



**Australian Meteorological
& Oceanographic Society**

**Australian Meteorological and Oceanographic Society response
to the
Heat Stress Risk Assessment Draft Report
by the
Independent Heat Stress Risk Assessment Technical Reference
Panel**

The Australian Meteorological and Oceanographic Society (AMOS) is an independent society representing the atmospheric and oceanographic sciences in Australia. Our vision is to advance the scientific understanding of the atmosphere, oceans and climate system, and their socioeconomic and ecological impacts, and promote applications of this understanding for the benefit of all Australians.

AMOS has an important role as a credible, independent voice for the profession. As part of this role it has established Expert Groups in areas such as climate variability, weather forecasting and physical oceanography, and regularly represents the views of its members to Government, institutes and the public.

AMOS welcomes the focus on weather conditions along shipping routes for live animal exports to the middle east. We note from the draft report that winter acclimatised sheep will experience heat stress when the environmental wet bulb temperature exceeds 28°C (Recommendation 2). Our climatological review of conditions in the Red Sea and Persian Gulf indicates that conditions are unsuitable for live exports in the months of June-September.

We calculated the average environmental wet bulb temperature at a height of 2 metres above the surface over the Red Sea and Persian Gulf regions using high quality atmospheric data produced by the European Centre for Medium Range Weather Forecasting (ERA-Interim, Dee 2011). We also calculated the fraction of time that the environmental wet bulb temperature exceeds 28°C in the region.

The expert group supports the approach of using a well-researched and soundly-based approach heat stress measure and the adoption of wet bulb temperature as the quantitative thresholds to be used. We note that the wet bulb temperature is readily computed from available weather information, and climatological statistics can be computed for use in the risk assessment. (Recommendations 1-3).

Recommendation 5 raises the prospect of future refinement of the heat stress model using diurnal and day-to-day variations. We note that such information is also readily available. Information on the diurnal variation certainly could be used to identify whether the sheep are likely to experience respite overnight. Information on day-to-day variations can be also be obtained to identify the likely variability in conditions.

Day-to-day *predictions* of conditions could be derived from the weather predictions of national weather services in the region or from the major global weather prediction centres. Information from these prediction centres could be used to predict conditions up to a week in advance, and such information may be useful in supporting operations. However, we note from the report (page 5) that "Once a loaded ship is enroute and meets conditions where the ambient WBT exceeds the threshold at which mortality increases, apart from changing route to seek cooler conditions, there is relatively little that can be done to alleviate heat stress to the sheep on board".

We also support Recommendation 7 with its focus on monitoring actual conditions on board the ships rather than rely solely on measurements of the environmental conditions. Information on the actual environmental conditions such as wet bulb temperature, is readily available to assist in calibrating and refining the heat stress model to reflect on-board conditions.

Our results indicated that the environmental wet bulb temperatures in the Persian Gulf and Red sea regions exceed the 28°C limit for a high proportion of the time in the months of June - September (Fig. 1). Moreover, the average environmental wet bulb temperature approaches or exceeds 28°C for these months, meaning that there would be considerable amounts of time above that threshold (Fig. 2). The fraction of time above 28°C approaches 100% in some areas, indicating that conditions do not cool down overnight, which may place increased stress on sheep (Draft report, 5.4.1).

Based on the recommended safe conditions for animals in the draft report, our analysis suggests that conditions are not suitable for live exports to the region for the period June-September. These results are derived from global representations of atmospheric conditions calculated from a combination of observations and state-of-the-art modelling systems. There is likely to be local deviation from these results that could be revealed through rigorous observational studies and detailed modelling. Moreover, the wet bulb temperature on the ship deck is likely to exceed that over open waters.

Reference:

Dee, D. P et al. (2011), The ERA-Interim reanalysis: configuration and performance of the data assimilation system. Q.J.R. Meteorol. Soc., 137: 553–597. doi: 10.1002/qj.828

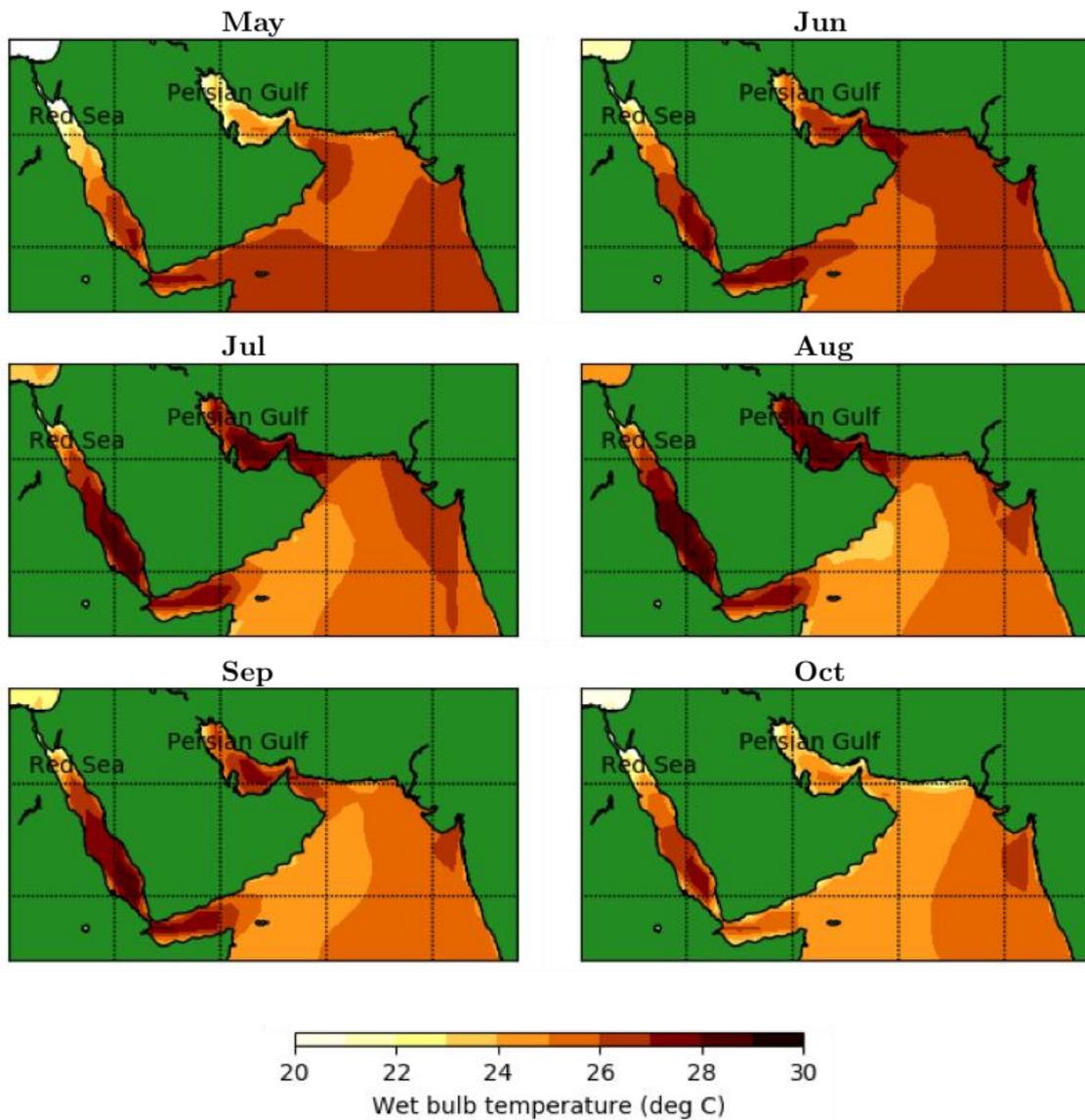


Figure 1. Monthly average environmental wet bulb temperature at a height of 2 metres from ERA-Interim, 2000-2013 for May-October.

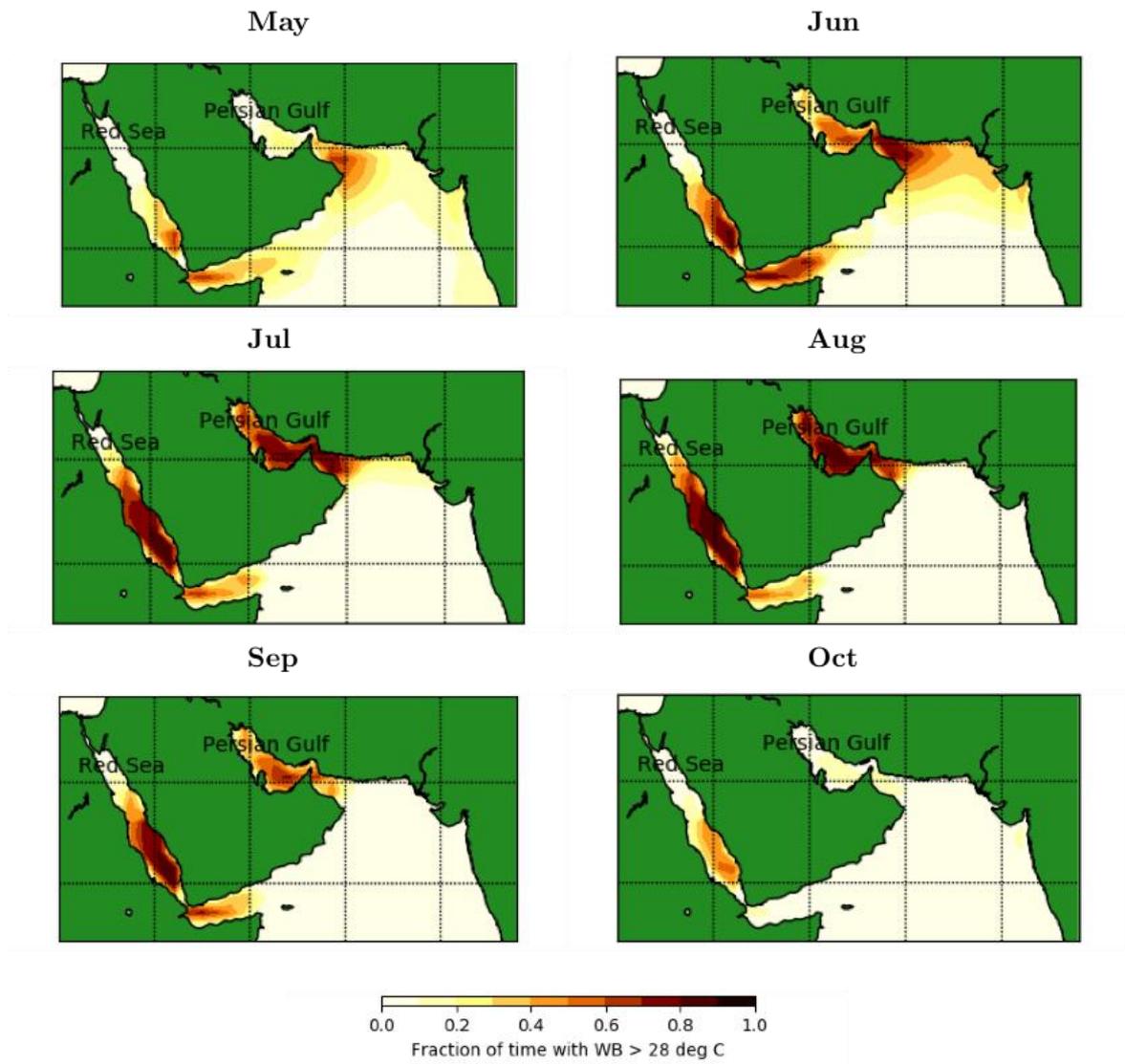


Figure 2. Monthly average fraction of time with environmental wet bulb temperature at a height of 2 metres greater than 28°C from ERA-Interim, 2000-2013 for May-October.

This paper was prepared by the AMOS Expert Group on Weather and Weather Prediction, and submitted by Dr Andrew Marshall, AMOS President, on 28 February 2019.