

Explanatory note – Decision to extend the prohibition of live sheep exports to, or through the Middle East until 22 September, 2019

The decision

1. The department has extended the prohibition of live sheep exports to, or through, the Middle East until 22 September 2019 with trade resumed from 23 September 2019.
2. The decision was reached after considering the best available science and evidence which suggested that the risk of heat stress in voyages departing in the first 3 weeks of September is comparable to, or higher than, June. The risk in October is more aligned to May.
3. The department also considered public submissions received in the public consultation process on proposed options for conditions relating to trade in September and October 2019.
4. This decision relates to 2019 only with future regulation of live sheep exports to, or through, the Middle East to be determined following a Regulation Impact Statement (RIS) process.

Legislation

5. The *Australian Meat and Live-stock Industry Act 1997* (AMLI Act) regulates the licensing of exporters. It prohibits the export of meat or livestock without a licence, which may be subject to prescribed conditions, orders and directions.
6. Section 17 of the AMLI Act, provides that the Secretary of the Department of Agriculture may, by legislative instrument, make certain orders to be complied with by holders of export licences.
7. The extension of the prohibition will be implemented through amendments to the *Australian Meat and Live-stock Industry (Export of Sheep by Sea to Middle East) Order 2018* (Middle East Order) and the *Australian Meat and Livestock (Prohibition of Export of Sheep by Sea to Middle East - Northern Summer) Order 2019* (Prohibition Order).

Science and evidence informing the decision

8. The department considered the best available science and evidence including;
 - a. analysis undertaken by the Bureau of Meteorology (Bureau) of historic temperatures and regional climatological analysis
 - b. the heat stress risk assessment (HSRA) review and academic research which informed this review
 - c. industry research
 - d. independent observer reports
 - e. voyage reports, and
 - f. on board observations during May 2019 voyages.

9. The department also considered the heat tolerance of sheep departing Australia in September, noting they are acclimatised to Australian winter temperatures and therefore are less tolerant of heat than sheep departing in summer and autumn.
10. The science and evidence suggests that the risk of an animal welfare incident relating to heat stress on voyages departing in the first 3 weeks of September is comparable to or higher than June, while the risk in October is more aligned to May.

Climatology and heat stress thresholds

11. At the time of consultation, the department reviewed data analysed by the Bureau for a number of locations in the Middle East. On 26 July 2019, after the completion of the consultation period, the Bureau contacted the department and informed that they had re-analysed the data using a different methodology which they believed was more accurate for high-end wet bulb temperatures (WBTs). The result of this was to lower the estimates of WBT across the Middle East such that the timing of late summer cooling moved earlier in the year by about a week. The exception to this was the Bab al Mandab Strait into the Red Sea and the central Red Sea which were only marginally impacted. All analyses relating to data provided by the Bureau and outlined here have considered data from the revised Bureau analysis.
12. Historical data analysed by the Bureau shows that for the duration of September, historical average WBTs in the Persian Gulf and the Red Sea remain as high as, or higher than, average WBTs in June. These findings are consistent with industry research.
13. The Bureau noted the influence of the Indian Ocean Dipole (IOD) in 2019. The IOD is a pattern of year to year climate variability in the northern Indian Ocean and Arabian Sea during May to November (similar to the El Niño and La Nina phases in the Pacific Ocean). Most international climate models forecast positive IOD conditions for the remainder of the southern hemisphere winter and spring in 2019. This means WBTs in the northern Indian Ocean and Arabian Sea are predicted to be higher than average until November 2019.
14. Deck WBTs on board live sheep export vessels are higher than ambient temperatures typically by 1-3°C due to the metabolic heat created by the animals. The rise in WBT on the decks depends on the stocking density, class of sheep and the rate and effectiveness of ventilation on the vessel.
 - a. This means when the ambient temperature is 29°C WBT, deck temperatures experienced by the livestock will be around 30-32°C WBT.
15. According to data analysed by the Bureau, for the main routes into the Persian Gulf (Straits of Hormuz), and the Red Sea (Bab al Mandab Strait), 95th percentile WBTs fall below 29°C WBT in early October. Most WBTs in the Persian Gulf cool below 29°C WBT at the very end of September but the hottest destination port, Doha, reaches this level around one week into October. WBTs from the middle of the Red Sea fall below 29°C WBT around the third week of September and conditions further north are notably cooler.
16. Based on the parameters in the industry heat stress risk assessment model (HotStuff), the heat stress threshold (HST) for a 40kg Merino adult, acclimatised to September in

southern Australia is 30°C WBT. Larger, heavier sheep will be less heat tolerant than this. The HST is the deck-side heat tolerance level for sheep and, according to the HSRA panel, represents the animal welfare threshold that should not be breached on live export vessels.

- a. A submission to the draft HSRA report stated that, based on measures taken during live export voyages, in winter-acclimatised sheep, there is an escalation of physiological heat loss mechanisms when the daily mean deck temperature reaches 30°C WBT. These comments did not reference a class of sheep.
17. The HotStuff model also defines mortality thresholds ie the WBTs when sheep die. For a 40kg Merino adult acclimatised to winter, the HotStuff model indicates the most susceptible sheep will begin to die at approximately 33.5°C WBT while this model indicates that around 50% of sheep will have died by 35.2°C WBT.
18. The LiveCorp/MLA Veterinary Handbook for the Live Export Industry (version 4.0) also defines important heat stress levels. It notes that WBTs above 29°C are considered the 'danger' zone for sheep (<http://www.veterinaryhandbook.com.au/ContentSection.aspx?id=13>).
19. Based on the above analysis, the department determined that if 95th percentile ambient temperatures were at 29°C WBT or above (which leads to deck temperatures of 30-32°C WBT), the risk of adverse animal welfare outcomes was determined to be unacceptable.

Acclimatisation

20. Sheep loaded during September will be acclimatised to cool temperatures in the Australian winter and therefore will have a lower tolerance for heat than sheep prepared for export earlier in the year. The HSRA panel noted that an animal's heat tolerance changes over the course of the year depending on seasonal temperature exposure. The panel also noted that it is not known how long sheep take to acclimatise but that other species have demonstrated some acclimatisation over two to three weeks.
21. The McCarthy Review noted that acclimatisation plays a significant role in adjustments to sheep metabolism. The Review report states that there is a lag in the way sheep adjust their metabolic rate in response to local weather, with winter-acclimatised sheep the least able to adapt to hotter temperatures, increasing the risk of inanition and salmonellosis.

Risk analysis based on mortality data 2013-2017

22. The department undertook an analysis of relative monthly mortality data from voyages to and through the Middle East from 2013 to 2017. Data from 2018 and 2019 were analysed separately to keep the trend analysis consistent with underlying regulatory conditions such as pen space allowances. Noting that different stocking densities are now in use, this was not considered indicative of likely mortalities in 2019, but rather considered indicative of relative risk of poor animal welfare outcomes in different months.

23. Average historical monthly mortality levels for Middle East voyages from 2013 to 2017, prior to regulatory changes in 2018, demonstrate (Attachment H):
- A five year average mortality rate of 0.71%
 - The months of June to September (inclusive) have higher averages than the 5 year average.
 - September records the 3rd highest average historical mortality rates after July and August. September has historically recorded the third highest average mortality per voyage suggesting it has historically been one of the riskier months for sheep exports.
24. Voyage reporting indicated heat stress was a cause of death on some September voyages where the mortality rate was above 0.5%. Heat stress was only occasionally implied as a cause of death on any October voyages.
25. There was a 62% reduction in mortality rate per voyage from the five year average mortality rate per voyage (0.71%) to the average mortality rate over the period 1 July 2018 to 30 Jun 2019 (0.27%). This improvement reflects the introduction in 2018 of increased pen space allowances, the prohibition in 2019 and other measures. This was also influenced by very few Middle East voyages from June to November 2018 which was not due to any regulatory or deliberate industry measure.

Data and voyage reports from May 2019 sheep export voyages to the Middle East

26. In his review of heat stress, McCarthy recommended that a revised model to assess heat stress should adopt the view that subjecting sheep to open mouth panting is unacceptable. This was supported by the HSRA panel's explanation that when an animal is panting with its mouth open, it is having "to work much harder to try and lose heat from the body, and this is considered to be beyond what is acceptable [welfare]".
- The HSRA panel and others note that in the absence of taking an animal's body temperature, panting is the best available behavioural observation to indicate heat load.
 - The department considers that there is a duration component to heat stress. Based on limited research on duration of exposure, it is not the department's view that short periods of open mouth panting constitutes compromised welfare.
27. Interim analysis of May voyages with regards to sheep heat stress:
- Reports from the IOs and AAVs on board the three vessels varied widely in their recording of panting scores and their assessment of heat stress. Above 31.0°C WBT video footage from the May 2019 voyages show all sheep with increased respiratory effort including periods of panting with open mouths.
 - Environmental data recorded on each deck for the three vessels indicates that high WBTs (30 – 33°C WBT) were reached for relatively short periods at a time (1 to 6 hours) before temperatures dropped (often quite quickly). While there is little data about a sheep's ability to withstand extended periods of hot conditions, the

available science indicates that these conditions may contribute to adverse animal welfare outcomes.

28. Interim analysis of May voyages with regards to sheep mortalities:

- a. There were no mortalities related to high temperatures recorded on any of the voyages.
- b. The mortality rates were exceptionally low compared to historic averages.
- c. The small sample size of three voyages is not large enough to have strong statistical significance. However, the fact that their average mortality rate per voyage was much lower than the longer term average, implies that the conditions under the Northern Summer Order contributed to improved animal welfare outcomes.

Targeted analysis by class of sheep

29. Industry research that is embedded in the heat stress risk assessment software (HotStuff), observations by IOs and anecdotal reporting describes that certain classes and breeds of sheep are more heat tolerant than others. This variability was also acknowledged by the HSRA panel.

- a. For example, for sheep acclimatised to September conditions, a 40kg Merino adult's HST is 30°C WBT, a 56kg Merino adult's HST is 29.3°C WBT and a 90kg Merino ram's HST is 28.2°C WBT.

30. A submission to the options for September and October, proposed that only certain classes of sheep should be eligible for export during September.

31. The department's view is that implementing export conditions specific to class of sheep would be administratively burdensome, impractical to implement and difficult to enforce. For example, it would be very difficult for an Australian Accredited Veterinarian (AAV) to verify compliance with weight limits of sheep by visual inspection prior to loading.

Targeted analysis by route and destination

32. The re-analysis of the temperature data by the Bureau resulted in lower estimates of WBTs across the Middle East such that the timing of late summer cooling moved earlier in the year by about a week. The exception to this was the Bab al Mandab Strait into the Red Sea and the central Red Sea which were only marginally impacted.

33. Travelling times to the Persian Gulf and Red Sea were considered by the department in reaching conclusions about resumption of trade. According to voyage reports, the Ocean Drover, one of the fastest vessels, can reach the Persian Gulf in 10 to 11 days and the Red Sea in 13 to 14 days.

Conclusion

34. Using a risk-based analysis of the best available science and evidence, the department came to the view that the risk of adverse animal welfare outcomes for voyages departing in the first 3 weeks of September 2019 was similar to June and the conditions under the Middle East Order would not be sufficient to mitigate this risk. Thus the

prohibition should be extended to 23 September 2019 such that vessels would reach Middle East waters at the start of October.