation/education to handling** through planned, low-stress interactions

9

LAND TRANSPORT

Image source: www.rta.net.au/services/livestock-transport & www.cattletrain.com.au

10

Lifetime movement records for cattle exported from Western Australian ports on three export voyages.

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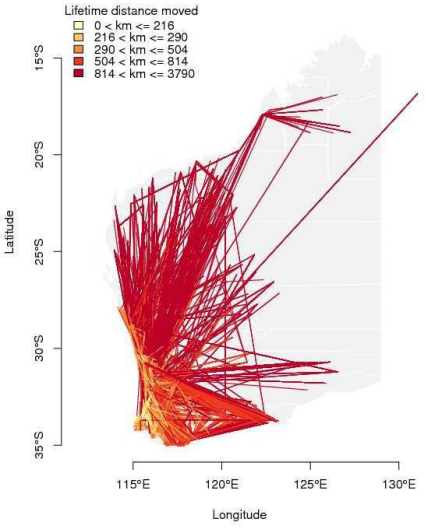

Perkins et al. (2015) *Identifying the causes of mortality in cattle exported to the Middle East*

11

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Land transport

Lifetime Movements of Cattle Exported from WA Ports:
The previous slide shows a map of **Western Australia,** with lines depicting **lifetime movement records** for cattle exported from WA ports across **three live export voyages**. Each coloured line represents a category of **total lifetime distance travelled** by cattle prior to export.

The three voyages included cattle loaded from **Broome** and **Fremantle,** and the movement pathways show cattle originating from **multiple regions across the state**.

In this dataset:

Yellow lines represent cattle that travelled **less than 216 km**
Dark red lines represent cattle that travelled **more than 814 km**

(For context, the **Western Australia border spans approximately 1,874 km,** illustrating the scale of distances involved in regional supply chains.)

12

LIVESTOCK PREPARATION

Livestock are assembled in registered pre-export facilities close to the port of departure

13

Livestock Preparation

14

Importation protocols & inspections

15

Importation protocols & fit-to-load inspections

During **pre-export quarantine within a registered establishment,** livestock must meet both:

- **Importing country health protocols,** and
- Australia's minimum welfare requirements under the **Australian Standards for the Export of Livestock (ASEL)**

Australian Government Accredited Veterinarians (AAVs) are required for consignments being prepared for export, and are typically **privately engaged by the exporter** to:

- Conduct **individual fit-to-load inspections**
- Verify completion of required **health and preparation protocols**
- Support compliance with the exporter's **Approved Export Program (AEP)** (which includes procedures required under Australian export rules and/or importing country requirements)

Consignments may also be subject to **inspection and verification by Government veterinarians** prior to export as part of export regulatory oversight.

16

REJECTION CRITERIA

17

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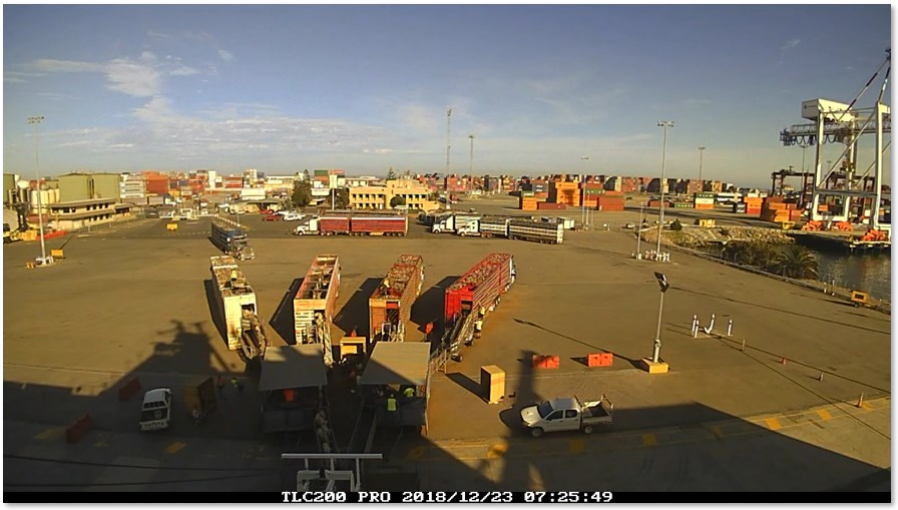
Loading



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Loading

The **scale and logistics of loading operations can be substantial**, requiring coordinated movement of large numbers of animals in a short time window.

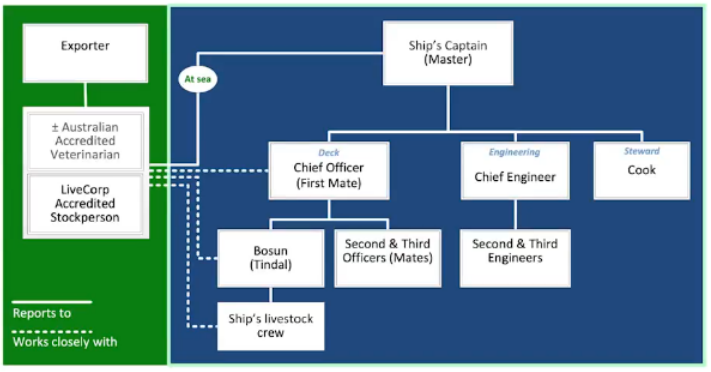
Key welfare considerations during loading and discharge include:

- **Calm, low-stress animal handling** to reduce fear responses and minimise injury risk
- **Efficient movement through facilities and ramps** to prevent crowding and slipping
- **Penning-up on board** to ensure animals are loaded with their designated cohorts, in designated areas of the vessel, and in appropriate commercial groups
- **Accurate stocking density**, aligned with vessel pen space requirements to support comfort and access to resources

Livestock loading may occur concurrently with **bunkers (fuel)** and other ship supplies (feed, bedding, provisions). This requires careful coordination to ensure **vessel stability, safe access and uninterrupted animal handling**

Veterinary oversight occurs during loading, including inspections as livestock are transferred from trucks to the ship's loading ramp.

19



Source: ABC Rural

SHIPBOARD PERSONNEL

20

Shipboard personnel

The Master or Captain is the highest authority on board, responsible for the overall safety of the ship, crew and cargo, including the livestock.

The chief officer, C/O is second in command and the operations manager. The C/O overseas the cargo, including daily livestock management tasks like feeding, ventilation, and waste disposal.

The Bosun is the senior deck crew member who directly supervises the livestock crew and deck operations act as the key point of contact for day-to-day stock issues like feeding and cleaning schedules.

The livestock crew are typically part of the ship's deck team and perform routine tasks such as feeding, watering, cleaning, and general livestock care. These crew members may hold maritime titles such as Able Seamen AB or Ordinary Seamen OS

The ship's engineers ensure ventilation systems and water supplies function correctly for mechanical issues affecting animal welfare. Vets and stock handlers liaise with the Chief Officer to involve the engineering team

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Additional personnel for sea voyages

An **industry Accredited Stockperson** is required on **all live export voyages** and is employed by the exporter.
An **Australian Government Accredited Veterinarian (AAV)** must be engaged by the exporter for:

- **Long-haul voyages,** and/or
- Voyages assessed as **higher risk**

Additional stock handling support is required based on consignment size:

- **1 competent stock handler per 3,000 cattle/buffalo** (or part thereof)
- **1 competent stock handler per 30,000 sheep** (or part thereof)

Any competent stock handlers **additional to the Accredited Stockperson and AAV** must demonstrate competency (typically through **experience on prior voyages**). This role **does not require formal training or accreditation,** but requires evidence of practical capability.

22

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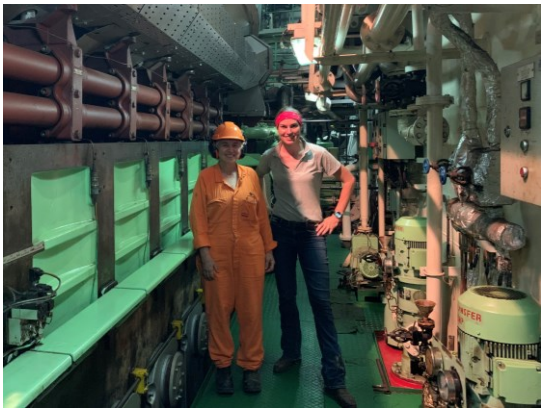

INDEPENDENT OBSERVERS

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Independent observers

In May 2018, the Australian government introduced the independent observer program.

"Observers play an assurance role within our regulatory system. They monitor, review and/or audit exporter arrangements on-board livestock export vessels"

Independent observers don't take an active role in animal management during the voyage.

The program helps address concerns about independence in reporting, as AAVs are privately employed by exporters, while a government-appointed veterinarian on board would still be providing services to the exporter.

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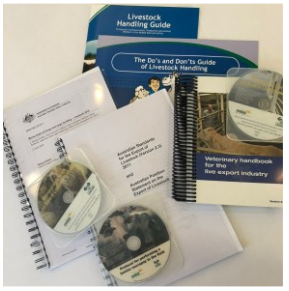
Accreditation of stockpersons



25

Training and accreditation

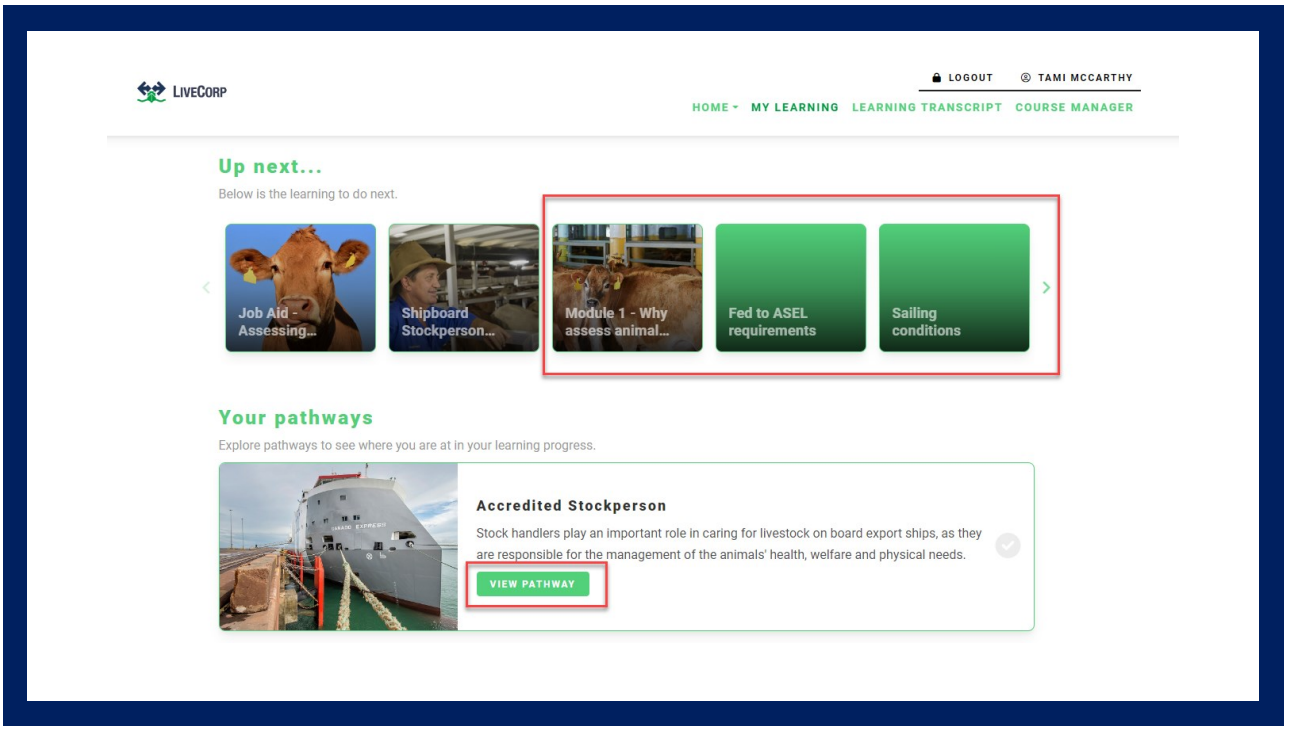
Shipboard Stockperson Training (LiveCorp)

- Training includes **online learning modules** (pictured in subsequent slides), followed by an **in-person course** combining classroom teaching and practical livestock handling sessions.
- **Attendees pay their own course fees** (or may be supported by their employer).
- Course content and materials are developed and updated through the industry's **RD&E funding framework** to support continuous improvement in animal welfare outcomes

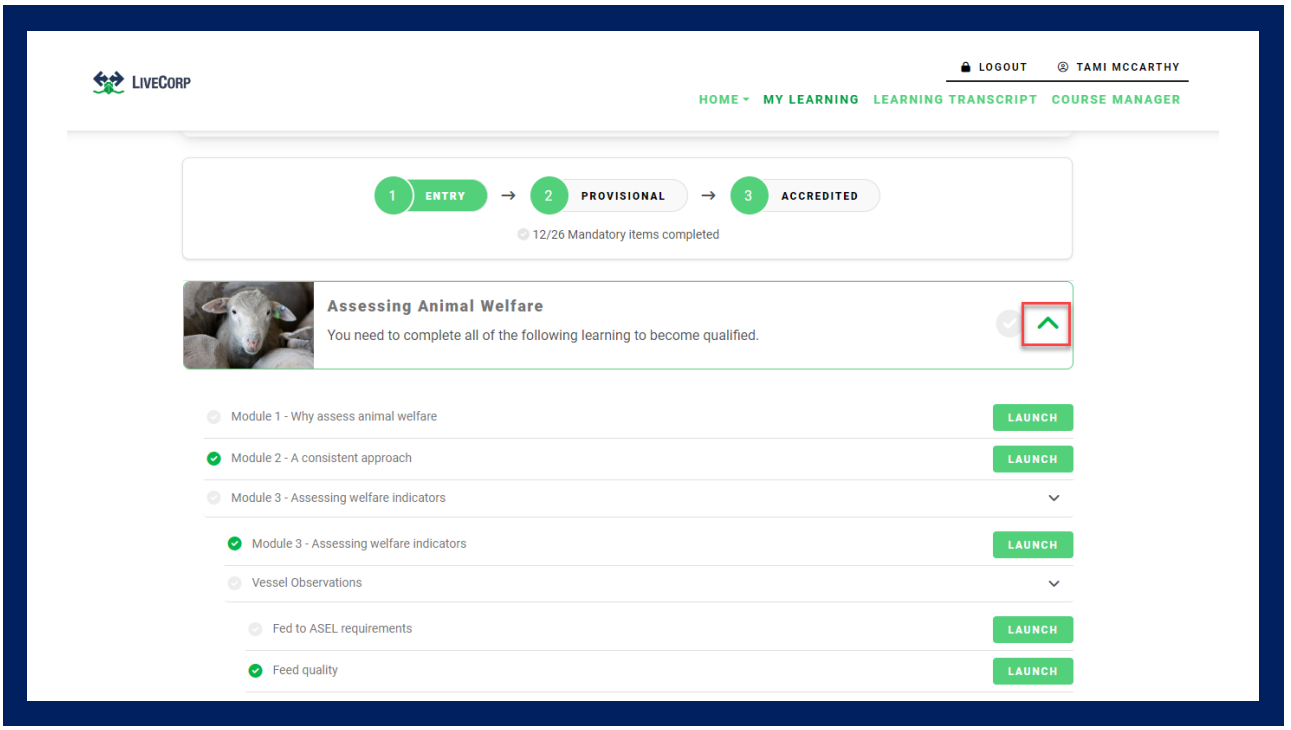
Australian Government Accredited Veterinarians (AAVs)

- **AAVs are accredited by the Australian Government** to carry out specific regulatory functions within the livestock export system.
- Accreditation requirements include:
  - Completion of **regulatory online training modules** (delivered via Animal Health Australia)
  - **Background checks** as part of the approval process
  - Current **registration with an Australian veterinary board**

26


LIVECORP
LOGOUT
TAMI MCCARTHY
HOME
MY LEARNING
LEARNING TRANSCRIPT
COURSE MANAGER
Up next...
Below is the learning to do next.
Job Aid - Assessing...
Shipboard Stockperson...
Module 1 - Why assess animal...
Fed to ASEL requirements
Sailing conditions
Your pathways
Explore pathways to see where you are at in your learning progress.
Accredited Stockperson
Stock handlers play an important role in caring for livestock on board export ships, as they are responsible for the management of the animals' health, welfare and physical needs.
VIEW PATHWAY

27


LIVECORP
LOGOUT
TAMI MCCARTHY
HOME
MY LEARNING
LEARNING TRANSCRIPT
COURSE MANAGER
1 ENTRY
2 PROVISIONAL
3 ACCREDITED
12/26 Mandatory items completed
Assessing Animal Welfare
You need to complete all of the following learning to become qualified.
Module 1 - Why assess animal welfare
LAUNCH
Module 2 - A consistent approach
LAUNCH
Module 3 - Assessing welfare indicators
Module 3 - Assessing welfare indicators
LAUNCH
Vessel Observations
Fed to ASEL requirements
LAUNCH
Feed quality
LAUNCH

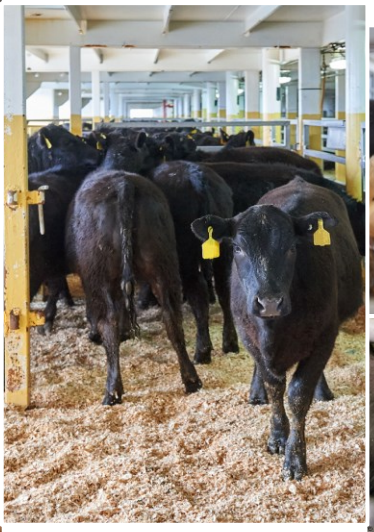
28

Daily Inspections

29

Daily Inspections

30



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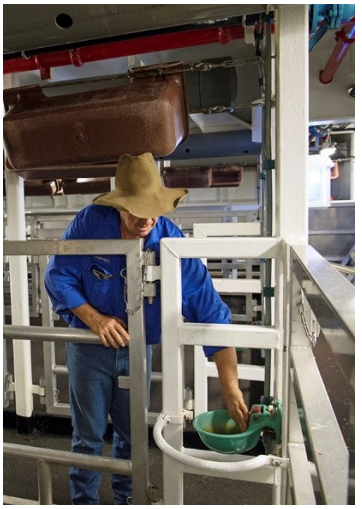
Daily Inspections

All livestock are inspected at least twice daily by accredited stock handlers and possibly a veterinarian. Stock handlers are taught to use a systematic approach to observing all livestock for signs of ill-health or poor adaption to the pen environment.

Stockpersons and vets monitor the environment in all livestock pens and submit a daily report to the exporter and Australian government detailing the temperature and humidity, ventilation and air quality, manure pad management, feed and water quality and access on each deck. Animal observations related to responses to sea swell, competitive feeding behaviour, general demeanour and panting score are also reported along with all individual health issues, treatments, mortalities and results of post-mortem examinations.

32

Feed and Water Access



33

Feed and Water Access

Monitoring feed access (on board)

- **Feed availability is monitored daily**, including the **amount of feed remaining on board** (by type such as pellets, grain and roughage), to ensure supplies remain adequate for the voyage.
- Stockpersons check that livestock are **fed to ASEL minimum daily requirements**, with any exceptions recorded along with the reasons.
- **Feed quality is assessed daily**, with issues recorded if feed is dusty, broken down into fines, contaminated, or less palatable.
- **Feeding behaviour is observed in pens** to detect hunger or competition at the trough (e.g., mild jostling vs climbing/smothering/lunging).

Monitoring water access (on board)

- **Average water consumption is monitored daily** (litres/head/day) as an operational check on water use across the vessel.
- **Any water quality or supply issues are recorded**, including interruptions, contamination, or trough access problems, because water access is critical to welfare.
- Reporting should describe **what the issue was, where it occurred, how long it lasted, and any animal impacts observed**.

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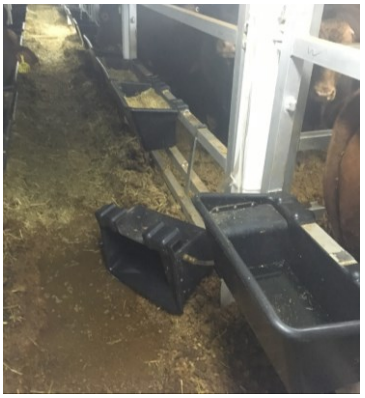
Feed and Water Access



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Health treatments

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Health treatments

- There are hospital pen spaces designated on each deck
- ASEL requirements stipulate the type and amount of medication available for each voyage.
- All treatments, mortalities and post-mortem results are reported daily.

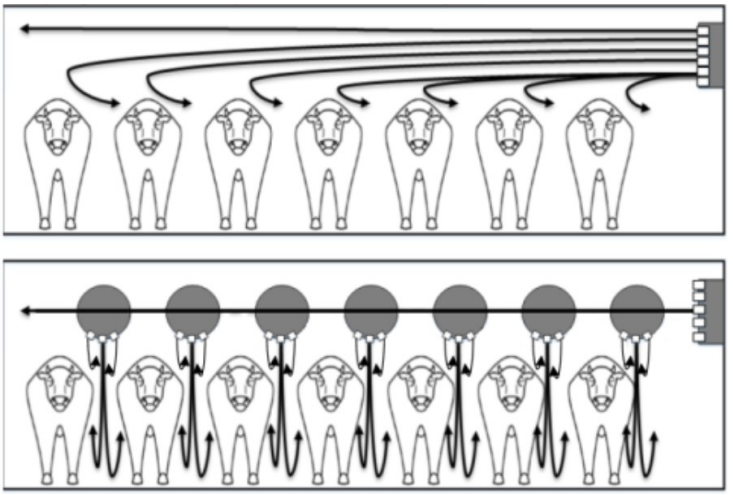
37

Ventilation and Air Quality

Source: https://www.vroon.nl/Fleet

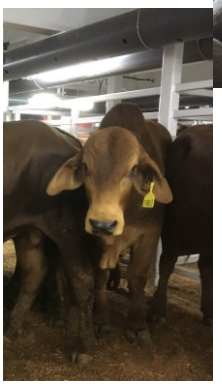
38

Ventilation and Air Quality



Source: W.LIV. 0290 Bedding Management and Air Quality Onboard Livestock Vessels – Draft final report (unpublished)

Tunnel Ventilation



Ducted Ventilation

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Ventilation and Air Quality

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Ventilation capacity and outside air temperature strongly influence the *microclimate* experienced by livestock on ship decks.
Ventilation systems support continual **air exchange,** using a combination of **air inlets and outlets** (commonly located along the upper sections of the vessel).

The effectiveness of ventilation depends on:

Airflow direction
Air speed
The system's ability to circulate air through pens and across the manure pad

Key functions of ventilation

- Maintain **fresh air and air quality**
- Support **thermoregulation** through convective cooling
- Remove **heat and humidity** from the deck environment (including moisture from animals and manure pad)

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Bedding and deck hygiene management

- Cattle produce relatively high levels of **moisture in urine and faeces,** which can increase humidity and degrade deck conditions over time.
- After approximately **7–10 days at sea,** decks may require **washing down and re-bedding** to maintain suitable conditions.
- Wash-down schedules must be carefully planned around:
  - Crew capacity and safety
  - Operational constraints (e.g., timing when sailing in **open waters**)
- Wash-down can temporarily increase **humidity,** however applying **fresh bedding** afterwards (e.g., **pinewood shavings**) can:
  - Reduce humidity and improve air quality
  - Improve overall pen comfort and manage moisture levels
  - Increase visibility of deck surfaces, supporting **better detection of leg injuries** during post wash inspection

Sheep decks are not washed down during voyages, their relatively low faecal moisture outputs means manure pad management is rarely required under routine sailing conditions

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Washing Down Cattle Decks

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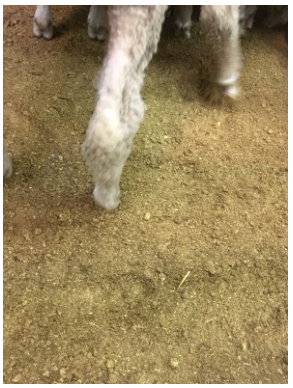
Manure Pad Management



Dry

Firm - Tacky

Wet

43

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Livestock Factors

Individual livestock factors can have a huge impact on the ability to adapt to voyage conditions and cope with changes in management and environment. The ewe in this pen is carrying more body condition and a heavier fleece than her pen mates and is responding much to more the heat and humidity encountered while crossing the equator.

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Post mortem investigations

45

Euthanasia, post mortem investigations and carcass disposal

Humane euthanasia may be required for individual animals for welfare reasons.
A captive bolt is used, with **xylazine sedation in cattle** where appropriate to support safe handling and effective euthanasia.

Post-Mortem Investigations
Where mortalities occur on board**, post-mortem examinations** are conducted on as many animals as practical to:
- Identify likely causes of death; Detect emerging health or welfare risks; Inform management actions for the remaining consignment

Post-mortems are prioritised based on:
- The condition of the carcass (including decomposition)
- The ability to perform the examination and **dispose of the carcass promptly**

Carcass disposal
Carcass disposal may be conducted in the **open ocean,** in line with **Marine Pollution (MARPOL) requirements,** including:
- Disposal **at least 100 nautical miles from land**
- Avoiding **special marine areas,** including the **Persian/Arabian Gulf, Red Sea,** and the **Great Barrier Reef**

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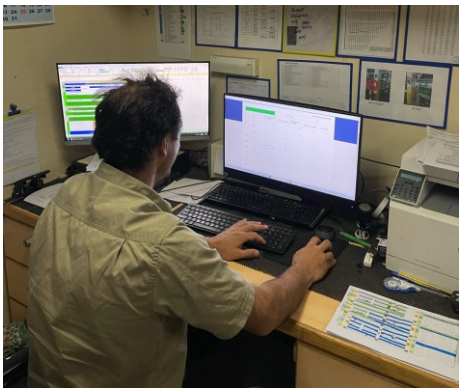

REPORTING REQUIREMENTS

47

Reporting requirements

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For every voyage, a **daily report,** and an **End of Voyage (EOV) report** is submitted to the Australian Government, the industry research and development body (LiveCorp), and the exporter providing an overview of:

- Voyage conditions and events
- Livestock **health and welfare outcomes**
- Performance of the **vessel and crew**

Independent Observer (IO) reports are also submitted to the regulator.
Emergency situations are reported through a **Notifiable Incident Report,** submitted within **12 hours** of the event

Digital Reporting Tool (LIVEXCollect)

- The following slide shows a screenshot of the home page of the **LIVEXCollect** reporting tool for **daily and EoV** reports.
- Currently, key measures are reported via a **desktop-based system**, with a **mobile app interface under development**.

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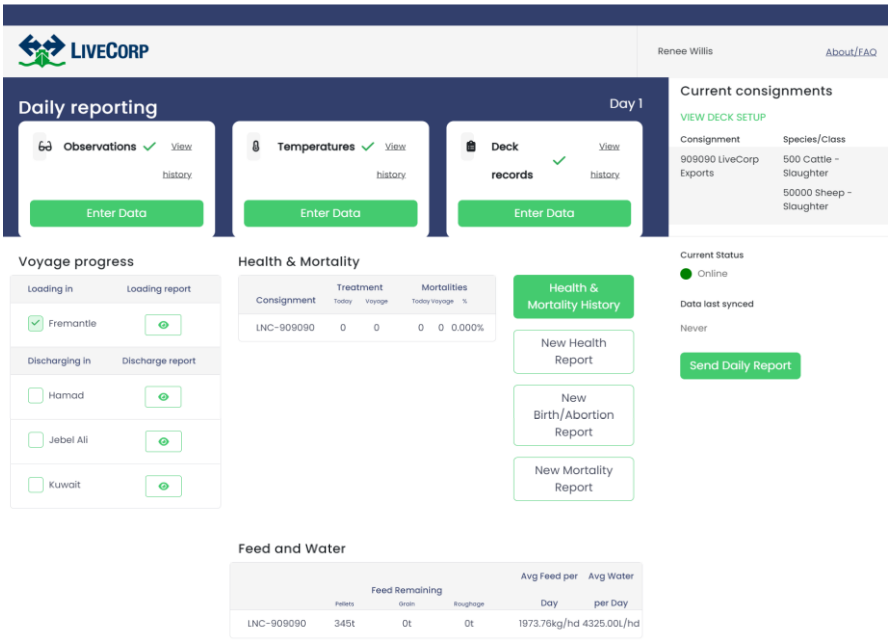

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RESEARCH & DEVELOPMENT

50

Research and development

Veterinarians and **industry accredited stockpersons** are frequently involved in R&D initiatives aimed at improving **animal health and welfare outcomes** across the live export supply chain.

Examples of focus areas include:

- **Optimising the onboard environment and animal management practices**
- **Improved monitoring of on-board deck conditions**
- **More consistent recording and structured reporting** of deck conditions
- **Enhanced documentation of health data,** including treatments administered to animals

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Discharge

Panjang Port, Indonesia

Port of Eilat, Israel

Hai Phong Port,Vietnam

52

Discharge

Muscat Port, Oman

53

Discharge

Pilot sheep are often used to get the flow of livestock moving during discharge

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Discharge

Discharge operations require **port approvals,** including verification of required **documentation** and inspection of animals as part of arrival procedures.

Welfare outcomes during discharge are influenced by local conditions and logistics, including:
- Availability and suitability of **handling facilities and ramps**
- Condition and design of **transport vehicles**
- **Weather conditions,** with heat stress risk often increasing while animals are held and moved in port
- Having **enough trained handlers** to maintain calm, efficient livestock movement

Effective discharge relies on strong coordination across multiple parties, including:
- Exporters/importers and receiving facilities
- **Port authorities**
- Local transport providers and scheduling around **traffic and port operations**

Ongoing improvements in handling practices and infrastructure can contribute to:
- **Reduced injuries** to livestock during discharge
- **Safer working conditions** and improved efficiency for handlers

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Destination Market – Feedlot / Farm

Receival Feedlot, Vietnam

Receival Feedlot, Oman

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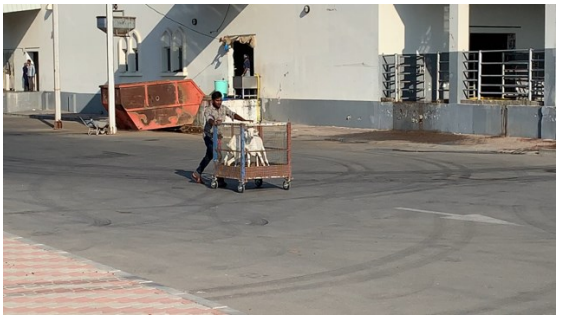
Destination Market – Livestock handling



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Destination Market

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Under **ESCAS**, exported animals must be managed in facilities that support welfare outcomes, including:

- **Suitable shelter and infrastructure**(e.g., shade, ventilation/fans, drainage), **Adequate space and bedding management**
- **Continuous access to clean water; appropriate feed** and consistent feeding practices
- **Ongoing monitoring of health and welfare**, including individual treatment where needed
- **Humane euthanasia** where an animal cannot be treated or recover
- **Disease control measures**, especially where animals may be mixed with local livestock

Animal handling in destination markets may differ from Australian standards due to:

- Differences in the behaviour and management needs of **Australian livestock compared with local animals**
- Varying levels of **infrastructure and handling equipment**
- The need for **targeted training for handlers** and adaptation of facilities
- **Effective restraint systems** to support safer handling and slaughter procedures

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Destination Market - Abattoir

Wet market Lampung, Indonesia

Muscat Municipal Slaughterhouse, Oman

60

Destination Market

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Welfare outcomes can be influenced by **cultural and market context,** including:

- Strong consumer preference for **freshly slaughtered meat**
- Concerns about the reliability of **cold-chain storage and food safety,** particularly in very hot climates or where food safety training/resources may be limited

Under ESCAS, slaughter practices require:

- **Appropriate slaughter infrastructure** e.g., suited to larger/heavier Australian animals

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Funding Regulation, RD&E and Industry Programs

Industry value (context): Total value of Australian livestock exports (2024): **~AUD $912 million**
(Source: https://livecorp.com.au/industry & *Australian Bureau of Statistics)*

Regulation (Australian Government / DAFF)

- Exporters must be **licensed by the Australian Government**
- DAFF regulation is funded through a **cost recovery framework**
  - **Fees-for-service** are charged to industry for direct regulatory services
- Exporters therefore pay for regulatory oversight and compliance activities
  (DAFF cost recovery policy: https://www.agriculture.gov.au/about/fees/cost-recovery *)*

Industry Research Development & Extension (LiveCorp / Livestock Export Program)

- **LiveCorp** is the Rural Research and Development Corporation (RDC) for Australia's livestock export industry
- Most RD&E is delivered through the **Livestock Export Program (LEP)** jointly funded with **Meat & Livestock Australia (MLA)**
- Funding comes from **statutory export levies/export charges,** including:
  - **Cattle:** levy per kg of exported liveweight
  - **Sheep, goats and dairy cattle:** per-head charge

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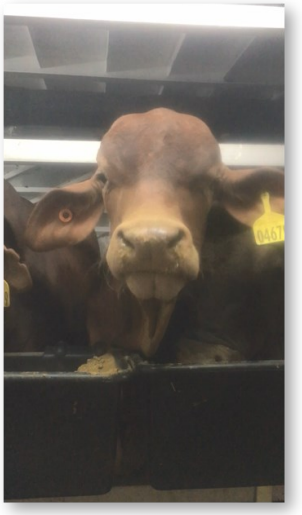
IMPETUS

Thank you…



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