Welfare assessments & priorities in small ruminant systems

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University Foundation - Brussels

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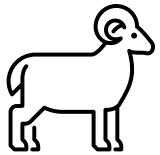
What are the welfare challenges for small ruminants?

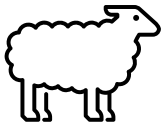
- Diverse group by purpose and husbandry system/practices
- Some animals may transition between different husbandry systems
- Relatively less studied than other farmed species

Defining the main welfare issues

Literature review and stakeholder agreement
Reviewed the literature for all possible welfare incidences for sheep and goats at all life stages



Collated the results to give 80-90 specific welfare concerns for each species



Reviewed by species sub-group experts (within TechCare) then reduced the list to those they felt were most relevant to their systems (approx. 30 per species)

NWS1 used these lists to determine a priority list for those issues they perceived to be greatest welfare concerns

Results: Summary sheep priorities

Rank	Mostly outdoor	Rank	Mostly indoor
1	GI parasites	1	Nutritional issues
2=	Lameness	2=	Mastitis
2=	Nutritional issues	2=	Housing conditions
4	Mastitis	4	Stocking density
5	Ectoparasites	5=	Respiratory disease
6	Poor maternal relationship	5=	Flooring and bedding quality
7	Morbidity and mortality rate	7	Poor air quality

Key outcomes (sheep)

Production purpose (meat or milk) did not influence the main welfare issues prioritised

Main difference was the environment in which sheep were mostly kept

Outdoor management – key concerns were disease, parasites and access to suitable nutrition

Indoor management - key concerns were the quality of the housing, mastitis and access to suitable nutrition

Results: Overall priorities by species

Rank	Sheep	Rank	Goats
1	Nutritional issues	1	Mastitis
2	Mastitis	2	Insufficient food and water
3=	Lameness	3	Agonistic behaviour/food competition
3=	GI parasites	4	Poor environmental management
5	Ectoparasites	5=	GI parasites
6=	Inadequate water supply	5=	Ectoparasites
6=	Reproductive disorders (abortion, dystocia etc.)	7	Lameness/claw health

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Three main strands of work for welfare assessment

- Identifiying existing PLF that may be suitable for assessing small ruminant welfare
  - Based on understanding impact of welfare issue on biological response of the animal
- Testing PLF through use of validated animal-based welfare assessment methods
  - Ensuring that welfare is measured consistently across countries and systems
- Investigatng novel PLF approaches to welfare monitoring/ management
  - Potential new methods to monitor sheep and goat welfare

Relevant PLF for the main welfare issues

How can these welfare issues be assessed?

- Nutrition, disease, environment, (behaviour)

What is the impact of the welfare issue on the animal's responses/changes:

- Changes in body state (e.g. Weight, fatness)
- Changes in behaviour (e.g. movement/activity, food or water intake, social contacts, diurnal rhythms)
- Environmental risk factors for poor welfare

Existing PLF that could be used to monitor welfare

Technology (LS)	Measures	Welfare
 Weigh crates	Weight gain/loss (adult); Lamb growth rate	Slower growth associated with disease, poor maternal relationship, parasitism Weight loss associated with food and water access, heat stress, stocking density, disease
 Milk meters	Individual records of changes in milk yield (dairy sheep)	Milk yield reduced by undernutrition, heat stress, disease, poor environmental conditions
Bulk milk tank weight	Group level assessment of changes in milk yield	Group level impacts of heat, environment or nutrition

Existing PLF that could be used to monitor welfare

Technology (LS)	Measures	Welfare
 Tags and readers	Individual movements and access to key resources (food, water, etc)	Changes in access patterns and daily rhythms associated with disease, heat stress, poor availability of key resources (e.g. queuing)
 Weather station/ environment sensor	Record of ongoing temperature, humidity, environmental parameters	Risk factors of heat stress or respiratory distress; measures of journey 'roughness' and sensory load during transport
Parlour order	Changes in order of entering or leaving	Changes are indicative of lameness or disease

Overall Approach

- Individual animal assessment NOT an overall welfare assessment of the flock
- Core set of AB indicators/measures focused on top 3 prioritised welfare issues for each country for species/purpose
- Additional recommended indicators which cover all the prioritised welfare indicators
- Some additional measures that give more 'overall' welfare information (optional but if measured to be done in a standardised way)
- Majority validated in literature except where none exist

- Additional resource-based measures (e.g. barn THI)or group level measures (e.g. bulk milk tank SCC) – resources/management check sheets

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ANIMAL WELFARE INDICATORS

Dairy sheep example

Core issues: mastitis, lameness, gastrointestinal parasites, nutritional issues, housing and environment (incl. bedding), diarrhoea, abortion

Additional issues: respiratory infection, competition/aggression, water quality, heat stress, rough handling, ectoparasites

Other measures: QBA

Output: list of indicators, and how to score or measure them

Example measures for Dairy Sheep (top 5 prioritised issues)

Welfare Issue	In field/unhandled	Handled
Mastitis	Hindlimb lameness	Somatic Cell Count
Lameness	Gait score	Gait score
Gastrointestinal parasites	Dag score	Faecal egg count Dag score FAMACHA score
Nutritional issues	Wool eating/biting/pulling	Body condition score Weight change Milk yield change Milk fat and protein (MIR)
Housing and environment	Fleece cleanliness Lying time/synchrony	Fleece cleanliness Fleece moisture Udder dirtiness Foot and leg health Claw overgrowth Ocular discharge Coughing Ear and horn damage

Example protocol: list of ABM and measurements

4. **Body measures of appropriateness of housing** (AWIN, scored as present/absent)

Table 6. Scores for bodily indicators of housing quality (scored as present = 1; absent = 0)

Measure	Present (photo)	Present (descriptor)	Absent (photo)	Absent (descriptor)
Leg injuries		Presence of swellings, hairless patches, callus, lesions or scabbed areas on leg joints.		No lesions, swellings or abrasions
Hoof overgrowth		Overlong or mishappen feet. Score 1 if at least one claw is overgrown		Hooves show an appropriate length and shape
Ocular discharge		Eyes wet or with pus, tear-staining or patches below the eyes		No discharge present

Most measures drawn from existing protocols available in different countries (e.g. AWIN)

Example of Resource and Management checklist

Indoors	Outdoors	Management
Barn dimensions	Dimensions of pasture	Number of animals
Ventilation	Fencing type	Type of animals
Windows	Pasture composition	Breed
Air flow	Shelter	Ewe weights
Ambient temperature	Ambient temperature	Lamb weights
Air quality	Weather measures	Ewe mortality
Lighting	Number of animals on pasture	Mortality causes
Number of pens	How stocked	Lamb mortality
How stocked	Stocking density	Lamb mortality causes
Stocking density	Supplementary feed	Predators known in area
Flooring type	Trough space per head	Predator sightings
Bedding type	Watering points	Clinical disease
Bedding depth	Watering point access	Veterinary treatments

Animal-based welfare indicators for the main welfare issues

Animal-based welfare indicators for the main welfare issues

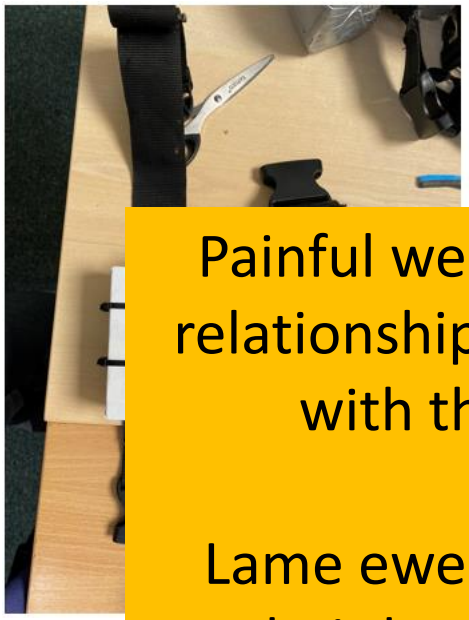





Are there novel approaches to assessing animal behaviour or welfare using PLF?

- Assessing social interactions (ewe-ewe and ewe-lamb proximity)
- Animal location and changes in diurnal patterns of behaviour
- Changes in spontaneous behaviours (access to resources, movement patterns)
- Ability to better assess environmental risks to welfare

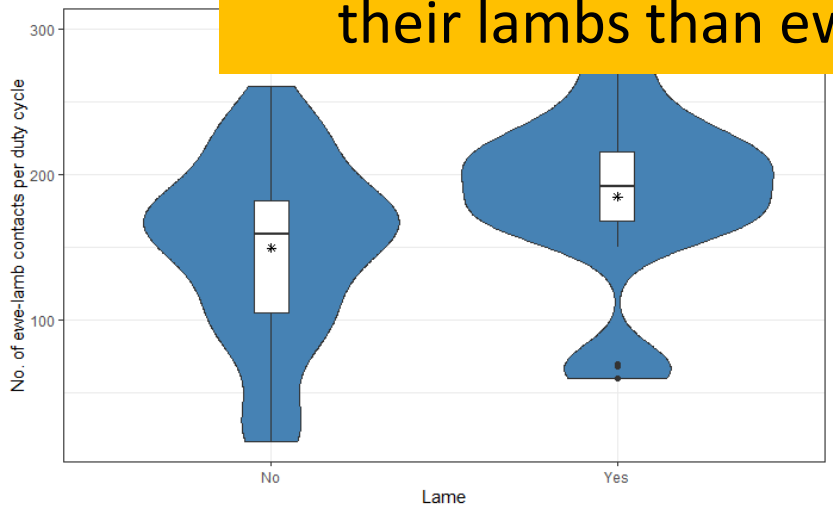
Assessing changes in social behaviour

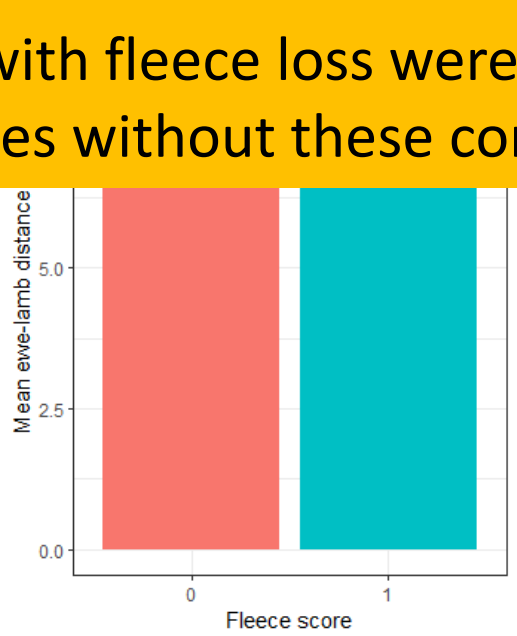


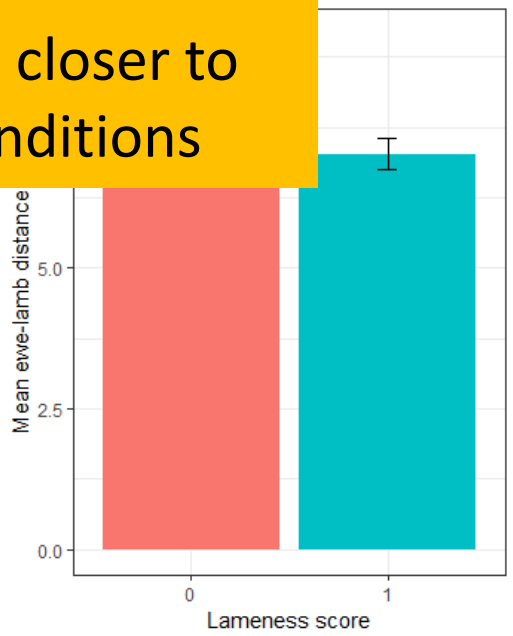
Bluetooth beacons (lambs) and beacons and bespoke receivers (ewes)

Painful welfare conditions (lameness) altered social relationships such that lame ewes had more contacts with their lamb and fewer with other ewes.

Lame ewes or those with fleece loss were closer to their lambs than ewes without these conditions



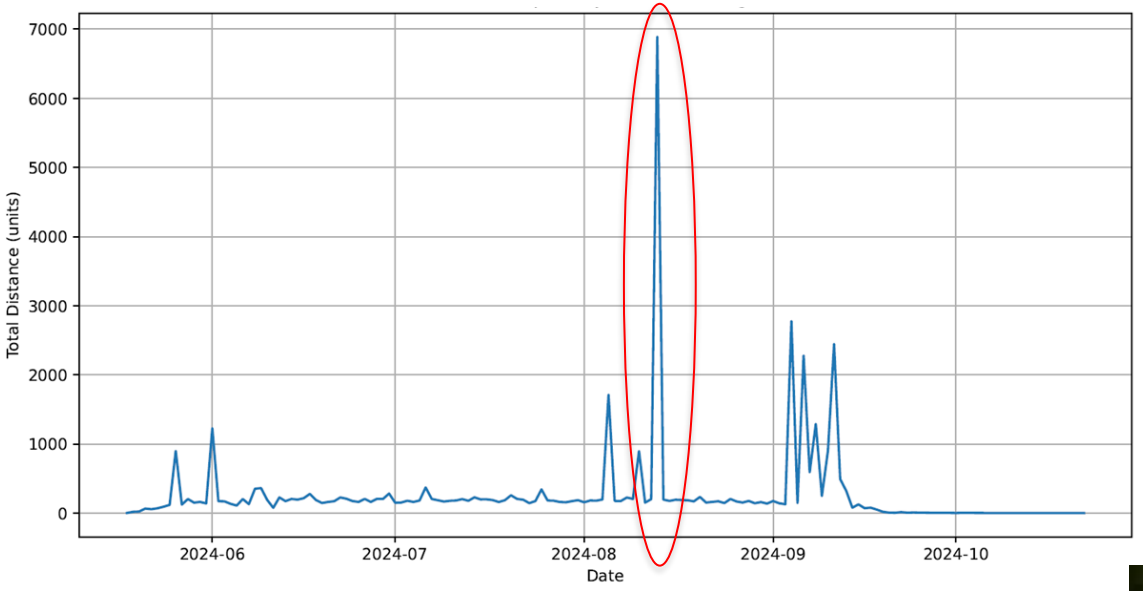


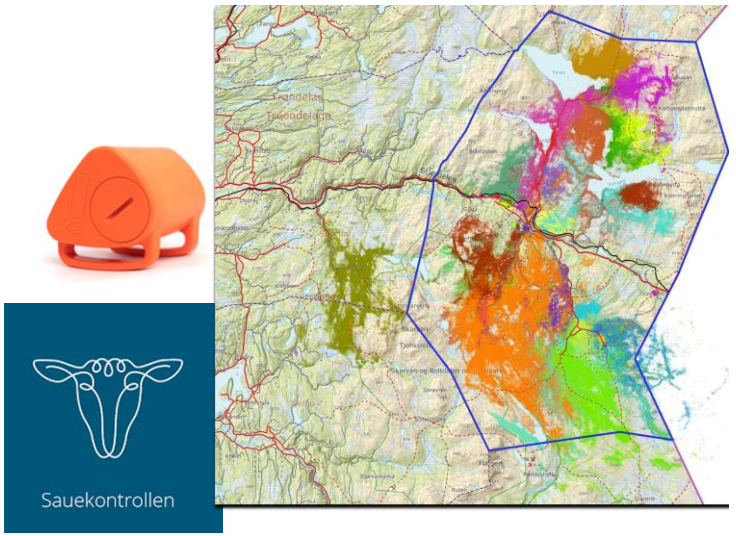


Novel approaches to assessing welfare via PLF

NIBIO

GNSS tracking of movement and location

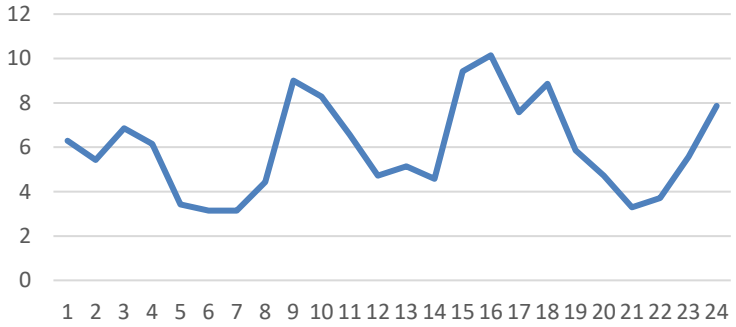


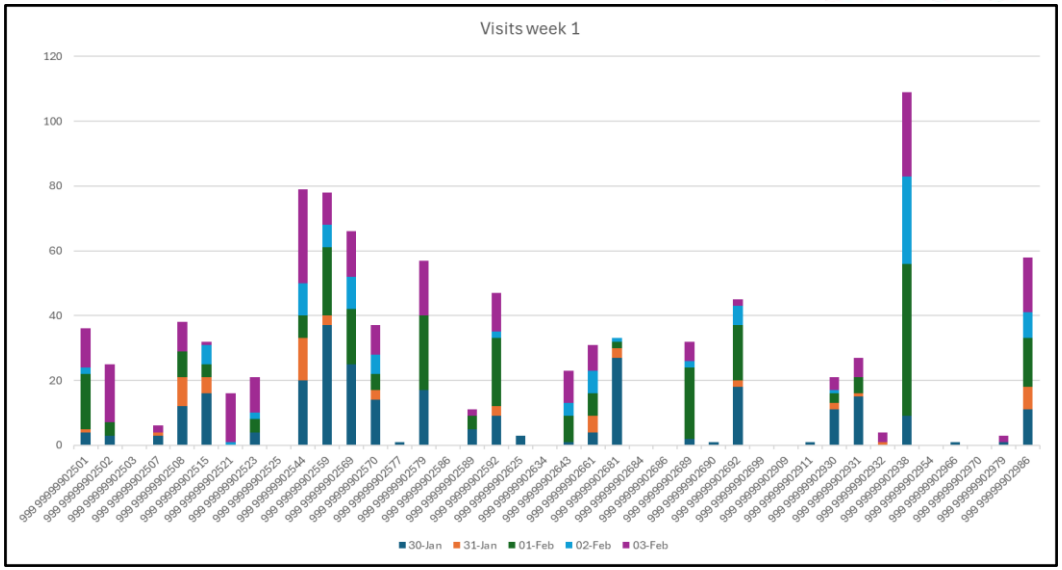


- Real-time tracking of movement and location
- Activity spikes and changes in behaviour related to predation events and mastitis

Patterns of movement and resource visits

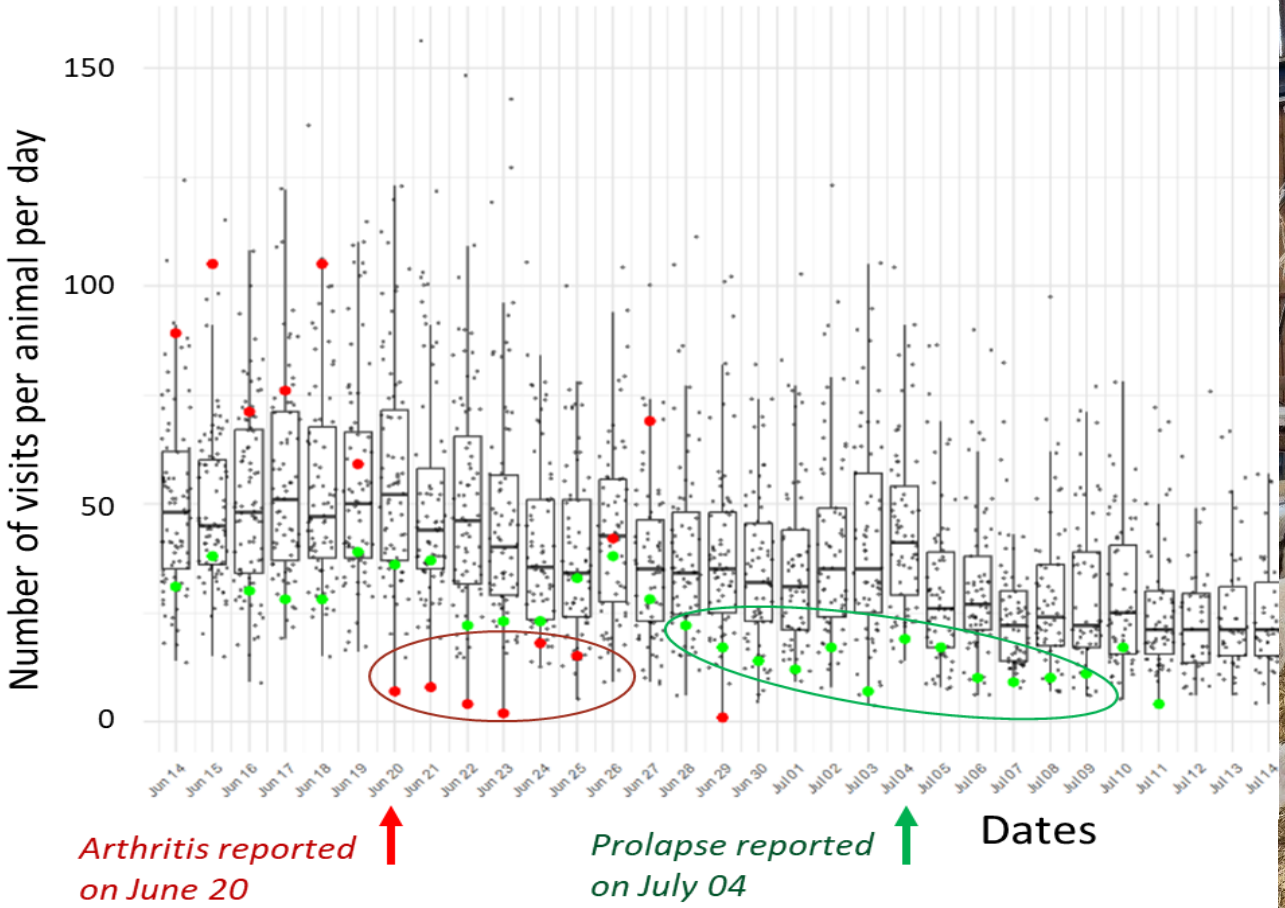
Week 1 Average visits: mid Feb





- Potential to identify changes in diurnal rhythm and landscape use
- Resource use influenced by weather and breed
- Still needs further development

Patterns of movement and resource visits



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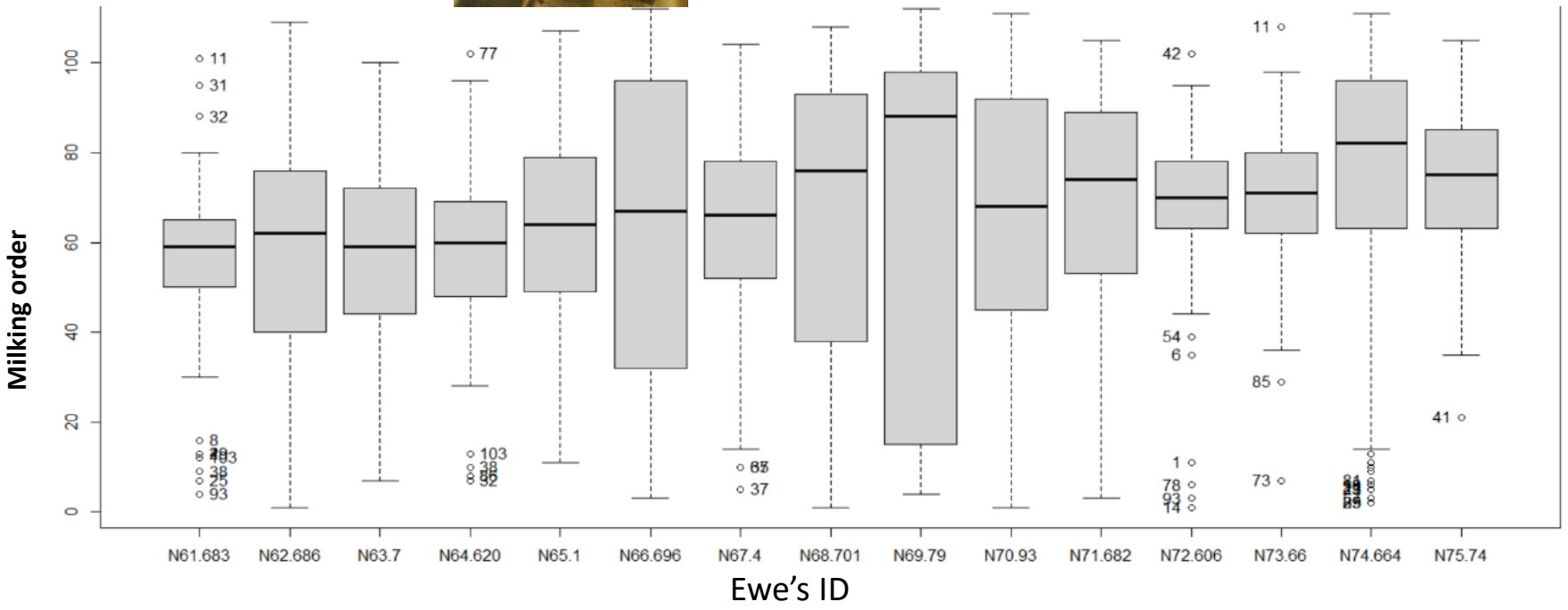
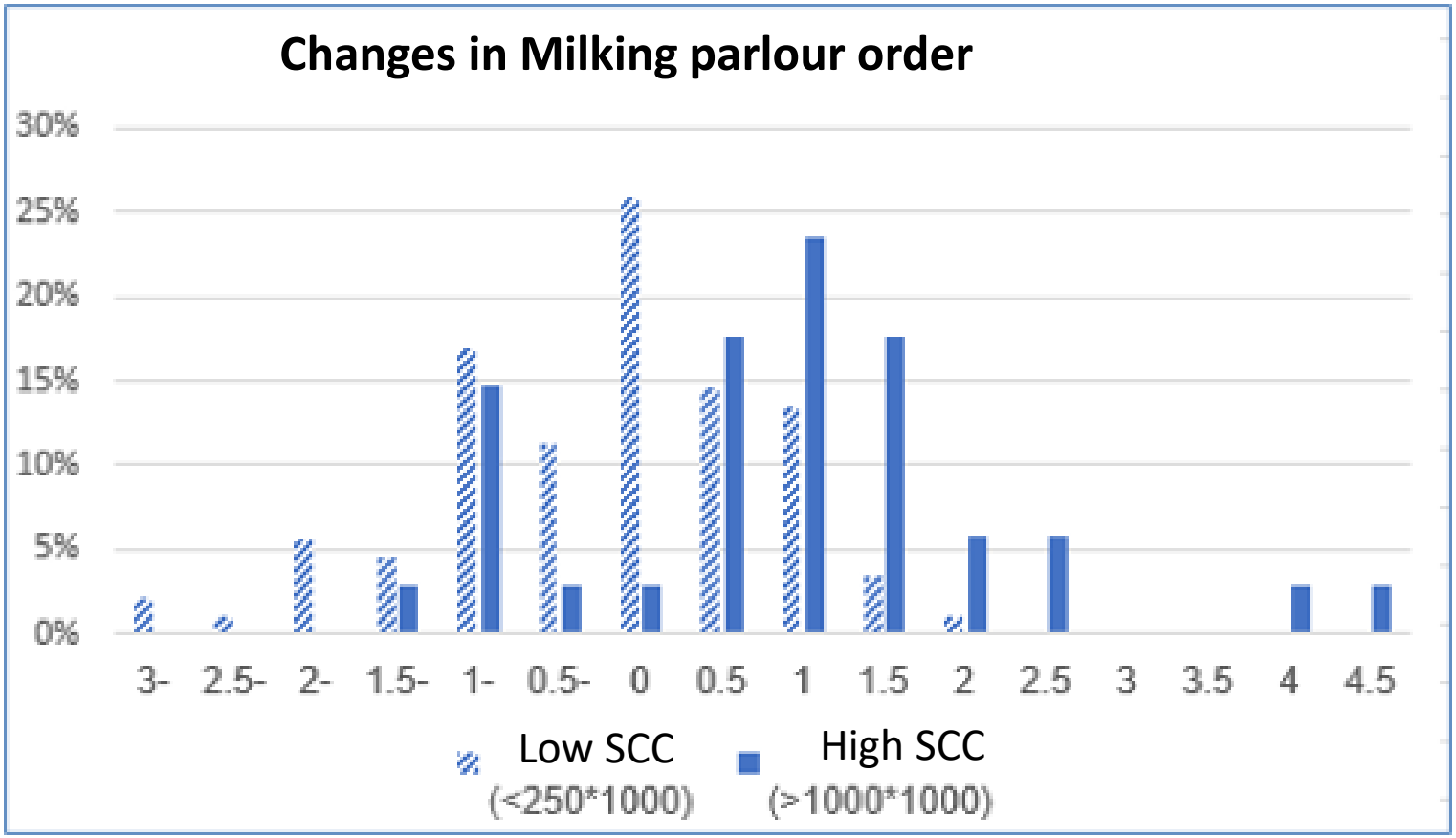
Milking parlour order

- Ewes enter milking parlour in a consistent order (especially start and end of order)
- Correlation with SCC in Lacaune sheep
- Sheep at the back of the movement had poorest udder health



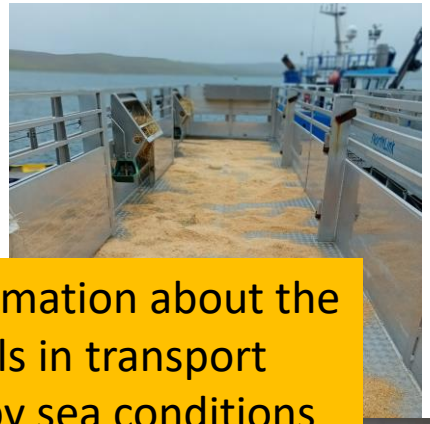
Milking parlour order

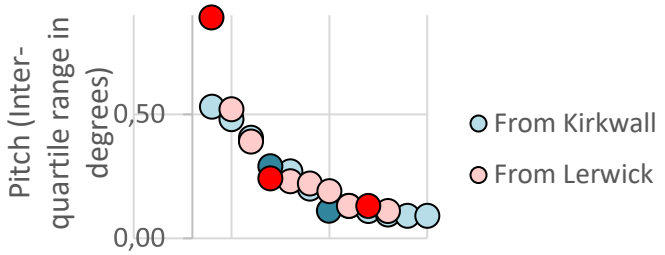


- 76% of ewes with high SCC entered milking parlour later than predicted
- SCC could be predicted with 80% accuracy by modelling parlour order and milk yield

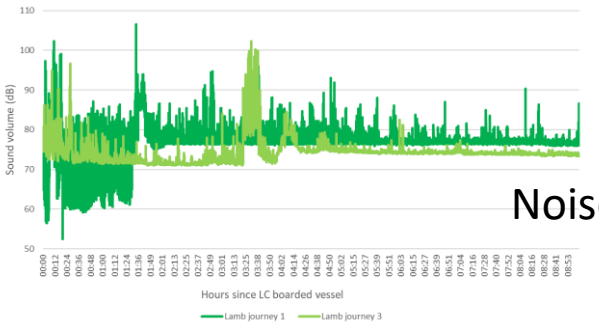
Novel approaches to assessing welfare via PLF

Assessing environmental risk factors – Sea Transport





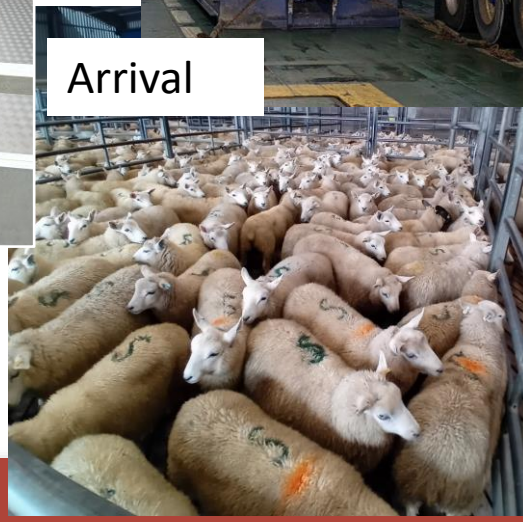
- Provide further information about the experience of animals in transport
- Behaviour affected by sea conditions
- Noisy environments, unpredictable movement in 6 planes



Noise exposure

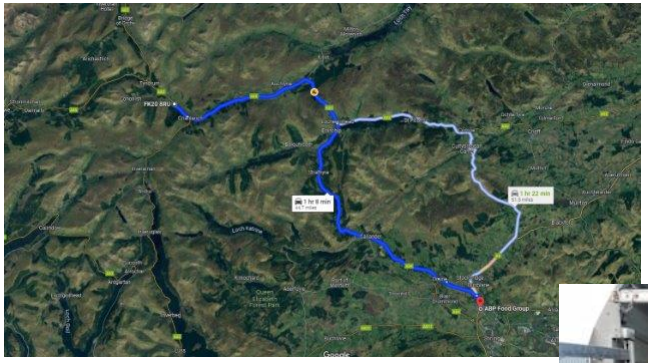
After loading

At sea

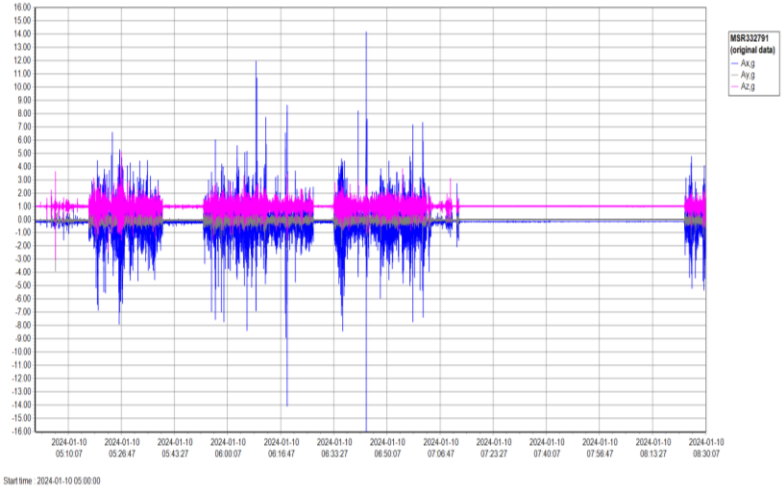


Arrival

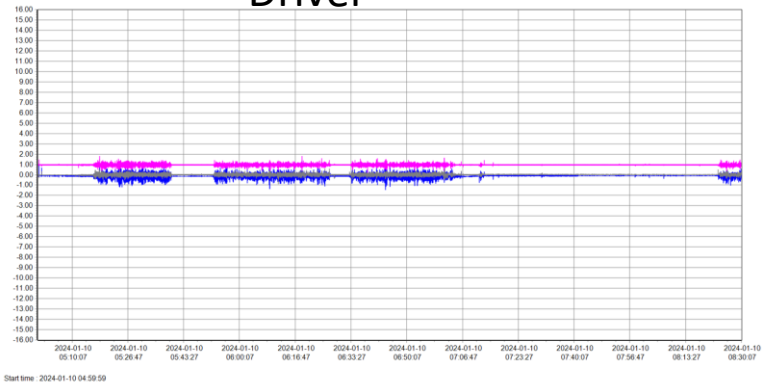
Assessing environmental risk factors – Road Transport



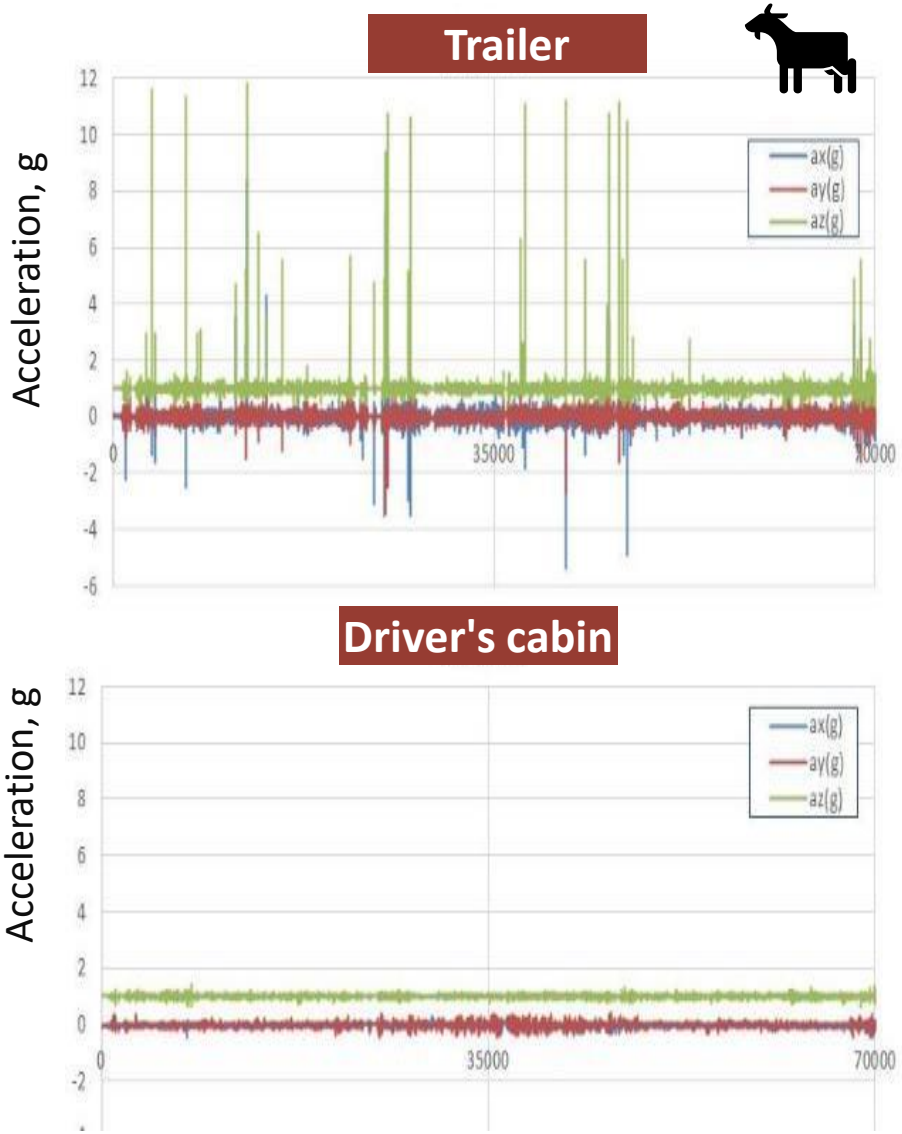
Lambs

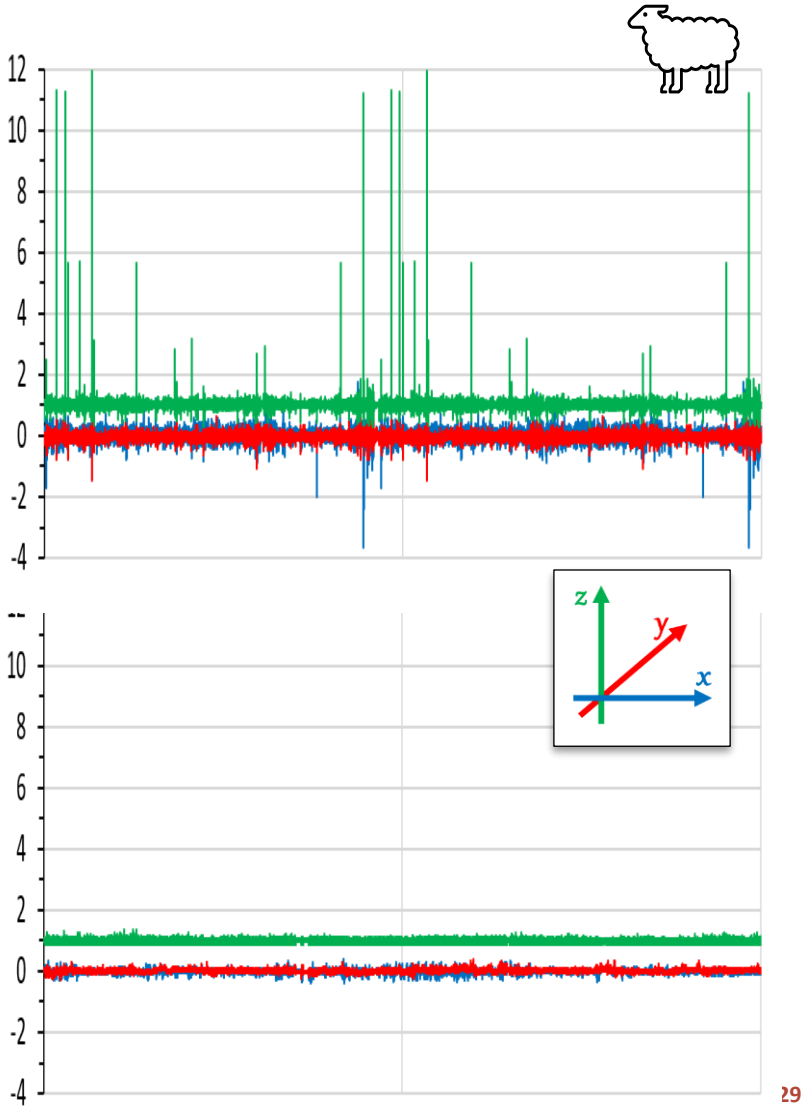


Driver



Assessing environmental risk factors – Road Transport





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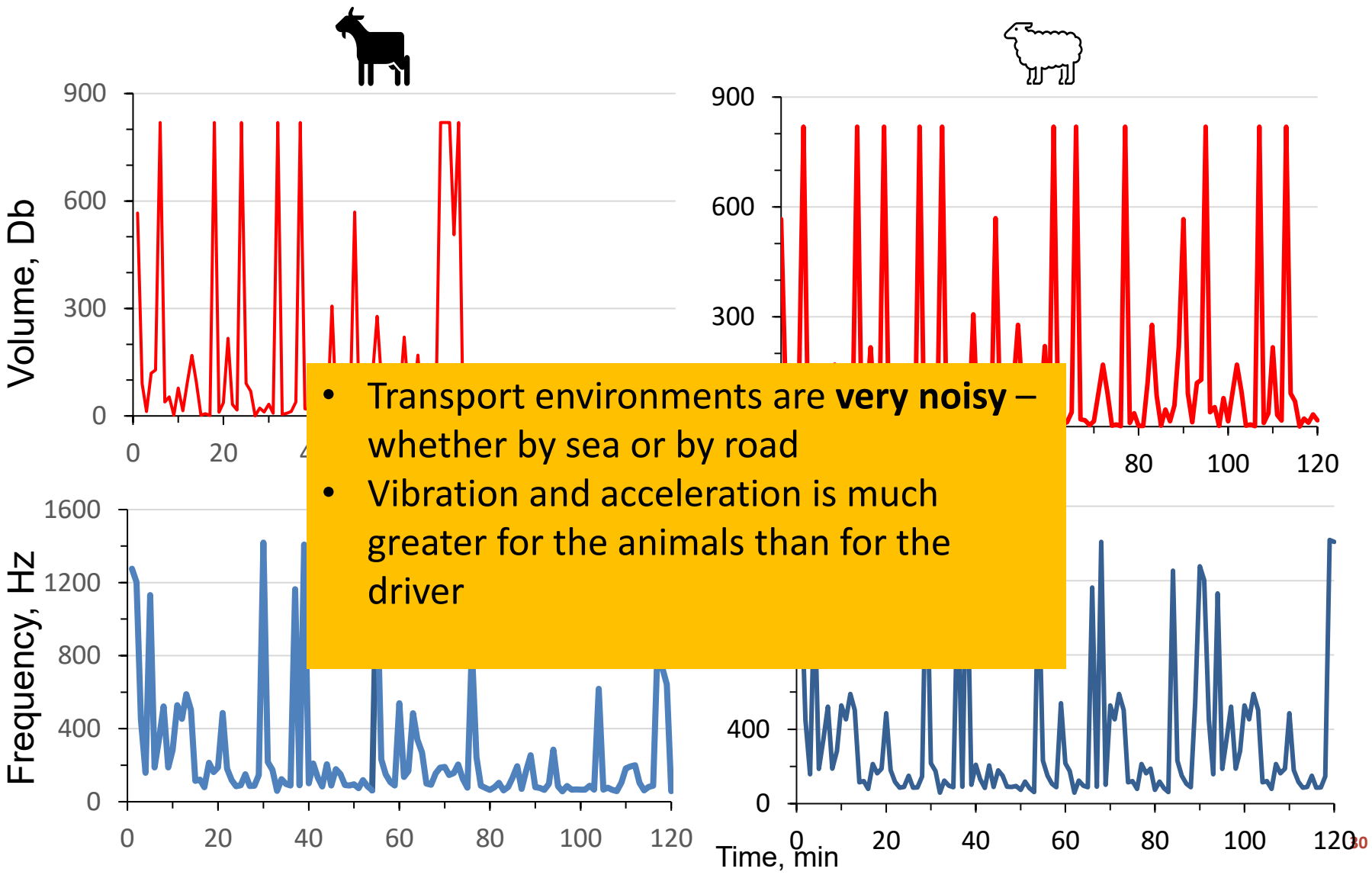

- Transport environments are **very noisy** – whether by sea or by road
- Vibration and acceleration is much greater for the animals than for the driver

What have we achieved

- Developed a prioritisation of welfare issues for sheep and goats in Europe based on stakeholder perceptions of animal welfare
  - Ensures that results are rooted in the experiences and concerns of those who will use any PLF
- Determined the main areas of animal biological response that could be assessed as part of EWS for welfare management
  - Important to allow testing of possible PLF tools on farm
- Defined standardised measures for welfare assessment to allow common approaches to be used across the project partners
  - Worked with Breedr to implement these into an App
- Created new knowledge on methods of assessment with PLF that may lead to improved welfare monitoring and management
  - Assessing social behaviours
  - Assessing movement and locations
  - Assessing use of resources
- Provided new approaches for assessing impact on animals of transport, as risk factors for sensory load

TechCare Partners

Thank you for your attention

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