AVA Submission:

ASEL Stage 2: Issues Paper

September 2018

Submission from the Australian Veterinary Association Ltd

www.ava.com.au

AUSTRALIAN VETERINARY ASSOCIATION

About us

The Australian Veterinary Association (AVA) is the national organisation representing veterinarians in Australia. Our 9,500 members come from all fields within the veterinary profession. Clinical practitioners work with companion animals, horses, farm animals and wildlife. Government veterinarians work with our animal health, public health and biosecurity systems while other members work in industry for pharmaceutical and other commercial enterprises. We have members who work in research and teaching in a range of scientific disciplines. Veterinary students are also members of the AVA.

Executive Summary

This submission makes comment on the Technical Advisory Committee (TAC) Stage 2 Issues Paper on the Review of the Australian Standards for the Export of Livestock (ASEL).

It is essential that the consideration of animal health and welfare and the associated requirements and regulations be science-based.

In order to answer the technical questions posed within the issues paper, the AVA has drawn on the available literature, incluing peer-reviewed material, and industry reports. We note that there are gaps in the literature, however there is a great deal of accumlulated data from decades of live export that could be further interrogated to inform answers to many of these technical questions. The AVA recommends use of this past data, as well as ongoing collection of morbidity and mortality data from every future voyage, for assessment by independent animal welfare scientists.

Importantly, animal welfare science relates to the physical and mental state of an animal and recognises the sentience of animals. Changes that are made should be based on ensuring the physical and mental welfare needs of exported animals throughout the entire supply chain, and not solely restricted to addressing mortalities. It is clear that the industry needs to leverage technology and move towards reporting all morbidity on every voyage, and that this must be available to the public in a transparent manner.

The AVA has addressed questions as set out in the Issues Paper, section by section.

In Section 2.0, the AVA has made comment on the general scope and intent of the review. The AVA strongly supports the intention that the standards must be science-based, and appropriately enforced.

In Section 3.0, AVA discusses the need for recording and review of morbidity and mortality data on each voyage, with a view to making immediate, continuous and ongoing improvements to animal welfare on every future voyage. AVA has provided a list of welfare indicators that should be included in the daily voyage report.

In Section 4.0, the AVA discusses the application of the Heat Stress Risk Assessment (HSRA) model, recommending that HSRA should be applied to any ship carrying livestock across the Equator. Consistent with our recommendations to the McCarthy revew, we outline that irrespective of stocking density, thermoregulatory physiology indicates that sheep on live export voyages to the Middle East during May to October will remain susceptible to heat stress and die due to the expected extreme climatic conditions during this time. Accordingly, voyages carrying live sheep to the Middle East during May to October cannot be recommended.

In Section 5.0, the AVA recommends that *Bos taurus* cattle from an area of Australia south of latitude 26° South must not be sourced for export north of the Equator from May to October. Only cattle weighing less than 500 kg should be shipped, but ideally weights should be less than 380 kg to avoid lameness conditions which are a serious welfare issue and result in culling of affected animals. Pre-export preparation of animals

must balance the need to adapt to new rations whilst minimising risks of salmonellosis. Similarly, time-off-shears must be balanced to enable healing of cuts but limit exposure to winter conditions and limit regrowth of wool. Pregnancy diagnosis in cattle, buffalo, camelids and deer must be performed by a registered veterinarian, and pregnancy diagnosis in sheep and goats must be performed by a competent operator.

In Section 6.0, the AVA strongly supports the use of an allometric model for determining space allocation in registered premises and on board ship. We also submit that adequate trough space is an essential requirement and inextricably linked to space allocation considerations. The issue of appropriate trough space should be addressed as a matter of urgency.

In Section 7.0, the AVA submits that the requirements specified for bedding in ASEL are grossly inadequate. There should be appropriate quantities of comfortable and dry bedding for all cattle and buffalo on every voyage, and adequate bedding for sheep and goats to mitigate soft/wet faecal pads as indicated. Lameness and leg abrasions due to inappropriate flooring are a serious live export welfare issue especially for cattle, and the AVA recommends that ASEL should include enforceable standards for flooring. In this section the AVA also discusses the need for attention to adequate fibre and appropriate protein levels in standard rations, to ensure the health and welfare of livestock undergoing transport.

In Section 8.0, the AVA emphasises the need for at least one veterinarian on board every live shipment regardless of voyage length, consistent with AVA policy. Ship-board veterinarians should be supported by an appropriate number of qualified stockpersons, at a number commensurate with the total livestock on board.

In Section 9.0, the AVA makes comment on the list of proposed minor amendments to ASEL which have been recommended by TAC.

NOTE TO READER:

This document should be read in conjunction with the ASEL Stage 2 Issues Paper, which can be found at this link: https://haveyoursay.agriculture.gov.au/review-asel.

The Issues Paper contains a great deal of discussion, which has not been reproduced here. Instead this document addresses the technical questions posed in the Issues Paper.

The **black bolded numbered headings** throughout this AVA document correspond to sections 2 – 9 in the Issues Paper. The reader should first examine the corresponding discussion within the Issues Paper, then refer back to this document for AVA's answers to the questions posed by the TAC.

Introduction

This submission makes comment on the Technical Advisory Committee (TAC) Stage 2 Issues Paper on the Review of the Australian Standards for the Export of Livestock (ASEL). The Issues Paper states "the standards are mandated by law in Australia, so they must, to the maximum extent possible, be evidence-based, supported by contemporary science relevant to Australian systems and the conditions faced during voyages from Australia". In view of this, the AVA awaits the imminent release of an independent literature review of scientific research relating to livestock exports from the Department of Agriculture and Water Resources (DAWR). We have produced this current submission on the Stage 2 Issues Paper without the benefits of having seen the literature review. Additionally, the review of the heat stress risk assessment model is also pending, and the comments made in this submission may be modified when that review becomes available.

The Australian Veterinary Association (AVA) policy on Live Animal Export is shown in **Figure 1**.[1]

Live animal export

Policy

Ideally, Australian food animals should be slaughtered as close to the site of production as practicable to minimise transport and handling stress, and to ensure they are protected by appropriate and enforceable animal welfare and slaughter standards.

Where live export occurs, an Australian-registered shipboard veterinarian must accompany each shipment and this veterinarian must be independent and thus not employed by either the exporting company or the shipping company. Pregnancy testing of animals for export must be performed by an Australian-registered veterinarian.

Effective operational protocols must be in place at all times to safeguard the welfare of exported animals. These protocols must ensure humane animal transport, handling and slaughter practices in accordance with best practice; and include accreditation of abattoirs, training of employees and the implementation of an independent animal welfare auditing process.

Animals should not be subjected to prolonged land transport prior to exportation.

Figure 1. Australian Veterinary Association policy on Live Animal Export (Source: https://www.ava.com.au/policy/151-live-animal-export)

[1] Full version of AVA policy on live animal export at: https://www.ava.com.au/policy/151-live-animal-export

Headings as per ASEL Stage 2 Issues Paper:

Section 2.0 – Overview/Introduction

AVA COMMENT ON ISSUES PAPER SECTION 2.0 FOLLOWS

2.1 What is the problem we are trying to solve?

AVA COMMENT: The AVA supports a review of the Australian Standards for the Export of Livestock (ASEL), given that the standards have not been updated since 2011, and that a number of important issues remain outstanding since the incomplete review in 2012-13. The AVA supports the stated aims of the review which are to develop standards that "*ensure consistent welfare outcomes across the industry, and which provide industry participants with clear criteria for demonstrably meeting their duty of care to the animals they manage along the export supply chain".* The AVA strongly supports the intention that the standards must be science-based, and appropriately enforced.

2.2 – What is the role for government?

AVA COMMENT: In its report on Regulation of Australian Agriculture in 2016, the Productivity Commission stated that "*animal welfare and profitability are not complementary because the market is largely unable to provide society with desired states of welfare"*, and that credible science must underpin standards which should be effectively regulated.

We note the further quote from the Productivity Commission has been reproduced in the paper that "*An important policy question is whether regulatory arrangements can effectively manage the welfare of Australian live exports without imposing costs that lead to a substitution to exports from other countries*".

The objective of this review is to develop standards which safeguard the welfare of Australian animals undergoing live export, not to safeguard export markets against competing countries. The Australian community has an expectation that animals undergoing live export will be treated appropriately, and that their welfare will not be sacrificed to ensure ongoing market viability.

Indeed, the stated **objective** of the ASEL Standard, as appears in the preface to ASEL, is:

"*The objective of this Standard is to set out the requirements to ensure animals are fit to export and manage the risk to animals' health and welfare throughout the export voyage*."

To that end, and consistent with our policy, the AVA submission focusses on animal welfare and not the economics of the industry.

2.3.1 – Out of scope

AVA COMMENT: The AVA notes the list of items which are now out of scope of this review, due to the shortened timeline. We understand that some of these items will be addressed by the Moss and Heat Stress Risk Assessment Reviews, respectively. However there remain important items on the list for which it is unclear if/how they will be addressed. The AVA seeks clarification and recommends that the TAC expand on this in their final report.

Section 3.0 - Reporting and investigations

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 3.0) FOLLOW.

3.1 Reportable mortality rates

Over the **past three financial years (2015-16 to 2017-18)**, the average voyage mortality rates recorded for the various classes of livestock exported by sea have been as follows:

- Sheep 0.75 per cent across 107 voyages (5.4 million sheep exported) = **40,500 sheep deaths**
- Cattle and buffalo, voyages ≥ 10 days: 0.17 per cent across 459 voyages (1.77 million head exported)
  - Cattle: 0.16 per cent across 443 voyages (1.76 million cattle exported) = **2816 deaths**
  - Buffalo: 0.46 per cent across 16 voyages (7,431 buffalo exported) = **34 deaths**
- Cattle and buffalo, voyages < 10 days: 0.09 per cent across 453 voyages (1.28 million head exported)
  - Cattle: 0.08 per cent across 423 voyages (1.27 million cattle exported) = **1016 deaths**
  - Buffalo: 0.33 per cent across 30 voyages (8,596 buffalo exported) = **28 deaths**

Issues Paper questions about reportable mortality rates:

- Should the current reportable mortality rates (RMR) be revised and, if so, how?

AVA ANSWER:

The AVA contends that Reportable Mortality Rates (RMR) are a crude way of assessing welfare: an arbitrary threshold percentage is artificial, does not reflect suffering (morbidity), and in our view, a different approach is warranted. Despite 5 decades of live animal export, very little data is available about ship-board morbidity in livestock and how to prevent the same issues from occurring on subsequent voyages. Morbidity data is essential to improve conditions for livestock and shipboard workers alike.

The AVA recommends that daily voyage reports should include morbidity data collection via smart phone apps, and these daily reports should be combined with autopsy reports and photos into the final voyage report. The form of this reporting should be developed in conjunction with AAVs to ensure:

- Appropriate data can be collected and recorded simply but accurately
- AAVs can record useful findings in the field e.g. Pant Score for the deck should be % Pant Score per pen, to allow better appraisal of heat stress with respect to numbers affected and severity. This data has to be recorded pen-side otherwise it will never be done properly, as it is too onerus after the fact.
- AAVs record findings consistently (within each voyage, among different voyages, among different AAVs) - lack of consistency and/or under-reporting is not useful epidemiologically.

At the end of every voyage, the voyage reports/data from the app/ plus autopsy reports should be given to an independent epidemiologist (at the expense of the Exporter/LiveCorp) who spends a day to examine and debrief AAVs. All the data should be added to a database to assess information on morbidity and mortality plus make recommendations for corrective actions. This must be done confidentially to ensure candid reporting. The collected information will allow development of the following:

- **Data base to collate disease information** to allow better selection of stock for future voyages
- **Data base on feed/chaff/bedding** modification
  - On board feed provisons are highly variable and there are no prescribed minium ration requirements, and no standard feed pellet has been developed for purpose. This results in highly variable chaff provisions and potential for metabolic conditions, such as bloat, where rations are inadequate or pooly formulated with insufficent long fibre.

- **Data base to collate ship information**. One example given to us by an AAV was an issue where cattle were repeatedly getting their heads stuck in a rail due to a pipe welded into the wrong place when an automatic watering system was installed. Another common example is when there is lots of lameness occurring on particular decks
- **Corrective action** can then be put in place. It does not have to be punitive, just carried out to remedy the issue(s) for example, remove the pipe or weld a steel sheet over hole prior to next voyage. And replace flooring strategically
- Final document goes to DAWR, tha Exporter, and Livecorp, and findings are incorporated into AAV training modules as appropriate.

DISCUSSION:
The AVA strongly endorses the sentiments behind:

(a) the McCarthy Review recommendation that mortality must be assessed in conjunction with morbidity, and that morbidity indicators should be the basis of general welfare assessment; and

(b) Recommendation 2 of Ferguson et al. (2008) that states: "*Mortality is clearly the ultimate measure of an animal's welfare (or lack thereof). However, it is recognised that it is not the only measure of welfare … and that some consideration should be given to protecting animals that might otherwise suffer … but not actually die*" (Ferguson, Fisher et al. 2008).

All morbidity and mortality should be recorded and reviewed on every voyage, with a view to making immediate, continuous and ongoing improvements to animal welfare on every future voyage.

Investigations long after the event are difficult, costly, and fraught with lack of findings and/or lack of long-lasting benefits, as it is usually only the next voyage where changes are implemented, before reverting to usual shipping practices.[2]

In the AVA submission to the McCarthy Review, it was recommended that (a) *sheep must be individually identified with electronic ear tags* (RFID NLIS tags) and (b) *aggregated voyage data, including key animal welfare indicators, can and must be measured and collated … and that data made available to scientists so future research topics are not only based on sheep mortalities, but also causes of morbidity during each voyage"*.

McCarthy (2018) recommends "*that the industry moves away from using mortality as a measure to a focus on measures that reflect the welfare of the animal"* and *"the Australian Government Accredited Veterinarian (AAV) … should be given information regarding the purchase lines of all sheep included in the consignment (i.e. the denominator) to identify 'line effects' within the mortality pattern on board*" (McCarthy 2018). It has also been recommended to "*Consider development of a strategic approach to online performance data monitoring systems that … incorporate measures currently being collected and reported on through the Shipboard Mortality Database (SMDB) and possibly through voyage reporting*" (Perkins, O'Hara et al. 2015).

Every voyage should have appropriate welfare parameter data recorded which is collated and used to improve outcomes for each and every subsequent voyage. This should be done through:

[2] Mortality Investigation Reports are at http://www.agriculture.gov.au/export/controlled-goods/live-animals/livestock/regulatory-framework/compliance-investigations/investigations-mortalities

(a) trace-back of animals to farm/feedlot of origin to learn about preparation of stock pre-embarkation: "*clarifying the mortality risk for sheep of different classes and from different sources"* (Makin, House et al. 2010); "*Line effects identified over the course of the voyage should be investigated once the voyage has been completed*" (McCarthy 2018); and

(b) development of training resources for AAVs that can be offered in a timely fashion through regular updates of resources such as ASEL Handbook App and VetHandbook App and through on-line training modules [e.g. "*A training module may be required to ensure that score allocation is consistent across industry*" (McCarthy 2018); e.g. "*Convene regular workshops for stockpersons and veterinarians to continually review and improve shipboard management*" (Banney, Henderson et al. 2009); "*Use the findings from this project to contribute to an update of the Veterinary handbook for the live export industry*" (Perkins, O'Hara et al. 2015).].

Morbidity data collection has been recommended for 2 decades. For example, in 1999 it was concluded that "*there is a need for … recording objective measurements where possible so that a performance history can be built up over time*" and "*a need for a thorough de-briefing after each voyage to discuss findings … to improve welfare of the cattle*" (Norris and Creeper 1999). In 2001 it was requested that "*stockmen should be trained in the use of hand held sensors to measure dry bulb and wet bulb temperature and CO_2 concentration, with representative measurements to be recorded whenever animal stress is noted. Ventilation arrangement and pen air speeds should also be noted. The data and animal observations should be recorded on a standard form and forwarded to MLA and LiveCorp to expand the available heat stress database. The data should include a photograph of the beasts and pens involved"* (MAMIC 2001).

- At what level of mortality should a notifiable incident be declared, thereby triggering an investigation?

See (1) above regarding use of morbidity as a more appropriate trigger.

- Should there be a relationship between the average mortality rate and the RMR and should it be reviewed annually?

See (1) above. Every shipment has its own set of risk factors and averages over many voyages do not apply to any particular voyage.

- What should be the stated purpose of an RMR, and what should be the consequence(s) of exceeding the RMR for a voyage?

See (1) above regarding use of morbidity as a more appropriate trigger. Consequences should be determined by the regulator.

- Should the RMR also relate to classes of livestock (within species), different areas of the vessel etc. as well as length of journey?

Yes. See (1) above.

- Should the RMR be replaced by, or supplemented with, reportable levels for more general welfare indicators (e.g. see McCarthy Review report)? If so, what should the welfare indicators be and what should be the reportable level for each?

Yes. See (1) above.

Welfare indicators should be recorded appropriately on the standard daily voyage report by the AAV (infers that they check every deck, every day and that they record true observations, in contrast to current forms where respiratory rate recording may not match heat stress score). McCarthy (2018) states "*The use of both a panting score and a heat stress score should be a mandatory requirement in the daily report*." (It is worth noting that (McCarthy 2005) recommended implementation of Panting Scores in 2005). The standard daily voyage report mostly already includes:

- General demeanour of stock.
- Daily feed & water intake:
    - Feed (pellets & chaff) volumes consumed. Problems associated with feeding. Feedback.
    - Water delivery/quality issues.
- Bedding volumes, consumption. Feedback.
- Panting and heat stress scores all species, all decks. Along the lines of McCarthy (2018) for sheep:
    - **Normal respiratory rate** (score 0: RR <34). The resting respiratory rate for sheep ranges between 16 and 34 breaths per minute (Fielder 2016).
    - **Mild heat stress** (score 1: RR 34-100)
    - **Moderate heat stress** (score 2: RR 100-160)
    - **Severe heat stress** (score 3: RR 160-220)
    - **Near death**: tongue-out, open-mouth breathing and/or 2nd stage breathing
- Deck scores to assess faecal water content and thus deck humidity.
    - Recommendation made in 2009: "*Develop a scoring system for bedding condition, abrasions, lameness, body faecal contamination and time spent lying/standing to assist industry to benchmark and improve health and welfare outcomes associated with bedding*" (Banney, Henderson et al. 2009) which was re-iterated by (McCarthy and Banhazi 2016).
- Births/abortions: record ear tag/s for trace-back
- Sick animals: record ear tag/s for trace-back, clinical signs, diagnosis, treatment/mitigation measures (appropriate use of drugs and identification of animals with meat WHP/ESI requirements (Brightling, Chapman et al. 2008))
    - It it important to note that there is a "*good correlation between core and rectal temperatures … indicating the usefulness of rectal temperature in clinical monitoring of animals subjected to high heat load*" (Barnes, Beatty et al. 2004).
- Mortalities
    - Found dead or euthanised?
    - Record ear tags for trace-back
    - Autopsy reports: Voice record as dissect/take photographs/fill out pro-forma designed to guide AAV through methodical autopsy
- Wet bulb temperature recording on every deck at air outlets and high risk locations (such as adjacent to engine room bulkhead) to monitor worst case scenarios on every deck. "*Automated continuous environmental monitoring equipment installed as a condition of any approved arrangement*", McCarthy (2018).

Figure 2 below indicates a quarter to a third of mortalities occur at "discharge" (Norman 2017). What are the causes of these deaths? Are these deaths occurring on ships during heat stress events at port during unloading? How can the causes be identified if not already recorded, and then minimised?

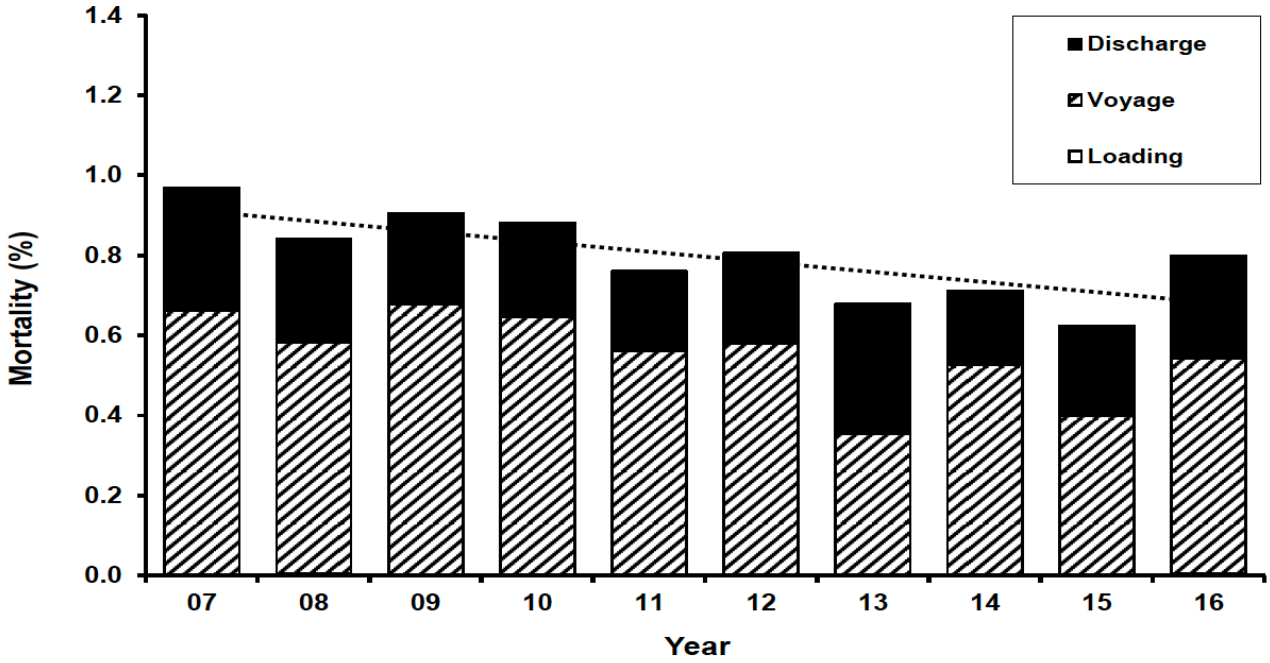

Figure 2. Annual mortality of sheep exported by sea from Australia to all destinations since 2007 (Norman 2017) .

This information must be made available at the end of every voyage for review by scientists to evaluate the welfare of stock and improve future voyages.

An extract of the LiveCorp submission in Stage 1 of the 2018 ASEL review (see page 47-48 of Stage 2 Issues Paper) requests the following information:

"*On board veterinary drug use: Industry has tendered to commence research to review and provide recommendations in relation to the on board use of veterinary drugs. This project will use a consultative group of AAVs to guide the process and will consider several different areas including:*

- *Review common shipboard diseases, diagnosis & treatments and the associated skills/competencies required to manage those diseases;*
- *Assess the capacity of stock people to treat and manage the diseases commonly faced during export;*
- *Develop best practice drug use resources;*
- *Review the ASEL veterinary kit requirements; and*
- *Explore mechanisms to improve treatment recording methods*."

This extract epitomises why more information needs to be gathered and recorded on every voyage, then made available to improve welfare outcomes and crew workplace health and safety on future voyages. There should already be a large database containing all this information, to which every subsequent shipment adds data.

3.2 Voyage reporting requirements

Issues Paper questions about voyage reporting

- What further changes, if any, do you think are necessary to the voyage reporting requirements of the standards?

See 3.1 above. All morbidity and mortality should be recorded and reviewed on every voyage, with a view to making immediate, continuous and ongoing improvements to animal welfare on every future voyage.

- Should the voyage reporting changes recommended by the McCarthy Review and then instituted by the Department be applied more broadly?

Yes. See 3.1 above.

- Some stakeholders would like voyage reports to be publicly available, while others argue that this approach may limit candour. What is the best approach to balance public transparency with frankness in reporting?

Data from each and every voyage needs to be submitted to independent scientists to review and recommend improvements. Transparency is paramount and information should be published on a website.

- Should there be on board real-time monitoring of animals and vessel conditions? If so, what should these be and what would be the cost?

Yes, by the AAV and automated technology. See 3.1.6 above.

- Should there be specific recording and reporting of additional environmental parameters on vessels during voyages? What might these be, and can or should reportable 'trigger' levels be set?

Wet bulb temperature is the most important parameter to measure and record. Other parameters could include:

- **Carbon dioxide concentrations** should be measured at outlets as it is a useful tracer gas in assessing effective ventilation rates. If pen air turnover (PAT) is inadequate, carbon dioxide concentrations rise. [CO_2] should be at least less than 0.3% (compared with atmospheric [CO_2] at 0.03%) (MAMIC 2001, McCarthy and Banhazi 2016).
- **Ammonia concentrations** > 25 ppm (17 mg/m^3) produce adverse welfare outcomes (MAMIC 2001, Costa, Accioly et al. 2003, Tudor, Accioly et al. 2003, Phillips, Pines et al. 2010, Phillips, Pines et al. 2012).
- **Other gases and dust** (MAMIC 2001, McCarthy and Banhazi 2016).
- **Deck movement** (with respect to animal foot and leg injuries and motion-sickness).

- Should there be specific recording and reporting of animal welfare indicators during, and at the conclusion of a voyage? If so, what might these welfare indicators be, how frequently should they be measured and can/should reportable trigger levels for these measures be established?

Yes. See 3.1 above. If a morbidity indicator is observed (e.g. any lame cow), regardless of number of affected cases, that is the trigger for immediate treatment of the animal and this needs to be recorded on the daily voyage report. At the conclusion of the voyage, accumulated morbidity data is gathered and assessed with respect to implementing corrective actions for future voyages. This information can be used to update AAV training modules and relevant Smartphone Apps.

- If reporting requirements are increased, what might be this cost and who would pay?

Not in scope of AVA submission.

4.0 Heat Stress Risk Assessment

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 4.0) FOLLOW.

4.1 Application of the HSRA model

Issues Paper questions about limits relating to heat stress risk assessment application

- Should paragraph 3A.4 (a) (ii) be amended to include other geographical locations?

Extract from Stage 1 Endorsed Reformatted ASEL (2018), showing paragraph 3A.4(a)(ii):

3A.4 Stocking density and penning arrangements are appropriate
(a) For export by sea, prior to loading the animals:
(i)…
(ii) for exports to the Middle East, an agreed heat stress risk assessment must be completed and indicate the risk is manageable as per the testing criteria in this Standard.

AVA ANSWER:

This paragraph should be amended to include "any destination where a ship carrying livestock crosses the Equator". This is because wet bulb temperatures at which heat stress occurs in sheep and cattle are found (a) in equatorial regions in all months of the year and, (b) in regions other than the Middle East.

DISCUSSION:

Currently, HotStuff v5.0 is used to calculate the risk of heat stress *mortality* (by determining WBT ML), but it should also be used to calculate the risk of heat stress (WBT HST) too (*morbidity*), as clearly stated by Ferguson et al. (2008): "*Consideration should also be given to utilising the HST values that have been developed, but not actually applied in the output and use of the HotStuff model*".

Table 1 shows the ranges of wet bulb temperatures at which heat stress occurs in cattle and sheep (Maunsell-Australia 2003, Stacey 2017). Any amendment should include "any destination where a ship carrying livestock crosses the Equator" because wet bulb temperatures at which heat stress occurs in sheep and cattle are found (a) in equatorial regions in all months of the year and, (b) in regions other than the Middle East (see **Figure 3, Tables 2, 3**).

Table 1. Preliminary wet bulb temperature risk criteria for heat stress in several livestock lines (Maunsell 2003).

	Wet Bulb Temperature Risk Range		
Livestock Line	**Safe**	**Caution**	**Danger**
Bos indicus	< 28^{0}C	28 - 31^{0}C (non acclimatised) 30 - 33^{0}C (well acclimatised)	> 31^{0}C (non acclimatised) >33^{0}C (well acclimatised)
Bos taurus	< 26^{0}C	26 - 30^{0}C	> 30^{0}C
Sheep	< 26^{0}C	26 - 29^{0}C	> 29^{0}C

Figure 3 below illustrates how cattle died during a shipment to China in 2018 in spite of meeting pre-export conditions. It provides an excellent example of why any shipment that crosses the Equator should be assessed for risks. It should be noted in the last two paragraphs that industry wants to better manage any future shipments (see section 3.1) and HSRA should be implemented on every shipment, not just those to the Middle East.

"Deaths spiked when the ship was near the equator, there were 12 lost on one day."

All pre-export conditions had been met and an Australian accredited vet and accredited stockmen were aboard the independently chartered vessel, Mr Meerwald said. Exporters are required to report any voyages on which more than one per cent of cattle die on board.

Mr Meerwald said Harmony was working with DAWR to investigate the circumstances.

"We are terribly disappointed at the outcome," Mr Meerwald said. "But it's not through neglect or irresponsible behaviour. This signals further respiratory work needs to be done when taking cattle from southern Australia across the equator.

"We hope to get a credible insight into what caused the issues and determine how to better manage future shipments."

He said Harmony had recommended to industry the adoption of the heat stress risk assessment model, adopted for the Middle East, be implemented on all shipments.

Figure 3. Excerpt from an article discussing cattle deaths during shipment to China published in the West Australian newspaper on 19 June 2018 (Source: https://thewest.com.au/business/agriculture/deaths-mar-china-cattle-trade-ng-b88870012z).

Table 2 illustrates how sheep are at risk of dying during live export regardless of destination country.

Table 2. Mortality rates, number of voyages, voyage and discharge days, and number of sheep exported for voyages to major destination regions during 2016 (Norman 2017).

Parameter	ME/N Africa	SE Asia	Total
Voyages (No.)	41	5	46
Sheep (No.)	1,758,898	16,423	1,775,321
Mortality rate overall (%)	0.80	1.18	0.80
Mortality rate range (%)	0.20 – 2.99*	0.72 – 1.76	0.20 – 2.99
Voyage days (Ave.)	17.15	13.23	16.72
Discharge days (Ave.)	5.12	0.92	4.66

Table 3. 98th percentile wet bulb temperatures for different regions (Stacey 2017). (Refer to discussion page 12)

Journey Name	Origin	January	February	March	April	May	June	July	August	September	October	November	December
Agadir via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53
Agadir via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53
Al Latakya via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Al Latakya via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Al Latakya via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	28.86	26.508	26.37	27.052	27.53
Al Latakya via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	28.86	26.508	26.37	27.052	27.53
Alexandria via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Alexandria via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Alexandria via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	27.2	26.508	26.37	27.052	27.53
Alexandria via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	27.2	26.508	26.37	27.052	27.53
Antalya via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Antalya via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Antalya via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	27.4723	26.508	26.37	27.052	27.53
Antalya via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	27.4723	26.508	26.37	27.052	27.53
Aqaba from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Aqaba from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Bahrain from North	North	27.814	29.24	29.4586	28.472	30.6023	30.9	31.64	31.9211	32.33	29.632	28.2	28.2
Bahrain from South	South	26.2	26.44	27.201	28.3638	30.6023	30.9	31.64	31.9211	32.33	29.2275	27.26	26.36
Beirut via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Beirut via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Beirut via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	28.76	26.508	26.37	27.052	27.53
Beirut via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	28.76	26.508	26.37	27.052	27.53
Benghazi via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Benghazi via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Benghazi via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	26.4125	27.68	26.508	26.37	27.052	27.53
Benghazi via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	26.4125	27.68	26.508	26.37	27.052	27.53
Casablanca via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53
Casablanca via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53
Dharan from North	North	27.814	29.24	29.4586	28.472	30.6023	30.9	31.64	31.9211	32.33	30.1636	28.2	28.2
Dharan from South	South	26.2	26.44	27.201	28.3638	30.6023	30.9	31.64	31.9211	32.33	30.1636	27.26	26.36
Doha from North	North	27.814	29.24	29.4586	28.472	30.6023	30.9	32.68	33.0085	33.084	29.632	28.2	28.2
Doha from South	South	26.2	26.44	27.201	28.3638	30.6023	30.9	32.68	33.0085	33.084	29.5061	27.26	26.36
Dubai - Jebel Ali from North	North	27.814	29.24	29.4586	28.472	29.76	30.9	31.64	31.8341	32.46	29.632	28.2	28.2
Dubai - Jebel Ali from South	South	26.2	26.44	27.201	28.3638	29.76	30.9	31.64	31.8341	32.46	29.1929	27.26	26.36
Fujairah from North	North	27.814	29.24	29.4586	28.472	29.328	30.75	31.2	31.2452	30.68	29.632	28.2	28.2
Fujairah from South	South	26.2	26.44	27.201	28.3638	29.328	30.75	31.2	31.2452	30.68	29.1929	27.26	26.36
Istanbul via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Istanbul via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Istanbul via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	28.1008	30.6614	26.508	26.37	27.052	27.53
Istanbul via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	28.1008	30.6614	26.508	26.37	27.052	27.53
Izmir via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Izmir via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Izmir via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	27.7251	26.508	26.37	27.052	27.53
Izmir via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	27.7251	26.508	26.37	27.052	27.53
Jeddah from North	North	27.814	29.24	29.4586	28.7496	30.1467	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Jeddah from South	South	27.9295	29.05	28.58	28.7496	30.1467	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Karachi from North	North	27.814	29.24	29.4586	30.2	30.2	32.2	28.72	28.2043	27.928	30.56	28.2	28.2
Karachi from South	South	26.4954	26.6722	27.8163	30.2	30.2	32.2	28.72	27.9533	27.908	29.4532	27.4067	27
Kuwait from North	North	27.814	29.24	29.4586	28.472	30.6023	30.9	31.64	31.9211	32.33	29.632	28.2	28.2
Kuwait from South	South	26.2	26.44	27.201	28.3638	30.6023	30.9	31.64	31.9211	32.33	29.2275	27.26	26.36
Mersin via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Mersin via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Mersin via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.172	28.86	26.508	26.37	27.052	27.53
Mersin via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.172	28.86	26.508	26.37	27.052	27.53
Muscat from North	North	27.814	29.24	29.4586	28.472	29.216	30.62	30.2	29.6907	28.604	29.632	28.2	28.2
Muscat from South	South	26.2	26.44	27.201	28.3638	29.216	30.62	30.2	29.6907	28.604	29.1929	27.26	26.36
Novorossiysk via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Novorossiysk via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Novorossiysk via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	28.2	32.0124	26.508	26.37	27.052	27.53
Novorossiysk via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	28.2	32.0124	26.508	26.37	27.052	27.53
Odessa via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.349	30.924	30.56	28.2	28.2
Odessa via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.349	30.924	29.814	29.36	27.2
Odessa via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	28.2	32.349	26.508	26.37	27.052	27.53
Odessa via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	28.2	32.349	26.508	26.37	27.052	27.53
Samsun via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Samsun via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Samsun via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	28.2	31.0687	26.508	26.37	27.052	27.53
Samsun via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	28.2	31.0687	26.508	26.37	27.052	27.53
Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Tekirdag via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Tekirdag via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Tekirdag via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.9818	30.6614	26.508	26.37	27.052	27.53
Tekirdag via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.9818	30.6614	26.508	26.37	27.052	27.53
Trabzon via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Trabzon via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Trabzon via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	28.2	31.0687	26.508	26.37	27.052	27.53
Trabzon via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	28.2	31.0687	26.508	26.37	27.052	27.53
Tripoli via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Tripoli via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Tripoli via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	27.0656	26.2094	26.508	26.37	27.052	27.53
Tripoli via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	27.0656	26.2094	26.508	26.37	27.052	27.53
Ust Luga via Suez from North	North	27.814	29.24	29.4586	28.7496	30.1122	31.344	30.788	32.1277	30.924	30.56	28.2	28.2
Ust Luga via Suez from South	South	27.9295	29.05	28.58	28.7496	30.1122	31.344	30.788	32.1277	30.924	29.814	29.36	27.2
Ust Luga via West Africa	North	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53
Ust Luga via West Africa	South	27.2	26.56	27.936	27.364	25.958	26	25.38	25.78	26.508	26.37	27.052	27.53

- Is the restrictive period of May to October for voyages departing to the Middle East appropriate? Are these the high risk months for heat stress for animals being exported to the Middle East? If not, what months should be considered as high risk?

Yes, May to October is appropriate. The AVA made the following recommendation in its Submission to the McCarthy Review 2018:

"*Irrespective of stocking density, thermoregulatory physiology indicates that sheep on live export voyages to the Middle East during May to October will remain susceptible to heat stress and die due to the expected extreme climatic conditions during this time. Accordingly, voyages carrying live sheep to the Middle East during May to October cannot be recommended*."

Records[3] show live sheep are shipped from Australia to the Middle East in all months of the year (see **Figure 4** showing number of shipments each month, each year, between 2005 and 2017). Between 2005 and 2017, there were a total of 509 voyages that carried at least 15,000 sheep on any ship. Of those, 51 (10%) shipments had ≥ 1.5% sheep mortality rate. Mortality investigations occurred on only 12 of these voyages.

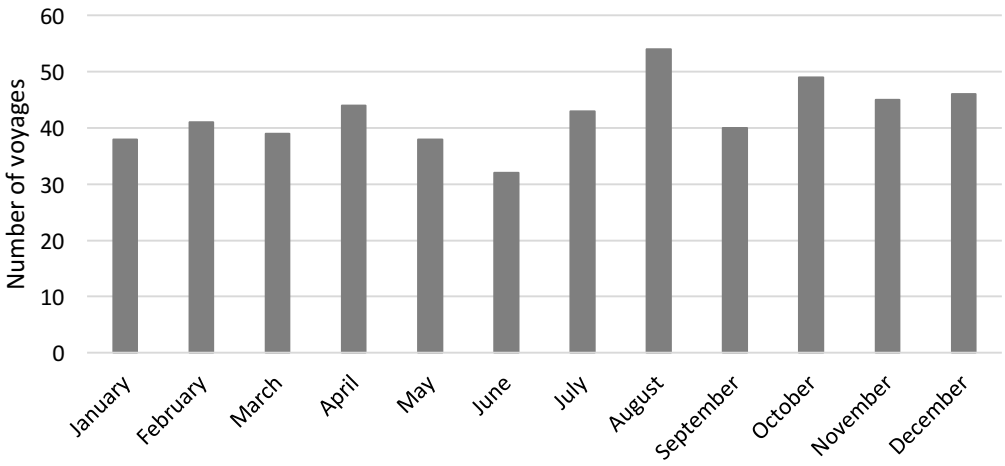

Figure 4. Total number of shipments (n=509) from Australia to the Middle East carrying > 15,000 live sheep between 2005 and 2017. Month indicates time voyage commenced.

Mortalities in sheep being exported to the Middle East are more likely to occur when voyages commence in the months of May to October (see **Figure 5**) which corresponds to the hotter months in the region. The sharp rise in sheep deaths in voyages in August corresponds with extreme summer temperatures and increasing relative humidity in the region in August and September (see **Figure 6**). The DAWR Mortality Investigation Reports corroborate that heat stress is a major cause of mortality in sheep during these months.

[3] Six-monthly reports tabled in Parliament are at http://www.agriculture.gov.au/export/controlled-goods/live-animals/live-animal-export-statistics/reports-to-parliament

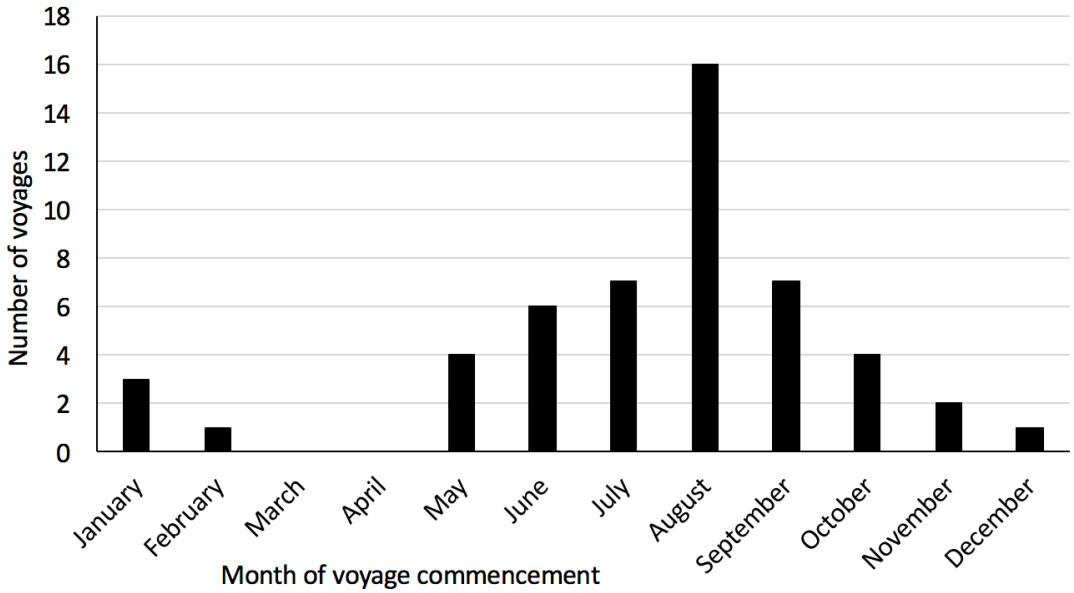

Figure 5. Number of voyages (n=51), by month of voyage commencement, when there were > 15,000 sheep on the ship from Australia to the Middle East between 2005 and 2017 and total sheep mortality rates were ≥ 1.5%.

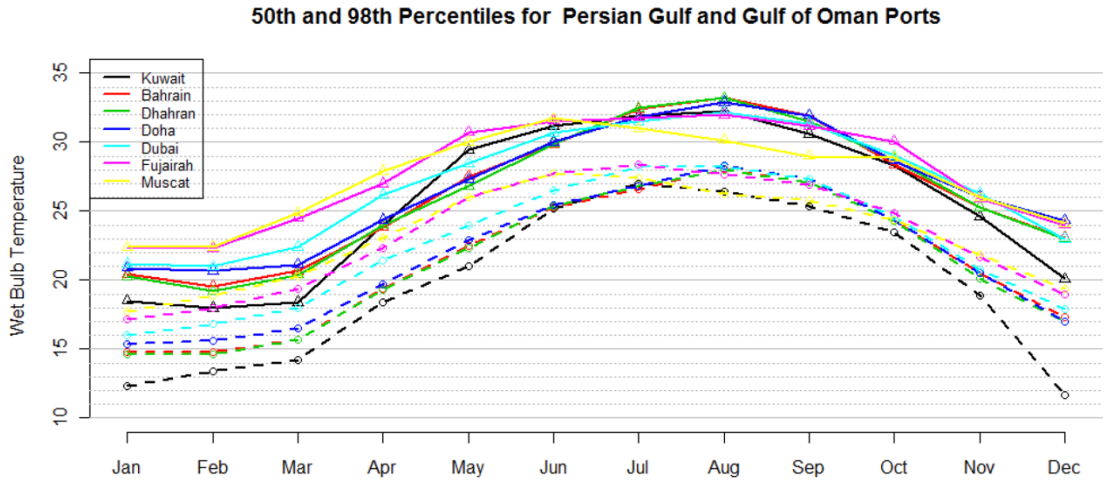

Figure 6. Annual port-specific wet bulb temperature distributions for the Persian Gulf region (Eustace and Corry 2009).

- Are there different high risk months for different markets that aren't considered in the standards?

Sheep and cattle are at risk of suffering heat stress going over the Equator at any time of the year (**Figure 7**). Even though sheep and cattle sourced from southern Australia in November to April are "summer-acclimatised" and better able to cope with the effects of equatorial temperatures than those sourced between May and October, they are still at risk. "Winter-acclimatised" sheep and cattle are at higher risk again.

The open oceanic waters of the Indian Ocean are characterised by generally lower mean wet bulb temperatures than experienced in the Persian Gulf and the Red Sea, as well as the Gulfs of Oman and Aden. However, there are times of the year when there can be sizeable areas with raised wet bulb temperatures. The region between 15°N and 10°N from 50°E to 70°E experiences a period from May to June when the mean wet bulb temperature exceeds 26°C – peaking at 26.7°C in June. The 98th percentile reaches 30°C in June. This is the time of northward transit of the sun and it coincides with prolonged periods of light wind conditions. The May to June period is also very humid over the approaches to the Gulf of Oman, although wet bulb temperatures are generally not quite as high as in the regions immediately to the south and west. The region between 5°N and 10°N between 70°E and 80°E to the west of the southern tip of India also warrants a mention. This region experiences mean wet bulb temperatures above 26°C early in the season – during April and May – as the sun traverses overhead and reaches 29°C on 2% of occasions.

The near equatorial region – from 5°N to 5°S is characterised by a relatively uniform wet bulb temperature distribution – mostly around 25°C to 26°C. There is a slight peak in the period from April to June as the southeast trade winds tend to be weaker at this time of the year and the SW monsoon is yet to develop. It is notable that although there is a strong tendency for most wet bulb temperature to fall within the 25 to 26°C range there are quite a few periods of time when the wet bulb temperature reaches 28°C. Although they are scattered throughout the year there is a preference for them to occur in June. They tend to coincide with periods of time when the SE trade winds are weak and there are large areas of light winds lasting several days. The voyage of the Becrux encountered one such period of elevated wet bulb temperature – reaching 28°C in Late June 2002. It is possible to avoid these areas on most occasions by changing the route to stay over regions where the wind is stronger, although this is not a practice currently followed.

South of 5°S there are periods of time between March and May when the mean wet bulb temperature is elevated close to 26°C. In April the wet bulb temperature reaches 28°C on 10% of occasions and there are occurrences in other months of the year when the temperatures reach 28°C.

Figure 7. Excerpt used during development of HotStuff (Maunsell-Australia 2003)

5.0 Sourcing and preparation of animals

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 5.0) FOLLOW.

5.1 Sourcing *Bos taurus* cattle

Issues Paper questions about sourcing Bos taurus cattle

- Should Paragraph 1A 3.2 (c) (iii) be retained in its current form?

AVA ANSWER:

This paragraph should be amended to: "*Bos taurus* cattle from an area of Australia south of latitude 26° South must not be sourced for export north of the equator from May to October".

DISCUSSION:

The "standard" heat stress threshold (HST) of *Bos taurus* beef cattle is 30°C wet bulb temperature. However, when adjustments are made for month and geographical zone, body weight, body condition score and coat length, their heat stress threshold decreases to temperatures that are commonly encountered at equatorial regions and in the northern hemisphere between May and October (**Table 4**; (Stacey 2017)).

Table 4. Adjusted heat stress threshold (HST) wet bulb temperatures (WBT °C) for *Bos taurus* beef cattle of 450 kg body weight (typical in live export (Banney, Henderson et al. 2009)) being shipped from different zones in southern Australia in July as determined using HotStuff v5.0 (Stacey 2017).

Parameter	Body weight (kg)	F weight (kg)	Core temp (°C)	BCS (fat score)	F condition	Coat length	F coat	Zone *	Acclim zone (°C)	F acc	Base HST (°C)	Tcore-HST (°C)	Adjusted HST WBT (°C)
Standard *Bos taurus* beef	300	1.00	40	3	1	mid	1	std	15	1	30	10.00	**30.0**
Bos taurus beef **July**	450	1.08	40	3	1	winter	1.1	3	10	1.13	30	13.4	**26.6**
Bos taurus beef **July**	450	1.08	40	3	1	winter	1.1	1	7	1.2	30	14.3	**25.7**

* See **Figure 8** for zone definitions.

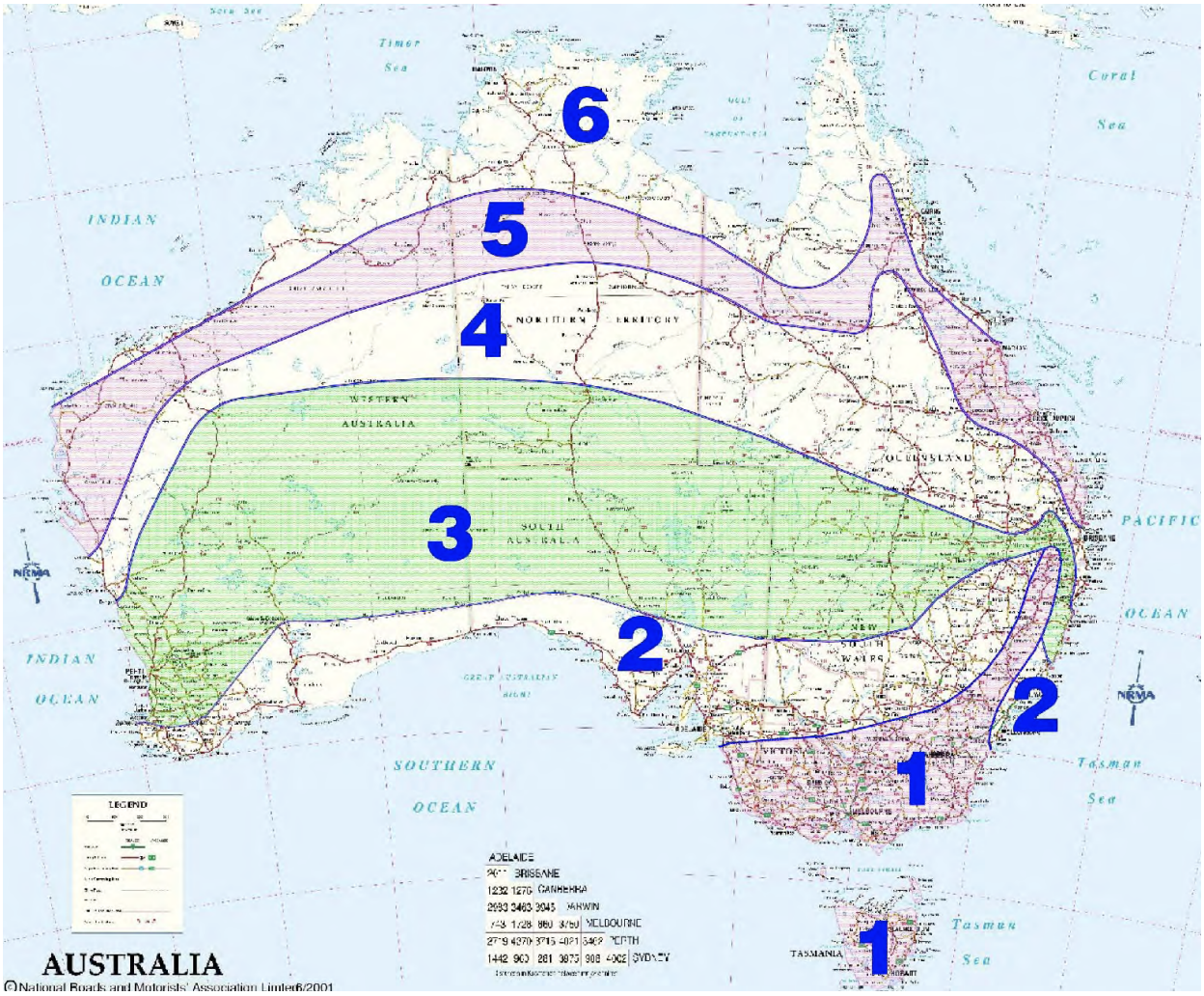

Figure 8. Zones used in HotStuff (Maunsell 2003).

- Should Paragraph 1A 3.2 (c) (iv) be retained in its current form?

The body condition scoring system of 1-7 used in ASEL for cattle (Appendix A of Reformatted ASEL) is different to that used by Dairy Australia for dairy cattle (scale 1-8: https://www.dairyaustralia.com.au/farm/animal-management/fertility/body-condition-scoring) and beef cattle (scale 1-5: http://agriculture.vic.gov.au/agriculture/livestock/beef/handling-and-management/condition-scoring-of-beef-cattle). It needs to be standardised. See Section 9.2.

5.2 Shearing sheep and hair sheep

Issues Paper questions about shearing livestock with wool, fibre or hair

- Should there be a minimum period of time off-shears and/or wool length to apply for all wool sheep being sourced for export?

AVA ANSWER:
All fibre must be < 25 mm in length in sheep (Beatty, Barnes et al. 2008).

DISCUSSION:
Minimum time off-shears needs further study. There is conflict between the following objectives:

(a) wanting to minimise time off-shears to minimise effects of heat stress during voyage,
(b) wanting to allow shearing cuts to heal (at least 10 days required) to minimise skin infections and septicaemia as sheep will be housed for 3 weeks using their faeces as "bedding",
(c) a weather tip on wool allows sheep to shed faeces and stay cleaner during voyages[4],
(d) exposure to winter conditions after shearing during acclimatisation at registered premises (if not shedded).

- Should all hair sheep and alpacas be subject to the same requirements as wool sheep?

Yes fibre < 25 mm in length. See 1 above. Longer fibre on any animal will prevent stockpersons observing body condition score, bloat, respiratory rate, diarrhoea and other general health indicators.

- Should the standards be amended to alter the specifications currently in place prescribing time-off periods for shorn wool sheep and shorn hair sheep? If so, what would you suggest?

See 1 above.

- Are any other changes necessary to the requirements for wool sheep and hair sheep?

- Should the current standards regarding timing of shearing prior to loading for export by sea be revised?

See 1 above.

[4] See sheep undergoing live export at: https://www.9now.com.au/60-minutes/2018/extras/clips/clip-cjfqblr2d003q0ql9dyfho98x

5.3 Maximum weight of cattle and buffalo sourced for export by sea

Issues Paper questions about maximum weight for cattle and buffalo to be exported by sea

- Should the maximum weight for sourcing and exporting cattle and buffalo be the same?

Yes. See 3 below.

- Should cattle and buffalo exported for feeder and slaughter purposes have a different maximum weight to cattle and buffalo exported for breeder purposes?

No. Buffalo have the same physiology and anatomy, hence same risks.

- Is 500 kg appropriate? Is 650 kg? Should it be higher/lower and why? What are the animal health and welfare risks? Are there any mitigating measures that must be taken?

AVA ANSWER:

Foot and leg trauma must be addressed urgently in this review. Reduction in foot and leg trauma relies on reducing weights of cattle being shipped and improving flooring (see Section 7.1). This has been known for many years, but is yet to be acted upon.

Only cattle weighing less than 500 kg should be shipped (Simpson 2012). All cattle greater than body score 4/7 (in current ASEL) represent a heat stress and a pressure sore/deck injury risk and should not be considered suitable for export without major alteration to stocking densities and bedding provisions (Simpson 2012).

Banney et al, 2009, recommend that ideally weights should be less than 380 kg (Banney, Henderson et al. 2009), though personal communication from an AAV is that cattle weighing between 380-500kg can be successfully transported if managed appropriately.

DISCUSSION:

<u>Lameness and abrasions</u>

Larger animals are more likley to suffer from lameness on board ship, and the lesions typically seen are extremely painful conditions. Foot lesions include claw abrasions, sloughing of claw or hoof wall exposing the sensitive hoof tissues, and exteriorisation of the pedal bone (P3), due to slipping and abrasion on rough or raised flooring. Animals develop swelling and open sores on their fetlocks and carpi due to trauma during lying or rising. Affected animals will become unable to rise and will lie in prolonged lateral recumbency once it becomes too painful to stand. This predisposes to development of further abrasions and pressure sores.

AAVs have reported to us that the presence of lame cattle on board ship is extremely problematic, not only because the animals suffer severe pain but also because of the consumption of veterinary and stockperson time. These animals are inevitably culled (rather than undergoing commercial slaughter) at their destination.

The conditions described above are extremely painful, plus lead to myonecrosis, dehydration, starvation and euthanasia because affected cattle are unable to rise. AAVs do attempt to treat these claw injuries on board – treatment includes glueing a wooden or plastic block to the unaffected (or less affected) claw in an attempt to elevate the affected claw off the ground, to prevent further trauma and allow it to heal. Anecdotally, AAVs apply as many blocks as they can, but time, resources and poor facilities mean that often only a small percentage of affected cattle receive treatment. It also puts AAVs, stockpeople and crew at risk

with respect to workplace safety (back and hand injuries) when attempting to apply blocks in sub-standard conditions.

Examples form the literature include:

"*It was commonly reported to the authors that heavy cattle (over 380 kg) will, depending on the surface of the pen floor and the stability of the ship, incur more leg injuries than other cattle*" (Banney, Henderson et al. 2009).

"*By decreasing the incidence of abrasions and lameness through the use of bedding, stockpersons and veterinarians point out that the time saved with reduced injury treatments allows the crew to spend more time monitoring and treating other livestock, which may otherwise be detected too late for effective treatment. It is not uncommon for the relocation of one lame animal to a hospital pen and its initial treatment to occupy a stockperson and member of the crew for up to three hours"* (Banney, Henderson et al. 2009).

- Is a weight restriction appropriate and are there extra conditions that should apply or should it be more specific, for instance, a body condition score and breed?

Weight restriction is appropriate and caters for differences in breed under ASEL. See 3 above and Section 9.2.

5.4 Minimum time sheep, goats, cattle and buffalo must remain at a registered premises prior to export by sea

Issues Paper questions about minimum hold times in registered premises

- What is the minimum time that sheep and goats should be held in an outdoors registered premises prior to loading aboard an export vessel? Should other provisions be included regarding seasonal factors, feeding and pre-conditioning to shipboard rations?

AVA ANSWER:

Sheep and goats should have a minimum of 7 clear days at registered premises to ensure they are not shy feeders (evidence of empty rumen), and to allow adequate time to observe for the development of Salmonellosis (evidence of diarrhoea) so that affected animals can be culled prior to shipping. This is appropriate because most sheep and goats are going on long-haul voyages.

Cattle should have a minimum of 3 clear days in the registered premises before sailing, regardless of voyage duration.

DISCUSSION

Under normal circumstances, ruminants typically require 14 days to adapt to a new ration and this is very pertinent for livestock transitioning from pasture to shipboard pellets. However, this adaptation period has to be balanced against the fact that extended time in pre-export premises increases the risk of ingestion of *Salmonella* organisms, which can persist in the environment for long periods and proliferate rapidly under favourable environmental conditions (Makin, House et al. 2010). *Salmonella* enteritis can kill sheep rapidly and in high numbers during assembly and the subsequent voyage. The disease is complex and multifactorial with respect to virulence and prevalence of organisms, livestock species, breed, sex, age, body condition score, concurrent disease and immunity/host resistance of livestock, source of livestock, distance travelled to assembly depot, year, time of year/season, registered premises factors, ration access and constituents, interval between use of facilities, port of loading, ship etc and may be complicated by inanition. Hygiene of facilities (faeces management, all-in all-out of mobs), minimisation of mixing of in-coming mobs, unidirectional flow of livestock through registered premises (to reduce carryover of virulent strains of *Salmonella* to subsequent assembly periods), possible oral vaccination through drinking water and veterinary inspection during the period at registered premises and before loading is essential to minimise risks. Refer to industry papers including (Norris, Richards et al. 1989, Norris, Richards et al. 1989, Norris, McDonald et al. 1990, Norris, Richards et al. 1992, Barnes, Beatty et al. 2008, Makin, House et al. 2010, Perkins, House et al. 2010, Barnes, Wickham et al. 2018).

In one study (**Figure 9**), the three most common causes of mortality in assembly depots (registered premises) prior to export were trauma, urinary disease and enteritis. Trauma was the dominant cause of death at receival while salmonellosis emerged from the middle to the end of the assembly period. Mortality tended to be highest towards the end of the assembly period (days 5, 6 and 7 after receival) (Makin, House et al. 2010).

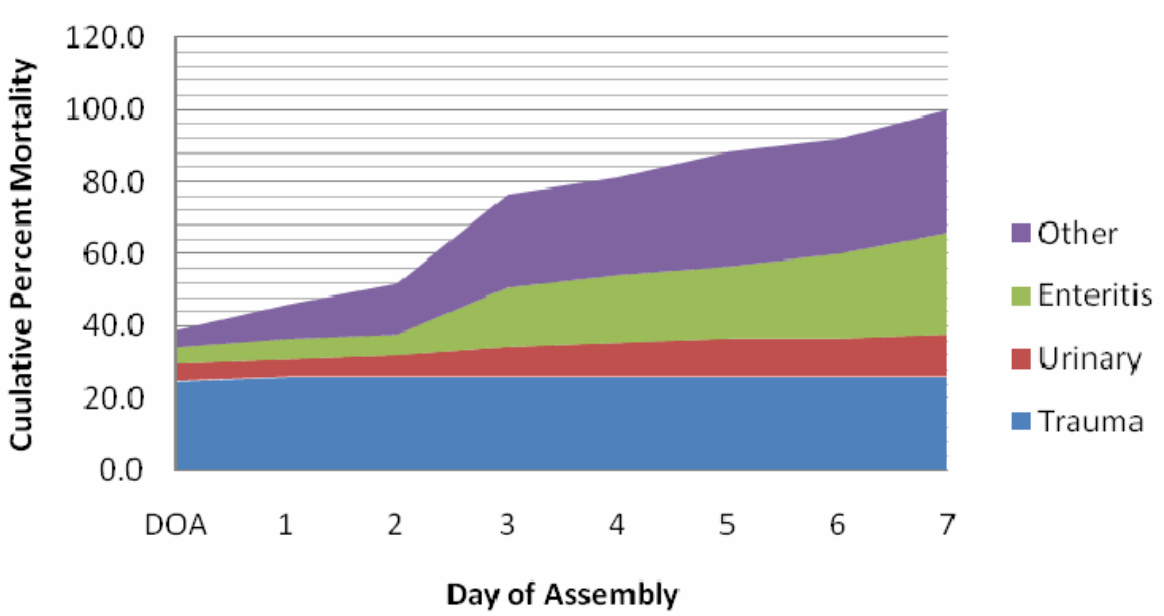

Figure 9. Causes of mortality expressed as a cumulative percentage (Makin, House et al. 2010) to illustrate the rising mortality in sheep the longer they are at the assembly depot (registered premises).

When sheep are experimentally infected with *Salmonella* organisms, they develop inappetence, pyrexia and diarrhoea 36-48 hours later. Clinical signs peak 3-7 days after infection. With a 3-day assembly period at the registered premises, the majority of disease will be observed in the first 7-10 days of any voyage but can be extended due to prolonged exposure to *Salmonella* in the assembly depot (registered premises) and/or faecal pad on the ship (**Figure 10**) (Makin, House et al. 2010).

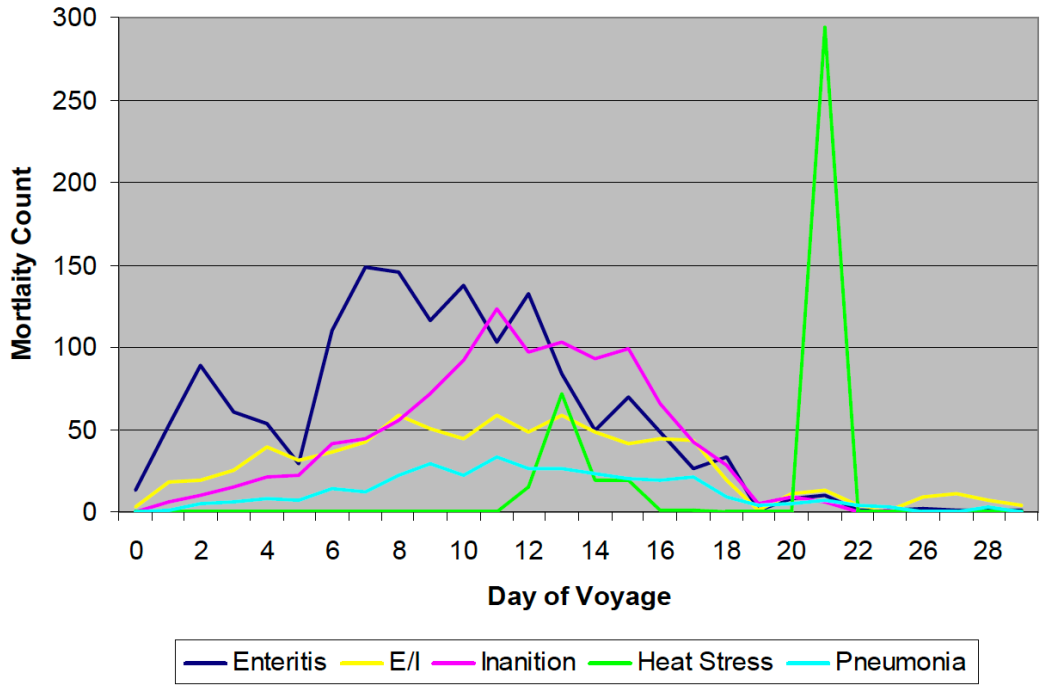

Figure 10. Mortality count in sheep for each of four major diagnoses by day of voyage across 19 voyages between 2005 and 2008 (Makin, House et al. 2010) illustrating the pattern of death due to salmonellosis contracted in assembly depots (registered premises) and causing a peak of deaths due to enteritis in the first 10 days of any voyage. The tendency for two peaks of mortality as a result of enteritis is partially explained by mortality in sheep loaded at eastern Australian ports (days 1-4) and Western Australian ports (days 6- 12).

- What is the minimum time that sheep and goats should be held in sheds at registered premises prior to loading? Should other requirements be made for seasonal factors, feeding and pre-conditioning to shipboard rations?

See 1 above.

- Should the standards be amended to alter the specifications currently in place prescribing timelines for various classes of livestock to remain at a registered premises prior to export by sea? If so, what would you suggest?

No. See 1 above.

- What would be the cost implications of any changes to the times livestock must spend in registered premises?

Beyond scope of AVA submission.

5.5 Management of shy feeders and inanition in sheep

Issues Paper questions about the management of shy feeders and inanition in sheep

- What measures should be required to reduce the incidence of inanition and salmonellosis in sheep? Are the current requirements in the standards adequate to manage shy feeders and inanition in sheep?

AVA ANSWER:

Inanition is a prolonged period of not eating. It is caused by a number of factors in sheep, including animal, farm, feedlot and ship-related issues. Disease (e.g. *Salmonella* enteritis), stress and pain, unfamiliar forage, feed restriction and pregnancy/lactation may all contribute to inanition. In turn, inanition can lead to salmonellosis (Makin, House et al. 2010).

Trough space and feed quantity and frequency of delivery are primary drivers of livestock behaviour on live export vessels and have substantial impact on morbidity and mortality. In sheep this is likely to contribute substantially to rumen stability, inanition, salmonella and other enteric diseases.

See Sections 5.4 and 6.1 for more detail.

- If not, what changes would you suggest?

See 1 above.

- What would be the cost implications of any proposed changes to these requirements?

Beyond scope of AVA submission.

5.6 Pregnancy test requirements and limits

Issues Paper questions relating to pregnancy requirements

- What is the risk of changing the pregnancy test requirement from all Damara sheep to only those that weigh over 40 kg?

Damara sheep can conceive from 30 kg, so it is recommended that the current requirement remains unchanged.

- Should the standards be expanded to include all fat-tailed sheep and not just Damara? Fat-tail sheep being: sheep distinguished by a genetic predisposition for the accumulation of fat in the tail and hindquarters.

Yes, the standards should be expanded to include all fat-tailed sheep. See 1 above.

- Must pregnancy testing be undertaken by a veterinarian, or is a competent pregnancy tester acceptable? Should it be expanded to any livestock pregnancy tester as accredited by the state or territory?

Pregnancy diagnosis of cattle**,** buffalo, camelids and deer for live export should be performed by a registered veterinarian for the following reasons:

- Registered veterinarians have professional and legal obligations to conduct veterinary procedures with a high degree of competence, and to certify the health, freedom from disease and physiological status of animals. Veterinarians are legally and professionally accountable for their activities and this provides a significant level of assurance and accountability to industry, exporters and importing countries that pregnancy testing has been performed diligently and with a very high degree of accuracy.
- Current training and accreditation standards for non-veterinary "accredited cattle pregnancy testers" in the relevant state or territory is inadequate and provides a very poor level of assurance of competency and high risk of poor compliance with resultant poor animal welfare outcomes.

Pregnancy diagnosis of sheep and goats must be done by transabdominal ultrasound. Use of electronic ID (see 3.1, above) is strongly recommended to allow trace back to identify poor operators. Lay operators are generally accurate at pregnancy testing sheep, but they and farm management must ensure attention to detail at every step during testing and drafting, so that only correctly tested animals are shipped.

- Should the 30 day period prior to export for pregnancy testing be extended to 45 days as a blanket change? Should there be discretionary allowances for low-risk cases, such as unjoined heifers or a shipping delay, where adverse animal welfare outcomes are likely to result from re-testing.

The 30 day period for pregnancy testing should be extended to 45 days only when conducted by a Pregcheck®-accredited veterinarian. The Pregcheck® accreditation process is unique in requiring veterinarians to demonstrate accurate estimation of gestational age, and to detect pregnancy down to at least 6 weeks or 42 days of gestation. In contrast, definition of 'not pregnant' by relevant state and territories for the purpose of accrediting non-veterinary pregnancy testers is 8 weeks or more pregnant. Therefore, under current practices, Pregcheck accredited veterinarians are capable of pregnancy testing up to 45 days prior to export without additional risk of undetected pregnancy in export cattle. This would substantially relieve the logistical challenges in accessing reliable, accurate pregnancy testing in remote

regions, allow for shipping delays, and for pregnancy testing during on farm preparation in circumstances where pre-quarantine periods require 30 days in quarantine.

- Should the age that goat kids and ewe lambs are pregnancy tested be increased to more than five months? What would be an appropriate age for goat kids and ewe lambs to be tested?

No, this should not be changed. Sheep and goats can become pregnant at 150 days of age.

- Are the methods for carrying out pregnancy tests appropriate? Are there any appropriate national pregnancy testing criteria currently in place that should be adopted/referred to in the standards?

Pregnancy testing of cattle and buffalo should be limited to manual palpation, except in circumstances where animals are too small to be palpated without risk to either the animal or operator (in which case, ultrasound by an ultrasound Pregcheck®-accredited veterinarian is the preferred alternative), or circumstances where breeder cattle are to be exported as pregnant, and gestational age is appropriate for accurate gestational ageing by ultrasound. Ultrasound technology has diagnostic limitations which, in practical circumstances, precludes highly accurate detection of non-pregnancy in comparison to manual palpation. Ultrasound technology should only be used with substantial professional judgement by an experienced veterinarian, and only in circumstances where manual palpation is not possible, or ultrasound provides a clear benefit and with no additional risk of mis-diagnosis in comparison to manual palpation. It would be appropriate for use of ultrasounds to be allowed only on a discretionary basis and with prior approval by the regulating authority, for circumstances as described above.

Pregnancy testing of sheep, goats, camelids and deer should be done by ultrasound.

- Should breeder cattle and buffalo only be determined as too small to be manually palpated safely by a veterinarian accredited under the National Cattle Pregnancy Diagnosis Scheme (NCPD) or should this be any veterinarian?

All *breeder cattle and buffalo* should only be pregnancy tested by a Pregcheck®-accredited veterinarian. Pregcheck® accreditation requires veterinarians to demonstrate a high level of skill in detection of pregnancy and estimating gestational age. Use of a Pregcheck®-accredited veterinarian provides assurance that pregnancy testing of breeder cattle is performed with sufficient accuracy to ensure good animal welfare outcomes, and meet the expectations of community, exporters and importing countries.

Anecdotal reports from AAVs suggest that non-compliance with pregnancy is a very common problem with cattle certified as spayed. This is largely due to the variable skills of operators spaying cattle in Australia and the inherent limitations of commonly used spay techniques in reliably preventing pregnancy in cattle. All female cattle, including spayed cattle, should be pregnancy tested to adequately mitigate the risk of poor animal welfare outcomes as a result of unidentified pregnancies.

- What would be the cost implications for any proposed changes to these requirements?

There should be no significant cost over current ASEL requirements. Extending pre-export testing period from 30 days to 45 days for Pregcheck®-accredited veterinarians would substantially alleviate logistical issues in live export supply chains and potentially lead to cost savings. It would also greatly alleviate perceived issues of accessibility to highly competent, accurate pregnancy testing services conducted by Pregcheck®-accredited veterinarians in some parts of the supply chain.

6.0 Stocking densities

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 6.0) FOLLOW.

6.1 On board stocking densities

Issues Paper questions about stocking density

- Do you agree with the application of an allometric model for densities? What is the appropriate k value and why? Should the k coefficient value vary depending on the species and voyage length?

AVA ANSWER:

The AVA strongly supports the use of an allometric model for determining space allocation. We also submit that adequate trough space is an essential requirement and inextricably linked to spacing allocation considerations. The issue of appropriate trough space should be addressed as a matter of some urgency.

DISCUSSION:

The *k*-value should be ≥ 0.033 based on disembarkation body weight for ***all livestock*** being exported by sea from Australia in ***all months of the year***. Any reduction in *k*-value is not yet scientifically justified. For full discussion, see the submission made by the Australian Veterinary Association to the McCarthy Review earlier in 2018 (AVA 2018).

Nevertheless, the AVA has had feedback from on-board AAVs that ASEL does not currently specify requirements for trough space, and that trough space is commonly inadequate. This is a significant oversight as morbidity and mortality is likely strongly correlated to both stocking density and feed trough space.

Trough space and feed quantity and frequency of delivery are primary drivers of livestock behaviour on live export vessels and have substantial impact on morbidity and mortality. In sheep this is likely to contribute substantially to rumen stability, inanition, salmonella and other enteric diseases, injuries and respiratory disease subsequent to trampling etc. In cattle, trough space and feeding behaviour is likely to be a major contributor to lameness, accidental deaths, bloat, inanition and variable weightloss in individual pens. There is a substantial knowledge gap and urgent need for applied research to identify and resolve these issues on live export vessels. It is likely an allometric model is also appropriate for feed trough space and will be influenced by feed quantity and feeding frequency.

- Should the McCarthy Review application of a k coefficient of 0.033 be applied more broadly?

See (1) above.

- How would you standardise liveweights? Is it appropriate to apply a factor associated with curfew and anticipated weight during the voyage? How else can curfew and weight gains after leaving the registered premises be accounted for?

The Export Advisory Notice 2018-06 appears to standardise liveweights with respect to curfews and allows for nominal weight gain during voyage.

Weights should be confirmed by weighbridge averages during transit to ship and factored for curfew losses if applicable.

- What is the financial impact of changing on board stocking densities?

Beyond scope of AVA submission.

6.2 Registered premises stocking densities

Issues Paper question about Registered Premises stocking density

- Are stocking densities at registered premises an issue?

AVA ANSWER:
It is difficult to be prescriptive for stocking densities in different registered premises around Australia. Stocking densities in intensively managed environments have significant interactions with pen size, flooring, slope, shelter, ventilation, and environmental conditions.

Where stocking density in registered premises is to be prescribed these should be referable to equivalent industry standards (for example, NFAS accreditation standards for outdoor feedlot cattle) or equivalent overseas standards, (for example that used in dry lot dairies, or intensively housed beef cattle feedlots e.g. FASS. Guide for the care and use of agricultural animals in agricultural research and teaching 3rd edition).

- What do you think about the options presented in the 2012-13 review? Should any of those options now be implemented?

The options presented appear to be arbitrary and it is not clear whether they are based on evidence. It is essential that recommendations are based based on science.

- What are the cost implications of changing stocking densities in registered premises?

Beyond scope of AVA submission.

7.0 On board resources and management

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 7.0) FOLLOW.

7.1 Management of bedding, and ammonia levels

Issues Paper questions about bedding and ammonia level

- What specific requirements (i.e. volume, usage, and components) should exist for bedding material for export consignments of cattle and sheep? Should these apply to all voyages or only some? Should it apply to all species or only some?

AVA ANSWER:
The requirements specified for bedding in ASEL are grossly inadequate.

(a) There should be appropriate quantities of comfortable and dry bedding for all cattle and buffalo, regardless of the length of the journey to minimise foot and leg trauma. "*The primary desired outcome from using bedding material on … ships is to minimise the incidence of lameness and skin abrasions at loading, during the voyage and during discharge"* (Banney, Henderson et al. 2009).

(b) All sheep voyages require bedding as a contingency to absorb excess moisture from soft or wet faecal pads.

(c) All goat voyages require bedding as a form of roughage (goats are browsers) and to alleviate diarrhoea.

It would be prudent to use multi-purpose bedding that provides (a) protection for feet, (b) urine and faecal moisture absorption capacity and (c) effective fibre for ingestion to alleviate gastrointestinal conditions such as inanition in sheep, diarrhoea in goats and bloat in cattle (see 7.2).

Poor flooring results in severe welfare issues (McCarthy and Banhazi 2016). The AVA also strongly recommends that standards for flooring should be developed under ASEL. This is not setting a precedent as AMSA Marine Orders historically set stocking densities for livestock during voyages, but now ASEL undertakes that role.

DISCUSSION:
It is well established that all animals need periods of rest within each 24 hour period to ensure good welfare. The requirements specified for bedding in ASEL are inadequate, given that there are inconsistencies between species and voyage lengths, but it is unknown how much bedding should be loaded. This information must be collated from AAV and stockperson reporting on future shipments (see Section 3.1 re morbity data collection and collation).

There should be appropriate quantities of comfortable and dry bedding for all animals, regardless of the length of the journey (remove exemption of no bedding for animals sourced from north of 26th parallel South) (Banney, Henderson et al. 2009). Quantities should not be token, but should be of a quantity that ensure animals can rest comfortably, to manage faecal pad in some sheep pens in humid conditions, and management of lame livestock. There must be adequate volume and changes of bedding to absorb moisture from faeces and urine to stop caking of animals and contamination of feed and water troughs. Additives to bedding could be considered to reduce ammonia (Tudor, Accioly et al. 2003, Banney, Henderson et al. 2009, McCarthy and Banhazi 2016). AAVs report that available bedding on long haul voyages is generally insufficient.

It is unclear why ASEL does not require bedding for cattle and buffalo on voyages less than 10 days, or those originating from northern regions travelling to SE Asia or Japan. This is not appropriate, given that (a) cattle are often footsore after road transport and (b) the need for daily rest periods during the voyage, as

described by Norris and Creeper (1999): "*approximately 5% of cattle showed signs of foot soreness in the first 24 hours after loading onto the ship. Pastoral cattle that had spent 24 hours on trucks prior to loading were most affected. Approximately 1% of cattle suffered swollen hocks and pasterns during the voyage, with occasional severe cases involving the entire limb*".

AAVs report that constant standing leads to extreme fatigue and attempts to lie and stand on hard surfaces lead to abrasions, joint and hoof damage. Flooring must not be too uneven (no raised mesh) or abrasive or slippery in pens. Flooring must be improved in all ships so legs and feet are not abraded which is a significant current concern.

There still needs to be additional research, and substantial extension on existing research as to best practice bedding management of sheep and cattle on long haul voyages, and what minimum bedding requirements should be. This is especially critical for long haul voyages and extended long haul voyages where deckwashing is limited due extended periods in protected/regulated waters etc. For example, see these excerpts from industry projects:

> "*The causes of injury and lameness following loading onto ships require further investigation. This should include defining the prevalence of injury and lameness on different ships, description of the floor surface on various ships to identify the better surfaces, and closer examination of the role of weldmesh in predisposing to injury or lameness*" (Norris and Creeper 1999).
>
> "*It was difficult to ascertain an industry average incidence of lameness, abrasions, infection or diseases associated with bedding management. This information may be available in veterinary voyage reports, which are sent to the Australian Quarantine and Inspection Service (AQIS), however present administrative arrangements do not allow these reports to be released by AQIS. Benchmarking the incidence of these incidents and welfare outcomes such as the time spent lying/standing and level of faecal contamination would be a good start to better measure and control the issues surrounding bedding management. This issue has been identified as a potential future research issue and outlined in more detail in section 0*" (Banney, Henderson et al. 2009).

- Should the standards be amended to alter the specifications currently in place to manage provision of bedding for livestock and ammonia levels on vessels? If so, what would you suggest?

Standards should be amended to include at least three times the current allowance of bedding per square metre of deck. There should be enough to replace every 3 to 4 days of the voyage and it should be in a form that does not predispose to respiratory diseases and pink eye. There should be extra to support care of hospital cattle as well as load and discharge requirements.

Re ammonia: See section 3.2: Ammonia concentrations should be measured and recorded daily as concentrations > 25 ppm (17 mg/m^3) produce adverse welfare outcomes for livestock *and* crew (MAMIC 2001, Costa, Accioly et al. 2003, Tudor, Accioly et al. 2003, Phillips, Pines et al. 2010, Phillips, Pines et al. 2012).

- Should there be a requirement that bedding is used to manage an appropriate faecal pad? Should a statutory reserve amount of bedding be required as a contingency amount to manage any flooded pens?

See 1 and 2 above.

Bedding must be kept dry prior to use:

> "*From industry comment, it seems it is difficult to keep bedding dry while stored on most ships*", (Banney, Henderson et al. 2009)

- What would be the costs of any changes to the current arrangements?

Beyond scope of AVA submission, however providing appropriate bedding will likely result in better hygiene, health and weight gain, hence economic benefits.

7.2 Water, fodder and chaff requirements on vessels

Issues Paper questions about water, fodder and chaff requirements on vessels

- Should paragraph 3A.3.2 (c) be amended as follows:
- 'For all long-haul and extended long-haul cattle voyages, at least 1 per cent of the fodder required for cattle must be chaff and/or hay.'

The statement in paragraph 3A.3.2(c) is ambiguous. Does the 1% refer to

(a) 1% of all feed loaded onto the ship e.g. 1000 cattle weighing 450 kg eating 2% of body weight as dry matter per day on a 20 day voyage would roughly need 1000 x 450 x 0.02 x 23 (3 days extra feed as per ASEL) x 1.1 (to convert to as fed) = 228 tonnes of which 2 tonnes is chaff/hay (in which case it is vastly inadequate) … or

(b) does it mean half of the daily intake per head per day is chaff/hay? (i.e. 1% chaff + 1% pellets per head per day)?

The latter would be excellent and ensure good gut health, but is the unlikely scenario. It would be extremely prudent to employ the services of ruminant nutritionists to produce a ***standard pelletised ration for each livestock species*** that is not only mixed evenly with respect to starch and minerals, but contains adequate fibre to minimise gastric acidosis and appropriate protein levels and other additives to minimise ammonia production (Costa, Accioly et al. 2003, Tudor, Accioly et al. 2003). This is an extremely important issue for industry to address.

In the mean time, in the absence of an ideal pelletised ration, attention to adequate fibre and appropriate protein levels in standard rations is essential for appropriate health and welfare of livestock undergoing transport.

Chaff should be provided on every voyage to treat shy feeders (stimulate appetite and promote ruminal health) and treat scouring livestock, and may supplement pelleted feed or be used as bedding as necessary. It can also be used in strategic management of pen/deck level ruminal health problems associated with prolonged lack of effective fibre or feed intake issues resulting in bloat. It can be used strategically to help manage predicted interruption to feeding intervals due to, for example, loading or discharge schedules. The amount of chaff required on any voyage is unknown and data needs to be collected in an evidence-based manner (see Section 3.1) in a timely manner to find out.

It would be prudent to use multi-purpose bedding that provides (a) protection for feet, (b) urine and faecal moisture absorption capacity and (c) effective fibre for ingestion to alleviate gastrointestinal conditions such as inanition in sheep, diarrhoea in goats and bloat in cattle (see 7.1).

Carrying hay/chaff on any ship appears fraught with difficulty and appropriate storage solutions are essential because "*from industry comment, it seems it is difficult to keep bedding dry while stored on most ships*" (Banney, Henderson et al. 2009).

- There are a range of issues relating to shipboard fodder requirements being reviewed within Industry. In the interim, are there any other changes to water, fodder and chaff requirements that need to be addressed?

See above

- Should automated water systems be mandatory on all voyages? What would be the cost associated with this change and who should pay?

Ad lib, clean water is fundamental to animal health, and is a basic requirement under all animal welfare standards including OIE standards. If there is evidence to suggest that automated watering would result in more reliable outcomes compared with manual systems, then it would be prudent to mandate this. Whether the system is automated or manual, in either case the most important consideration is that there must be very regular monitoring and maintenance to ensure adequate water availability. Cost consideration should not be a factor for such a critical welfare outcome as safe and reliable water supply. Livestock consume high volumes of water during any voyage and should not have intake restricted due to inadequate water delivery to pens.

> "*Animals transported by live export vessel should have sufficient access at all times to drinking water. Rationale: cattle particularly increase the amount they drink when exposed to high heat and humidity, in many cases drinking more than 10% of their body weight daily, e.g. over 40 litres per head per day for a 400 kilogram heifer*" (Barnes, Beatty et al. 2004).

- Should there be extra fodder provisions for voyages longer than 10 days?

Yes. Voyage time for purposes of calculating fodder allowances should include allowance for fodder consumed during loading and discharge and should not encroach on fodder contingency planning. These should be additional to voyage length including loading and discharge, and should be available as genuine contingency for unexpected delays, miscalculations and other contingencies. Feed contingencies should be commensurate with voyage length, and would most easily be dealt with as daily feed allowance PLUS a % contingency.

8.0 On board personnel, animal management and care

AVA ANSWERS TO ISSUES PAPER QUESTIONS (SECTION 8.0) FOLLOW.

8.1 On board personnel and the monitoring and management of animals

Issues Paper questions about on board personnel and the monitoring and management of animals

- In addition to the ship's crew, which on board personnel should accompany livestock export consignments? Should this apply to all consignments? Please provide detail.

It is AVA policy that at least one veterinarian should be on board every live shipment, regardless of voyage length. AAV feedback to the AVA is that there should be at least one veterinarian and one stockperson per 2000-3000 head of cattle or 30,000 sheep on every voyage.

- Should the current requirements in the standards be amended and, if so, what elements should be changed?

See 1 above.

- What is your view of the three options for AAVs accompanying voyages proposed during the 2012-13 review, and why?

Option 3 – Mandatory AAVs. An accredited veterinarian must be appointed to cover all consignments as they are the only ones in a position to make diagnoses and treat livestock appropriately.

- Does the requirement for Independent Observers now in place modify or change the need for AAVs to accompany some or all voyages?

There are limited spaces for staff accommodation on any ship. Any independent observer should be a competent veterinarian that contributes to optimising animal welfare through observation, diagnosis, treatment and autopsy as appropriate during the current voyage and collects and collates data to enhance all future voyages.

- What do you believe the roles and responsibilities of the following personnel should be, and why?

- AAVs

Monitoring and maintaining livestock health in a proactive manner through observation, diagnosis, treatment and autopsy as appropriate to optimise animal welfare on the current voyage. Comprehensive recording to enhance future voyages.

- Stockpersons

Experienced, competent accredited stockpersons are essential in implementing loading and discharge plans, providing and facilitating animal husbandry and basic health care on live export vessels including feeding and watering of stock and pen hygiene management. All vessels should sail with a highly competent stockperson and there should be training and formal qualification recognition of senior stockpersons.

The roles of the AAV and senior stockperson on board should be complementary and best outcomes likely to occur where overall management of livestock is a shared responsibility and both work co-operatively at similar levels of responsibility/authority.

- If AAVs are to be placed on more or all voyages, what is the additional cost and who should pay?

Industry to pay appropriate fee for trained, competent veterinarians. There should be substantial changes to available resources for treatment and hospital pen management so that veterinary interventions can be applied that will result in significantly better outcomes. For cattle, this requires availability of appropriate cattle handling equipment to treat head and leg problems, and substantial changes to hospital pen allocation, design and management.

- Is it a practical requirement for stock handlers on board to be able to observe all animals at all times during a voyage? If not, what requirement should exist to ensure animal health and welfare is appropriately monitored during a voyage?

A ship is a very unnatural environment for livestock so all stock should be checked twice daily at feeding times. Stocking rates, penning configurations, fleece length must all be managed so stock handlers can clearly see the demeanour, body condition, nature of respiration, presence of diarrhoea etc. in each individual animal.

8.2 Requirements for vulnerable/special classes of animals

Issues Paper questions about vulnerable/special classes of animals

- Are there specific requirements that need to be in place for vulnerable or special classes of livestock, which are currently not addressed in the ASEL? Which categories of stock and what additional requirements are needed? Could these be managed under specific management plans, or departmental discretions?

It is essential that animals unsuitable for export are not shipped (Schipp, Smalley *et al*. 2013). There may be circumstances when specific higher risk classes such as heavy dairy cows and bulls are exported, and will require specific management on a case-by-case basis. It may be most appropriate that these are managed by the CRMP, subject to DAWR discretional approval and oversight, until such time as market size, management expertise and sufficient data has established clear minimum management criteria to be included in ASEL.

See also Section 9.

- Should the requirements in the standards be amended to address concerns raised about safeguards for vulnerable/special classes of animals? If so, what changes should be made?

See 1 above.

9.0 Minor amendments

AVA RESPONSES TO ISSUES PAPER RECOMMENDATIONS (SECTION 9.0) FOLLOW.

9.1 Exclusion of deer and camelids

ASEL Review Technical Advisory Committee interim recommendation:

- Removal of the requirements relevant to exporting deer and camelids by sea, to be replaced by the provision of consignment specific management plans. These plans will initially cover the requirements contained within ASEL but will be required to be customised to address specialised animal health and welfare requirements for these high-risk consignments.

Agree.

- Specific comments made by Deer Industry Association of Australia will be considered for updating the minimum requirements for deer consignments.

Agree.

9.2 Updating definitions and body condition scoring

ASEL Review Technical Advisory Committee interim recommendation:

- Definitions for 'pastoral' and 'station' sheep to be included as agreed in 2012-13 and in Appendix A of this Issues Paper.

Agree.

- Updated and industry standard body scores to be included as agreed in 2012-13, as proposed by the Australian Buffalo Industry Council, and as detailed in Appendix B of this Issues Paper.

Appendix B.1 body condition scores for sheep diagrams are wrong. Look at http://www.lifetimewool.com.au/conditionscore.aspx for an alternative. Use same for goats as Appendix B.2 describes similar. As Agriculture Victoria rightly point out, the Australian dairy industry uses a scale of 1-8 and beef industry 1-5. ASEL should adopt the BCS score used by industry relevant to that species and livestock class.

Alternatively, given that livestock tend to put on body condition in a similar manner across their body, ASEL could generate one chart, such as in **Figure 11**, and list the scores down the left side for different species.

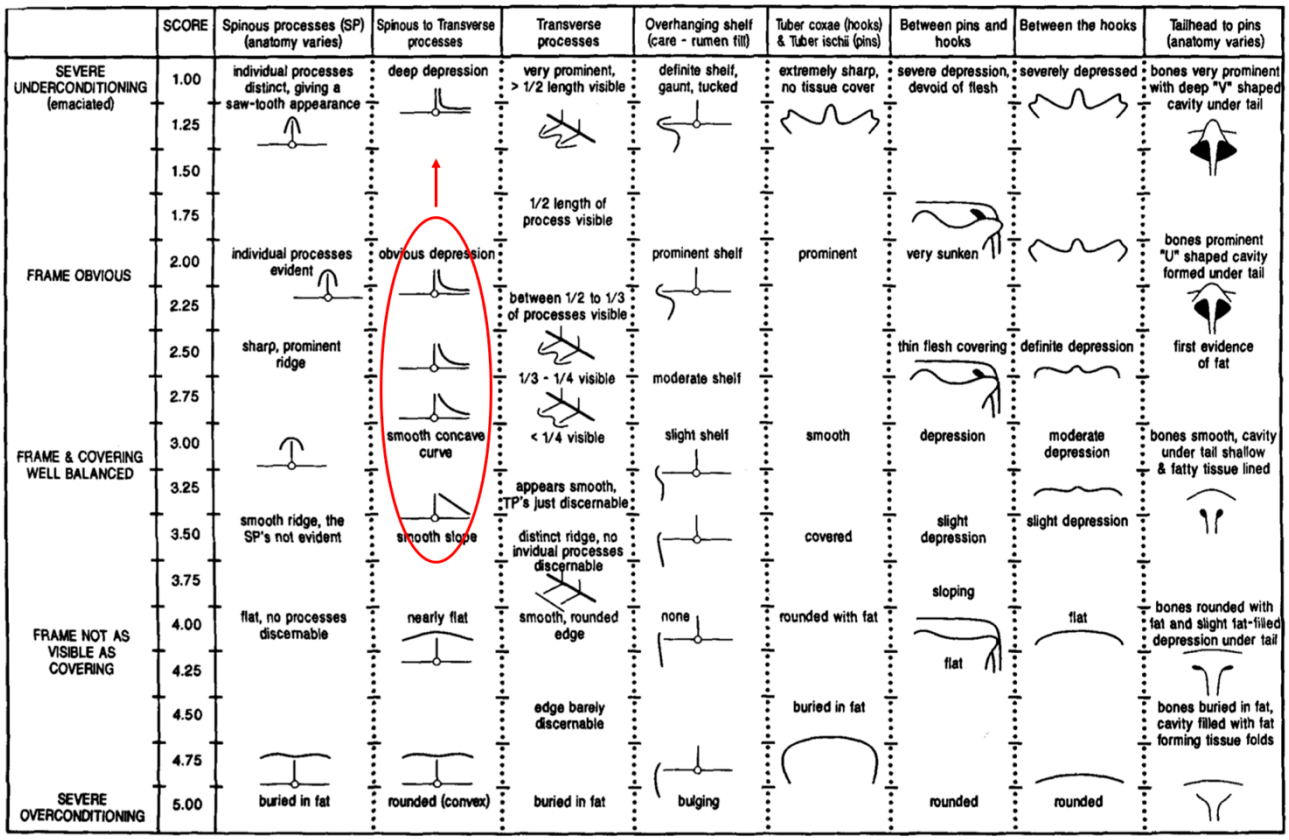

Figure 11. Body condition scoring chart for Holstein cows (Edmonson, Lean et al. 1989) which could be modified to suit all species.

- Terms to be quantified through drafting the standards text to remove legal uncertainty of certain standards. Definitions list to be thoroughly reviewed, considering the Australian Animal Welfare Standards and Guidelines definitions.

Agree.

9.3 On board veterinary medicines and equipment

ASEL Review Technical Advisory Committee interim recommendation:

- Amend ASEL to reflect that Appendix F Table #10 applies to all classes of cattle and buffalo exported by sea, not only slaughter and feeder classes.
- Appendix F—Mandatory veterinary medicines and equipment—is updated:
- Upon completion of research by Livecorp into Shipboard drug use
- In consultation with experienced shipboard AAVs
- With consideration to the causes of poor welfare outcomes and mortalities upon review of consignments
- Divided into minimum requirements for the voyage and minimum doses per quantity and class of animals.

Agree with ALEC that "*a review comprising a small group of experienced shipboard veterinarians and stockpersons should revise the suitable veterinary kit for livestock on short-haul and long-haul voyages*".

A veterinarian must be on every voyage to consider practicality, route of administration and relative risks of withholding period compliance and meat residues in destination markets.

Hospital pen space allocation, design and management. Livestock vessels are poorly equipped or designed for appropriate hospital management and resultant diagnosis, treatment and outcomes of animal health problems in individual animals is unacceptably poor. In addition, there are very substantial and unacceptable OH&S risks in treating animals appropriately on livestock vessels with practically no suitable facilities or equipment. AAV's skills and knowledge is poorly utilised to a very large extent as a result of inadequate hospital pen management on live export vessels.

9.4 Minimum liveweights for export

ASEL Review Technical Advisory Committee interim recommendation:

- Amend 1A.3.4(d)(i) to increase the minimum liveweight of sheep for export by sea from 28 kg to 32 kg

Agree with increase in weight. Ensure all sheep at least BCS 2.5 (out of 5).

- Amend 1A.3.4(e)(i) to increase the minimum liveweight of goats for export by sea from 22 kg to 24 kg

Agree with increase in weight. Ensure all goats at least BCS 2.5 (out of 5).

9.5 Secondary inspection of goats prior to export

ASEL Review Technical Advisory Committee interim recommendation:

- Paragraph 1A.1.1 (b) should be amended to:
- 'When goats are exported by sea, they must be inspected by an authorised officer or AAV at least once during export preparation, (excluding the day of delivery to the registered premises and day of final inspection prior to loading), to confirm the goats have been held in the registered premises for five (5) days and fed appropriately as per Appendix D.'
- apply to all sea voyages of goats.

Agree.

9.6 Horn requirements

ASEL Review Technical Advisory Committee interim recommendation:

- Consistent with the Land Transport Standards 'Horned bulls should have the nonvascular tip removed to a diameter of three cm.'
- Paragraph 1A.3.2 (b) should be replaced with a requirement that horned cattle must have the nonvascular horn tip removed to a diameter of three centimetres.

The Australian Animal Welfare Standards and Guidelines for Cattle (2016)[5] state in guideline G6.24: "*Tipping should only remove a solid, nonvascular portion of the horn, and result in a blunt horn end*". There is no mention of 3 cm diameter.

It is appropriate to have a maximum allowable horn length. If trimming the non-vascular portion of the horn results in a horn exceeding the maximum length, then the beast is not fit for shipping.

AAVs indicate there should be consideration for horned cattle to be drafted separately and provision for additional space allocation and feed trough access for horned cattle, in spite of research indicating horned and polled cattle can be mixed without detriment to welfare of polled cattle (Barnes, Beatty et al. 2008).

- No change to paragraph 1A.3.3(b).

Agree.

- Paragraph 1A.3.5 (b) for goats with horns, should be amended to read …. 'If horned, with horns that are likely to restrict access to feed and water during transport and/or endanger other goats or stock handlers, the horns must be tipped to remove the points, with only the solid non-vascular horn cut.'

Disagree. Do not export goats with horns as they are prone to entaglement and death during voyage.

[5] The Australian Animal Welfare Standards and Guidelines for Cattle (2016) are at: http://www.animalwelfarestandards.net.au/cattle/

9.7 Sourcing of sheep through Darwin, Weipa or Wyndham

ASEL Review Technical Advisory Committee interim recommendation:

- Change the requirement of paragraph 1A.3.4 (d)(v) to be geographic – all ports north of 20 degrees South

It is unclear what the TAC's goal of this recommendation is. **Figure 12** below shows the latest bluetongue zoning in Australia, the 20th parallel of latitude South and sheep stocking densities across Australia.

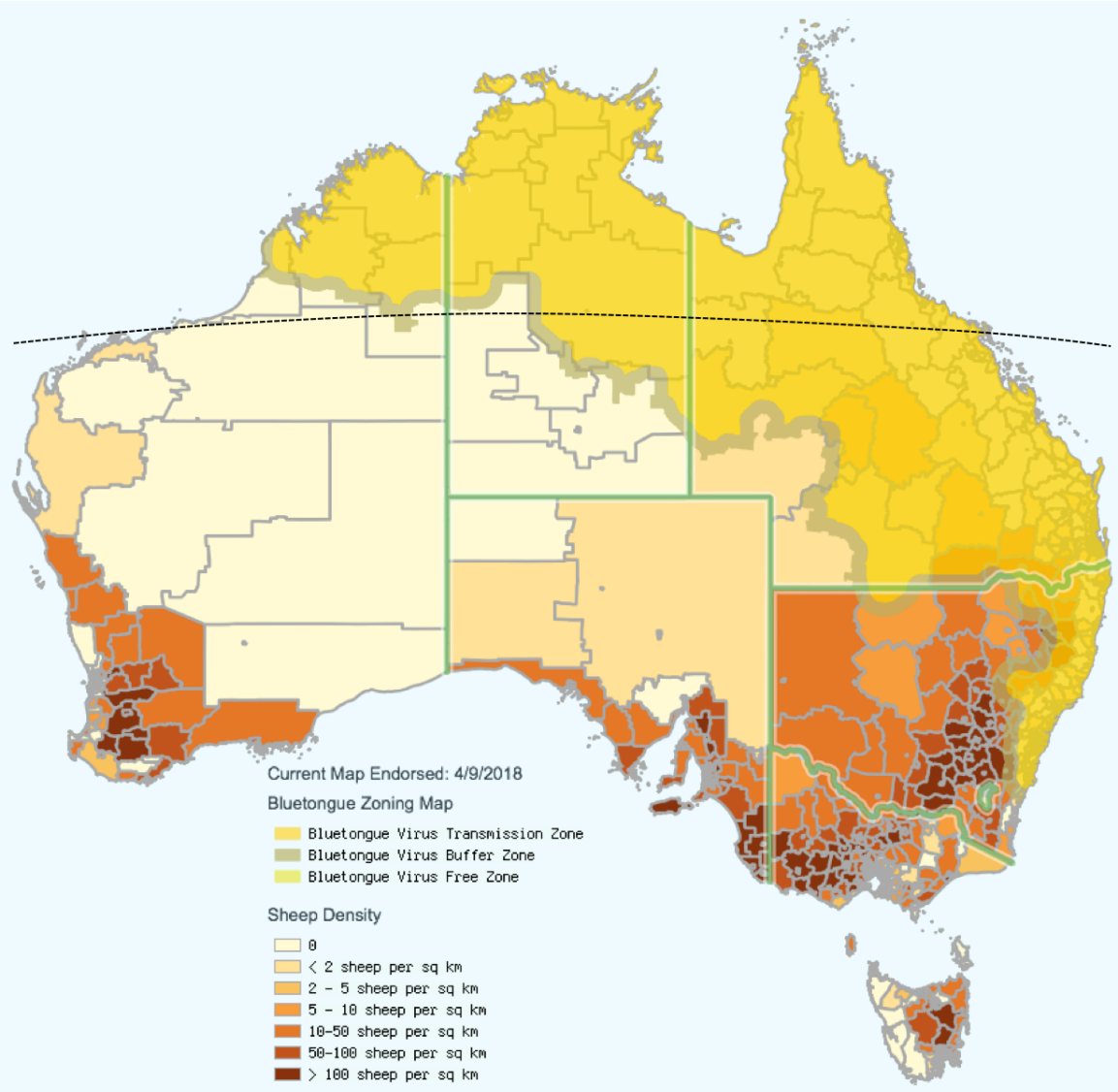

Figure 12. National Arbovirus Monitoring Program bluetongue zoning map showing sheep densities and estimated 20th parallel of latitude South (black dotted line; sourced 10/9/2018 from: https://namp.animalhealthaustralia.com.au/public.php?page=pub_home&program=2).

9.8 Water engorgement management

ASEL Review Technical Advisory Committee interim recommendation:

- The provision of water to animals within a registered premises is under the domain of state or territory legislation and the Australian Animal Welfare Standards and Guidelines. Paragraph 2B.1 (c) to be deleted

2B.1 (c) is not in the Australian Animal Welfare Standards and Guidelines. It should remain in ASEL. There may be rare circumstances where water deprivation or dehydration on live export vessels occurs.

9.9 Proposed duplication areas with the Land Transport Standards

ASEL Review Technical Advisory Committee interim recommendation:

- While ASEL 2B.6 (a) and (b) address issues that come under the domain of the Australian Animal Welfare Standards and Guidelines and may be considered as duplication, are considered fundamental to ASEL and are to be retained.

Agree. Retain. Emphasis on welfare aspects is important.

- Appendix B contains shorter periods of curfew and travel before rest for animals to be exported. This is due to the cumulative stress of transport through the supply chain. Appendix B should be retained.

We note that this could be confusing for truck drivers and handlers. But if it results in better welfare outcomes and can be implemented successfully, agree that Appendix B should be retained.

9.10 Extension of long-haul voyage requirements

ASEL Review Technical Advisory Committee interim recommendation:

- Paragraph 3A.3.2 (h) should be amended as follows:

'For all sea voyages via the Suez Canal, the Cape of Good Hope, the Panama Canal or Cape Horn, or via any other route where the voyage is expected to be longer than 30 days, the statutory reserve of additional fodder that must be loaded must be increased to at least seven (7) days.'

Agree.

Conclusion

Reviews and enquiries into live animal export performed in Australia over the last three decades, and submissions to the 2018 ASEL review from various stakeholders all request animal welfare reform. We trust that this review will implement many of those reforms including significant recommendations of the McCarthy Review as specified above.

Animal welfare science has advanced significantly since the beginning of the live export trade. However, the current standards do not reflect these advances. Importantly, animal welfare science relates to the physical and mental state of an animal, and recognises that animals are sentient. Changes that are made should be based on ensuring both the physical and mental welfare needs of exported animals throughout the entire journey, and not solely restricted to addressing mortalities.

The Five Freedoms model of animal welfare, which encompasses nutrition, environment, health, behaviour and mental state, has served for many years as a useful, outcomes-based framework to help identify and evaluate actions necessary to avoid adverse welfare outcomes. It is vital to ensure that these survival-related freedoms are optimised at all times.

In addition, in 2018, we know that ensuring good animal welfare means providing animals with all the elements required to ensure their health, physiological fitness and a sense of positive individual wellbeing in what is now known as the Five Domains model of animal welfare (Green and Mellor 2011, Mellor and Beausoleil 2015).

At the bare minimum, it is essential that OIE welfare standards for shipping are met; at present, exporters do not consistently meet the primary welfare needs of live animals that are exported from Australia by ship.

ASEL standards represent a mimium standard, but the expectation is for continual and sustainable improvements in animal welfare outcomes based on science. The questions throughout the document emphasise the need for interrogation of the data and research that has accumulated over decades of live export, as well as ongoing collection and interpretation of morbidity data, to inform continuous improvements across the industry.

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