Quantitative assessment of cattle behaviours on board livestock ships

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Abstract

This report details the results of a study investigating the behaviour of cattle during a commercial live shipment from Australia to the Middle East. Behavioural observations were made of *Bos taurus* x *Bos indicus* cattle in pens composed only of horned animals (horn length up to 12 cm), only of polled animals and of a mix of polled and horned animals (horn length up to 12 cm). Two pens each with seven animals were examined for each treatment.

The footage used for this study was that used previously in B.LIV.0242. A surveillance system recorded continuous footage of the animals using two video cameras in each pen, connected to digital video recorders. Animals were fed a standard shipper pellet at 3% body weight (as fed). Water was available *ad libitum* in automatic watering troughs.

Point sampling was used to assess behaviour at 10 minute intervals throughout the first 10 days of the voyage and the behaviours recorded included number of animals lying down, standing, feeding, drinking, physical interaction between the animals and self grooming (licking and rubbing).

From analysis of the footage the cattle were most often standing (not eating or drinking) or lying down (sternal recumbent) at the majority of time points. However, for the first 24 hours there were significantly fewer animals lying down, eating and drinking and self grooming at each time point than in the final 24 hours recorded on day 10. Conversely there was significantly higher physical interaction at each time point on day 2 than in the final 24 hours recorded on day 10

This work has shown that continuous video recording of animals on a commercial shipment for several days is possible, producing video footage of quality that can be analysed for aspects of animal behaviour. In the pens studied, it was shown that during the initial 24 hours there was more physical activity and interaction than for the last 24 hours. This study is a useful stepping stone for further studies comparing shipboard behaviour with that in other management systems such as feedlotting or extensive grazing systems.

Executive summary

The objective of this study was to utilise video footage of cattle taken as part of “B.LIV.0242 Assessing the welfare and feeding behaviour of horn and polled sheep and cattle during export” to make an informed estimation as to what proportion of the day animals spend performing certain basic behaviours. On one shipment a surveillance system recorded continuous footage of the cattle using two video cameras in each pen, connected to digital video recorders. Animals were fed a standard shipper pellet at 3% body weight (as fed). Water was available *ad libitum* in automatic watering troughs.

Behavioural observations were made of *Bos taurus* x *Bos indicus* cattle in pens composed only of horned animals (horn length up to 12 cm), only of polled animals and of a mix of polled and horned animals (horn length up to 12 cm). Two pens each with seven animals were examined for each treatment. Point sampling was used to assess behaviour at 10 minute intervals throughout the first 10 days of the voyage and the behaviours recorded included number of animals lying down, standing, feeding, drinking, physical interaction between the animals and self grooming (licking and rubbing).

From analysis of the footage the cattle were most often standing (not eating or drinking) or lying down (sternal recumbent) at the majority of time points. However, for the first 24 hours there were significantly fewer animals lying down, eating and drinking and self grooming at each time point than in the final 24 hours recorded on day 10. Conversely there was significantly higher physical interaction at each time point on day 2 than in the final 24 hours recorded on day 10. Some recumbancy is necessary to prevent fatigue in cattle (Arave and Albright 1981). In this study rest may have been initially disrupted due to new environment stressors, indicated by a higher incidence of physical interaction and standing at the beginning of the voyage. However, by day 3 more cattle were observed at each time point lying down indicating acclimatisation to surroundings. On day 3 to day 5 fewer cattle were standing and more were lying down at the time points observed. Lying time is also affected by previous deprivation. Metz (1985) found that deprivation of lying and eating for 3 to 5 hours led to compensatory lying during the subsequent time periods. It may be that from day 3 to 5 cattle were lying down more frequently as a compensatory response to the long periods of standing prior to shipment (e.g. transport) and during acclimatisation to new surroundings on ship.

Lateral recumbancy was rarely observed and when it was observed cattle seldom held this position till the next sampling point (10 minutes). Cattle would be unlikely to stay in a lateral recumbent position for a long period as it prevents eructation of gases from the rumen (Coe et al. 1991).

Cattle did show a diurnal response to time observed standing, with more cattle observed standing during the day than at night. Previous studies have also shown that cattle show a diurnal rhythm of locomotion with greater activity during daylight hours, especially at sunrise and sunset (Phillips 1993).

Effect of treatment was analysed in horned, polled and mixed pens and similar results were found to those previously in B.LIV.0242 that mixing of horned and polled cattle, within specification, will not have a negative influence on an animal’s well-being. In the present study, more cattle in mixed pens were observed lying down and eating and less standing than those in horned and / or polled pens indicating cattle in mixed pens may have been less disrupted than those in horned and polled pens.

This study provides a useful snap shot of behaviours exhibited by animals during shipment. It would be useful to do a comparison of shipboard behaviour with that exhibited in a paddock environment as initial review of literature show that there may be similarities in behavioural time budgets of animals during live shipment compared to those in less intensive situations such as a paddock environment.

Contents

Page

1 Background 6

2 Project objectives 6

3 Methodology 6

4 Results and discussion 10

4.1 Results 10
4.2 Discussion 13

5 Success in achieving objectives 15

6 Impact on meat and livestock industry – now and in five years time 15

7 Conclusions and recommendations 16

8 Bibliography 17

9 Appendices 18

9.1 Appendix 1 18
9.2 Appendix 2: 19
9.3 Appendix 3: 20

1 Background

There has been no scientific documentation of cattle behaviours on live export vessels. Anecdotal evidence suggests that both cattle and sheep spend the majority of their time standing or lying down during a voyage. This project will aim to quantify cattle basic behaviours over the duration of a voyage. It will provide a starting point for industry to base future work. Such work may include comparing stocking densities on board ship and comparing ship behaviours to feedlot or paddock housing.

The aim will be to provide industry with documentation to show, on average, what cattle are doing at any one time. Behaviours examined will include; standing, lying (either sternal or lateral recumbancy), eating, drinking, elevation of head (high, normal, low), mounting or sexual behaviour, or licking. To achieve this aim observation and analysis of video footage at 10 minute intervals throughout a cattle voyage to the Middle East will be made.

The primary objective of the study is to make an informed estimation as to what proportion of the day animals spend performing certain basic behaviours. That is what proportion of animals are standing, lying, eating etc at any given time. This is only an average of all animals, under only one set of conditions, but it will provide industry with a starting point to compare to other situations.

2 Project objectives

Quantify the proportion of time cattle spend performing key behaviours using video recordings from B.LIV.0242 “Assessing the welfare and feeding behaviour of horn and polled sheep and cattle during export”.

3 Methodology

Bos taurus cross *Bos indicus* bulls were sourced from Western Australia. The bulls (average weight 425 kg, condition score 3-4) were shipped live from Fremantle to the Middle East during July and August 2007. During live shipment, experimental cattle were penned according to presence or absence of horns (up to 12cm) at stocking rates that gave them 2.2m^2 per head (ALES 2003) as shown in Table 1. The stocking rate was 20% less that the standard set by ALES (2003). This was due to the time of year and the hotter conditions expected during the voyage.

Table 1. Pen treatment according to horn character of cattle during live shipment

Pen Number	Pen size (m^2)	Number of cattle in pen	Horn character of cattle
1	15.45	7	Mix of polled and horned up to 12cm
2	15.60	7	Mix of polled and horned up to 12cm
3	15.76	7	Horned only (up to 12cm)
4	15.76	7	Horned only (up to 12cm)
5	15.60	7	Polled only
6	15.45	7	Polled only

All pens were single tiered, enclosed and ventilated and were next to one another as shown in Figure 1 and 2:

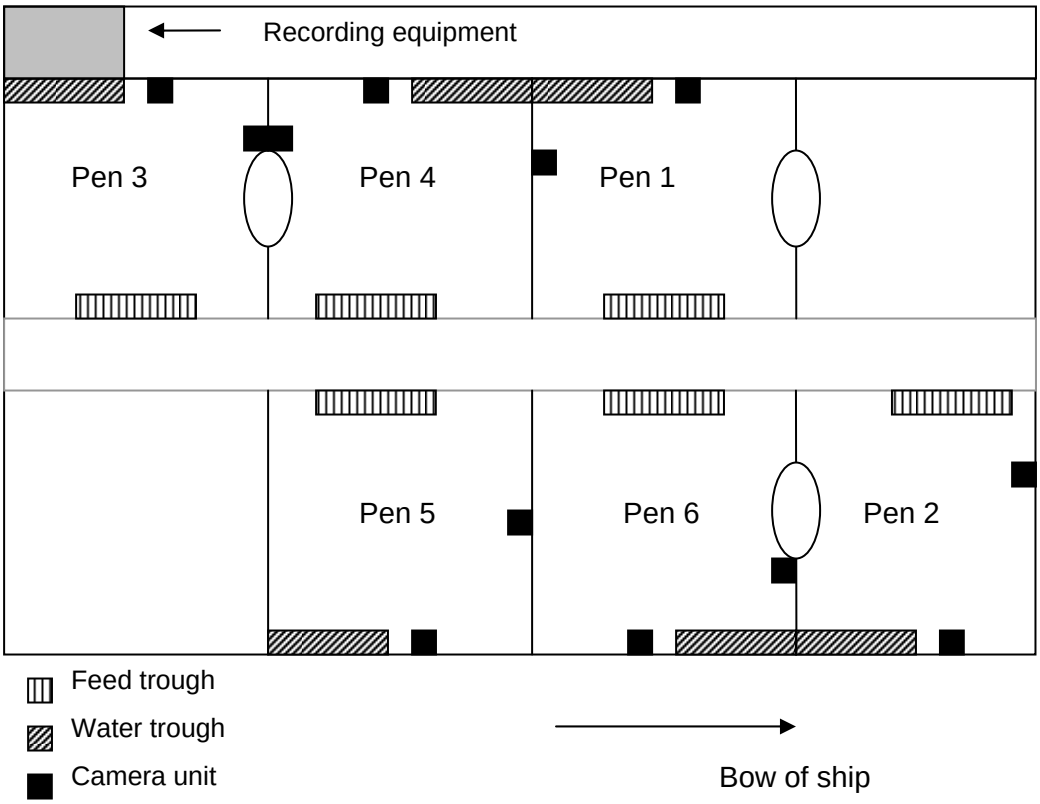

Figure 1. Layout of experimental pens on live export ship

Figure 2. Experimental pens and surveillance cameras on the live export ship

Animals were fed a standard shipper pellet at 3% body weight (as fed). Cattle were fed daily in the morning and in late afternoon (exact times varied between days). Water was available *ad libitum* in automatic watering troughs.

Each experimental pen was fitted with two surveillance cameras as shown in Figure 1 and 2. The cameras recorded continuous footage from when cattle were loaded (22nd July; 2100 hours (d0)) until d13 of the voyage (4th August 2007), 2 days before reaching the destination port of Kuwait. The decision was made to end the video monitoring at this point as gates were opened between replicate pens to allow more room for cattle due to the hot conditions experienced during the voyage.

Video footage was reviewed using point sampling every 10 minutes for the entirety of available footage. Video footage was fast forwarded to 30 seconds prior to each 10 minute time point and watched for 30 seconds up until the 10 minute time point (e.g. 8:59:30 AM to 9:00:00 AM). This allowed ease of viewing of active behaviours such as agnostic interaction between animals.

For this project the 10 minute intervals were taken as 0:00:00, 0:10:00, 0:20:00, 0:30:00, 0:40:00, 0:50:00 for each hour of the day. The following observations were made at each time point;

- Number of feeding events: Number of animals within approximately 0.5 metres of the feeder and orientated toward the feed.
- Number of animals drinking: Number of animals within approximately 0.5 metres of the water trough and orientated toward the water.
- Number of animals lying down (lateral or sternal recumbancy)
- Number of animals standing (not eating or drinking) with;

  - Head low
  - Head normal
  - Head high
- Number of physical interactions:
  - Number of mounting events
  - Number of pushing events: Number of times an animal pushed passed another animal
  - Number of bunting events: Number of times an animal pushed or bunted another animal with its head (on either the side or head-to-head).
- Number of animals licking
- Number animals rubbing/ scratching

ANALYSIS

Effect of time of day was studied by taking day as 0610 to 1750 hours and night as 1800 to 0600 hours. Times were not corrected for time zones as animals were penned in an enclosed deck and therefore were unlikely to be affected by change in light patterns.

Although video was set to record for the entirety of the voyage there was little data available at night on days 5 to 13. The reason for this lack of footage may have been due to electricity issues as footage was unavailable from both DVR's during the same time periods. Two pens of horned and one pen of polled had footage available till d 13, while the other pens had footage extending until d10. It seems likely that one DVR was turned off at the conclusion of d10 while the other was left to run till d13 before being switched off.

These constraints were taken into consideration in analysis in the following ways:

- Effect of time of day was analysed in the first 4 days of the voyage only. These days had continuous footage for the 24 hour periods.
- Effect of day, treatment and variation between behaviours was only analysed using daytime footage (610 to 1750 hours) from d1 to d10.

4 Results and discussion

4.1 Results

The shipment departed Fremantle late on the 22/7/07 (day 0) and unloaded at the destination port in Kuwait (6/8/07, d 15). Daily recordings of wet bulb temperature during the voyage show that wet bulb temperature increased on d 4 and reached 29˚C on d 7, 11 and 12 (Figure 3). Ventilation within the pens was satisfactory throughout the voyage.

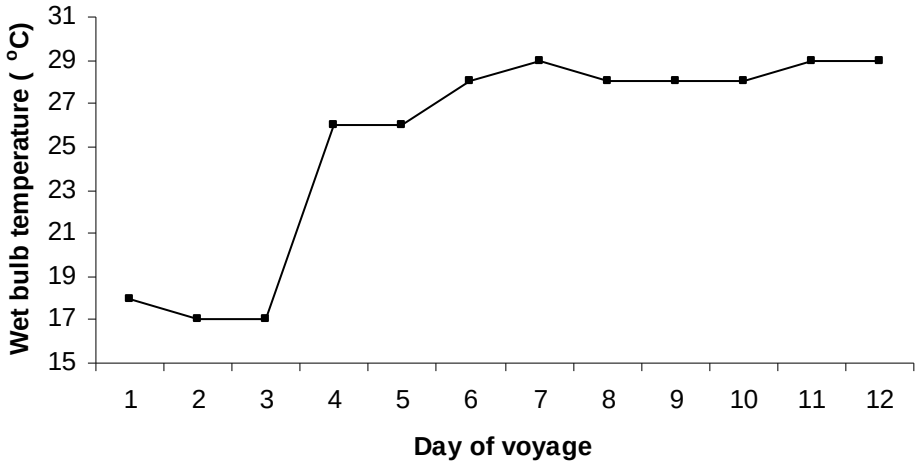

Figure 3. Daily wet bulb temperature during the cattle video monitored live export voyage

A higher number of cattle were observed to be standing (not eating or drinking) and lying down than exhibiting physical aggression, eating and drinking or self grooming ($p<0.01$) (Figure 4 and Appendix 1). There was a significant effect of day during the study ($p<0.01$). As shown in figure 4 and appendix 1, there were more cattle standing and less lying at time points observed on day 1 than on days 2 to 10 ($p< 0.01$). However, on d3 to d5 fewer cattle were standing and more were lying down at the time points observed ($p<0.01$). On days 1 to 13 cattle that were standing were observed to have their head in normal position more often than a low or high position at time points observed ($p<0.01$) (Figure 5). Physical aggression was observed more often on d2 than d1 ($p<0.01$) and the end of the study (d 9 to 10). Cattle were observed at the feeder and water trough less on d1 and 2 than d 3 to 10 ($p<0.01$) and exhibited less self grooming (licking and rubbing) at observed time points on d1 than day 3 to 10 ($p< 0.05$). When lying down, cattle were observed in sternal recumbent position more than lateral recumbent position ($p<0.01$). Lateral recumbancy was observed less on the first 3 days of the voyage than on d 8 ($p<0.01$) and 9 ($p<0.05$) of the voyage.

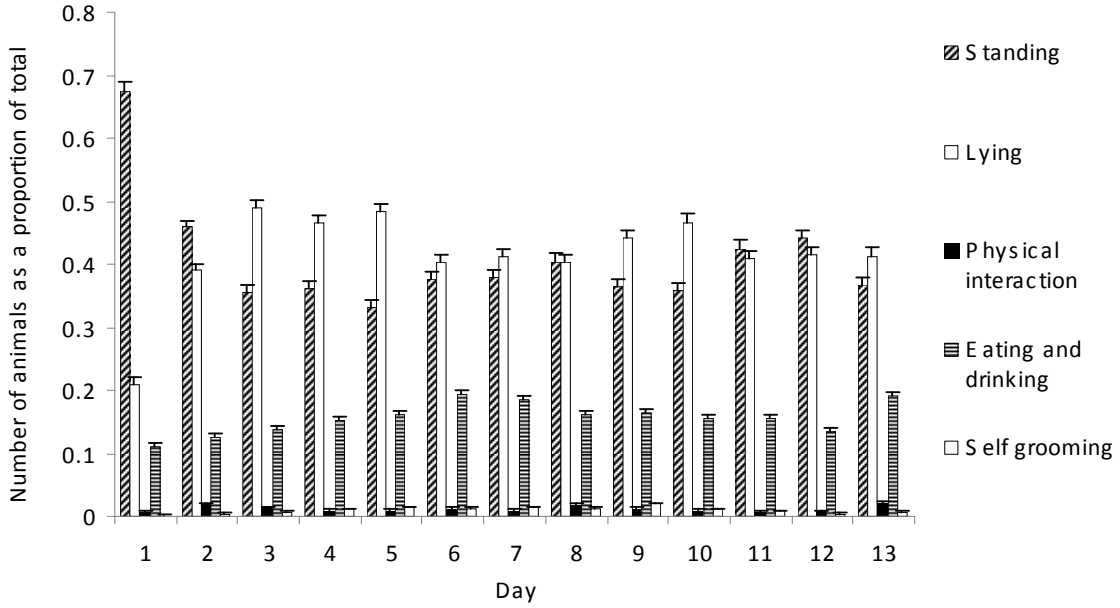

Figure 4. Daily mean number of cattle as a proportion of total number of focal animals that were standing (not eating or drinking), lying (sternal and lateral recumbancy), exhibiting physical interaction (mounting, pushing, bunting), eating and drinking and self grooming (licking and rubbing). Means are of 6 pens (days 1 to 10) and 3 pens (days 11 to 13).

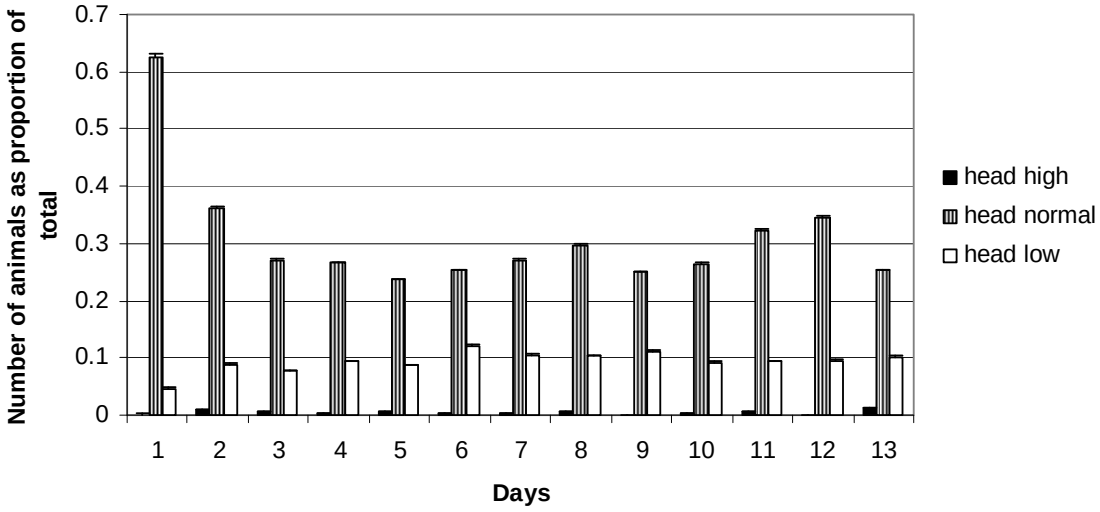

Figure 5 Number of cattle standing (not eating or drinking) with head high, normal or low as a proportion of total number of focal animals (days 1 to 10 n = 6 pens, d 11 to 13 n = 3 pens).

The effect of time of day was studied on d 1 to 4 (Figure 6). Following this there was little footage available during the night. From the days studied significantly more cattle were observed lying down and less standing at night than during the day ($p<0.01$). More cattle were also observed self grooming (licking and rubbing) at night than during the day ($p<0.01$).

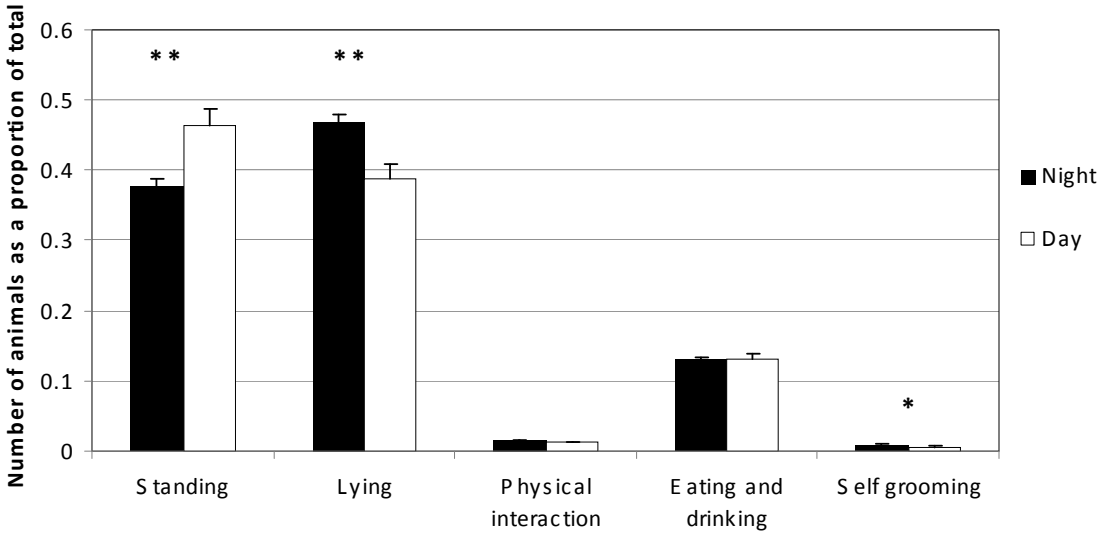

Figure 6. Mean number of cattle as a proportion of total number of focal animals that were standing (not eating or drinking), lying (sternal and lateral recumbancy), eating and drinking and self grooming (licking and rubbing) at night (1800 to 600 hours) compared to during the day (550 to 1750 hours). Means are of 6 pens on days 1 to 4 of voyage (within behaviour groups significant difference indicated at $p<0.01$ (**) and $p<0.05$ (*))

The effect of treatment was tested between mixed, horned and polled groups (Table 2). In mixed pens, more cattle were observed lying down and less were observed standing than in horned and polled pens ($p<0.01$). Cattle in mixed pens were observed to be eating more of the time than cattle in horned pens ($p<0.01$).

Table 2. Mean number of cattle as a proportion of total number of focal animals that were standing (not eating and drinking), lying down, eating and drinking in the first 10 days of the voyage for each treatment group. Within rows, means with different superscripts differ significantly ($p<0.01$)

	Horned	Polled	Mixed
Standing (not eating or drinking)	0.41 ± *0.04* ^{a}	0.45 ± *0.03* ^{b}	0.36 ± *0.03* ^{c}
Lying	0.42 ± *0.03* ^{a}	0.38 ± *0.03* ^{b}	0.44 ± *0.03* ^{c}
Eating and drinking	0.14 ± *0.01* ^{a}	0.15 ± *0.01* ^{ab}	0.18 ± *0.01* ^{b}

The difference in observations made at 10 minute, 20 minute, 30 minute and 60 minute intervals were investigated. It was found that only observations of mounting behaviour differed between sampling intervals. There was a higher number of mounting events observed when observations were made at 10 minute intervals versus 60 minute intervals ($p<0.05$) (Figure 7).

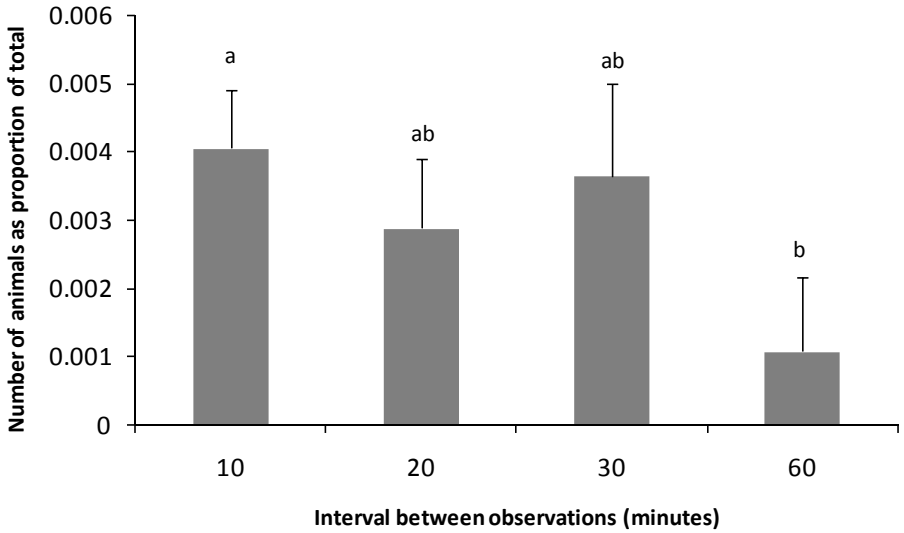

Figure 7. Mean number of cattle as a proportion of total number of focal animals that were observed mounting when observations were made at 10, 20, 30 and 60 minute intervals. Means are of all treatment pens on days 1 to 3 of voyage (means with different letters differ significantly $P<0.05$)

4.2 Discussion

Point sampling was used in this study to observe cattle behaviours. Observations in this study were made using this technique due to the labour intensive efforts required to review footage in its entirety and our belief that observations at 10 minute intervals would adequately capture common behaviours exhibited during the voyage. Miltlohner *et al.* (2001) compared continuous behavioural sampling of cattle with scan sampling. It was found that viewing at very short intervals (10 minutes) was highly correlated with continuous sampling for all studied behaviours. However, long interval scan sampling (30 to 60 minutes between scans) was generally inaccurate and imprecise for measuring behaviours of short duration such as eating and drinking. The present study compared observations made at 10 minute, 20 minute, 30 minute and 60 minute intervals. It was found that for most behaviours there was no difference in recorded observations between the different observation intervals. However, mounting events were not captured as frequently when observations were made hourly versus at 10 minute intervals.

Individuals were not identified in this study and therefore it may be that the observations did not differ between observation intervals as the actual number of cattle exhibiting each behaviour was similar. However, the particular individuals exhibiting each of these behaviours may have been different between particular observation intervals. This was observed in lying behaviour of the cattle, where a pattern in lying behaviour was observed. Previous studies have also found that there appears to be social facilitation to lie down (Coe et al. 1991) and this was certainly shown in the present study. However, rarely would all cattle lie down. Instead, there would usually be period of time were all cattle except 1 or 2 would lie down (usually lasting around 1 hour). During this time, those cattle that were standing would rotate with those lying down. This could be a prey response but in this case was difficult to analyse as individual cattle were not differentiated.

It is important to have a clear understanding of an animal's behaviour under various management conditions in order to fully understand the best management needs for that animal. In this study the

analysis of behaviour of cattle on board a live export vessel has given insight into common behaviours exhibited during a voyage.

On average, cattle sleep for 7 hours per day (Meddis 1975). However, this sleep is classified into true sleep (REM) and “quiet” sleep (NREM). Cattle can sleep without loss of vigil or consciousness (Merrick 1971) and experience REM sleep in short 2 to 8 minute periods (Ruchebusch et al. 1974). Sleeping is a difficult behaviour to observe in cattle particularly when using surveillance quality footage; however, recumbancy can be used as an indication of rest and in some cases sleep. Some recumbancy is necessary to prevent fatigue in cattle and cattle that are deprived of REM sleep will instead exhibit NREM sleep while standing (Arave and Albright 1981). In this study it was found that lying down was observed less at time points early on in the voyage compared to later. This indicates that rest may have been initially disrupted due to new environment stressors, indicated by a higher incidence of physical interaction and standing at the beginning of the voyage. However, by d3 more cattle were observed at each time point lying down indicating acclimatisation to surroundings. On d3 to d5 fewer cattle were standing and more were lying down at the time points observed. Lying time is also affected by previous deprivation. Metz (1985) found that deprivation of lying and eating for 3 to 5 hours led to compensatory lying during the subsequent time periods. It may be that from d 3 to 5 cattle were lying down more frequently as a compensatory response to the long periods of standing prior to shipment (e.g. transport) and during acclimatisation to new surroundings on ship.

Studies have found that a higher proportion of dairy cattle lie down in the very early morning or at night and this is supported by the circadian resting cycle (Overton et al. 2002; Ruckebusch 1972; Kondo et al. 1984). This past research supports findings of the present study that more cattle were observed lying down at night than during the day. In the present study and in studies conducted previously by Coe et al. (1991), cattle were most often observed to be lying down in a sternal recumbent position.

Environmental temperature did not impact the number of cattle observed lying down. Previous studies have found that increased environmental temperature impacts negatively on the proportion of animals lying down (Shultz 1984; Overton et al. 2002; Albright and Arave 1997). This standing response maximises evaporative cooling from body surfaces (Igono et al. 1987). It may be that when temperatures were cooler at the beginning of the study, cattle were less settled in their new surroundings; therefore resulting in a higher number of animals observed standing during this time. The day following the hottest observed day of the voyage (d8) there was a significantly higher number of cattle observed in lateral recumbancy than the first 3 days of the voyage. This behaviour may be linked to heat load of the animal (accumulating from the previous day) and a way of increasing surface area of the body for evaporation without standing. However, animals observed in lateral recumbancy seldom held this position till the next sampling point (10 minutes). Cattle would be unlikely to stay in a lateral recumbent position for a long period as it prevents eructation of gases from the rumen (Coe et al. 1991).

Social grooming is commonly seen in groups of cattle. Cattle will spend several minutes daily in the grooming process (Hafez and Bouissou 1975). In this study, cattle observed self grooming increased following acclimatisation to the new shipboard environment.

Cattle are naturally diurnal feeders and show a distinct grazing pattern with maximum grazing activity around sunrise and sunset (Hafez and Bouissou, 1975). The present study did not show a significant difference in the number of cattle feeding at night compared to during the day. Delivery of feed has been found to result in a larger number of animals eating (Overton et al. 2001). Some time

points observed in the present study coincided with feeding time. At these time points, it was noted that cattle did show more of an interest in the feed resulting in most cattle moving over to the feeder. However, the effect of feeding time on behaviour was not analysed in this study.

Cattle did show a diurnal response to time observed standing, with more cattle observed standing during the day than at night. Previous studies have also shown that cattle show a diurnal rhythm of locomotion with greater activity during daylight hours, especially at sunrise and sunset (Phillips 1993).

Effect of treatment was analysed in horned, polled and mixed pens and similar results were found to those previously in B.LIV.0242 that mixing of horned and polled cattle, within specification, will not have a negative influence on an animal's well-being. In the present study, more cattle in mixed pens were observed lying down and eating and less standing than those in horned and/ or polled pens indicating cattle in mixed pens may have been less disrupted than those in horned and polled pens.

5 Success in achieving objectives

The project progressed well, with the video surveillance system being successful and extremely useful in monitoring animal behaviour. Video footage of 6 shipboard cattle pens has been observed and behaviours successfully recorded at 10 minute intervals for 10 consecutive days. Although video was set to record for the entirety of the voyage there was little data available at night on days 5 to 13. The reason for this lack of footage may have been due to electricity issues as footage was unavailable from both DVR's during the same time periods. Two pens of horned and one pen of polled had footage available till d 13, while the other pens had footage extending until d10. It seems likely that one DVR was turned off at the conclusion of d10 while the other was left to run till d13 before being switched off.

Results from this study and B. LIV 0242 were presented at the XXI International Ethological Conference in Rennes, France. This conference was held on the 19th to 24th August 2009 and involved delegates from over 30 countries. The abstract and poster that were presented are shown in Appendix 2 and 3 respectively. There were a large number of delegates that were interested in the study's results. Most delegates were surprised at the amount of research that is being funded to improve the live export industry in Australia and the high level of standards that are in place for the welfare of livestock during export.

6 Impact on meat and livestock industry – Now and in five year's time

The project will provide a starting point for industry to use for future comparisons between different stocking rates on board ship and between different housing regimes such as feedlot and paddock. The surveillance system will be a useful tool for any further shipboard work in assessing livestock behaviour.

7 Conclusions and recommendations

In this study the analysis of behaviour of cattle on board a live export vessel has given insight into common behaviours exhibited during a voyage. This work has shown that continuous video recording of animals on a commercial shipment for several days is possible, producing video footage of quality that can be analysed for aspects of animal behaviour. In the pens studied, it was shown that behaviour was significantly influenced by time of day, day of voyage and pen composition (horned, polled and mixed horn length). In general, there was more physical activity and interaction at the beginning of the voyage than at the end of the voyage. It is important to have a clear understanding of an animal's behaviour under various management conditions in order to fully understand the best management needs for that animal. Further study is needed to provide rationale behind live export guidelines, particularly in the area of segregation of animals for live export. This study has again given further support to the mixing of horned and polled cattle (within specifications) during live shipment. Assessment of behaviour is an important tool to assess responses of animals to various segregation options.

There were limitations in the present footage. Particularly as individuals could not be differentiated and therefore time spent by an animal exhibiting particular behaviour could not be determined. For example, during periods where the majority of animals were lying down there appeared to be a rotation of animals lying down with those standing; however this was difficult to interpret when unable to identify individuals. There were insufficient replicates of shipments to form conclusions of common cattle behaviour during live shipment, particularly as there were only 2 pens of similar composition. However this study provided a useful snap shot of behaviours exhibited by animals during shipment. It would be useful to do a comparison of shipboard behaviour with that exhibited in a paddock environment as initial review of literature show that there may be similarities in behavioural time budgets of animals during live shipment compared to those in less intensive situations such as a paddock environment.

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9 Appendices

9.1 Appendix 1

Table 3. Daily mean number of cattle as a proportion of total number of focal animals that were standing (not eating or drinking), lying (sternal and lateral recumbancy), exhibiting physical interaction (mounting, pushing, bunting), eating and drinking and self grooming (licking and rubbing) (As shown in figure 4). Means are of 6 pens (days 1 to 10) and 3 pens (days 11 to 13).

Day	Behaviour				
	Standing	Lying	Physical interaction	Eating and drinking	Self grooming
1	0.68±0.01	0.21±0.01	0.01±0.00	0.11±0.01	0.00±0.00
2	0.46±0.01	0.39±0.01	0.02±0.00	0.13±0.01	0.00±0.00
3	0.35±0.01	0.49±0.01	0.01±0.00	0.14±0.01	0.01±0.00
4	0.36±0.01	0.47±0.01	0.01±0.00	0.15±0.01	0.01±0.00
5	0.33±0.02	0.48±0.01	0.01±0.01	0.16±0.01	0.02±0.00
6	0.38±0.02	0.40±0.01	0.01±0.01	0.19±0.01	0.01±0.00
7	0.38±0.03	0.41±0.02	0.01±0.02	0.18±0.01	0.02±0.01
8	0.40±0.03	0.40±0.02	0.02±0.02	0.16±0.01	0.01±0.01
9	0.36±0.04	0.44±0.02	0.01±0.02	0.16±0.01	0.02±0.01
10	0.36±0.04	0.47±0.02	0.01±0.03	0.15±0.01	0.01±0.01
11	0.42±0.04	0.41±0.02	0.01±0.03	0.15±0.01	0.01±0.01
12	0.44±0.04	0.41±0.02	0.01±0.03	0.13±0.01	0.00±0.01
13	0.37±0.05	0.41±0.02	0.02±0.03	0.19±0.01	0.01±0.01

9.2 Appendix 2:

Abstract presented at the International Ethological Conference 2009

Stockman, C.A., Barnes, A. L. And Beatty, D. T. 2009. Impact of sea transport on cattle behaviour: Assessing the welfare and feeding behaviour of horned and polled cattle during export. In *XXXI International Ethological Conference Abstracts*. 421 -422 Rennes, France

Impact of sea transport on cattle behaviour: Assessing the welfare and feeding behaviour of horned and polled cattle during export

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The behaviour of cattle was assessed during a commercial live shipment from Australia to the Middle East. A comparison was made between the behaviour of *Bos taurus* x *Bos indicus* cattle in pens composed only of horned animals (horn length up to 12 cm), only of polled animals, and of a mix of polled and horned animals (horn length up to 12 cm). Two pens each with seven animals were examined for each treatment.

Behaviour was assessed for 15 minute observational periods at 000, 0600, 1200 and 1800 on days 1, 3, 5, 7 and 10. Behaviours measured included feeding events, lying down, physical interaction and non physical threats. A surveillance system recorded footage of the animals using two videos cameras in each pen, connected to a digital video recorder. Footage was recorded at 25 frames/ second for the first 10 days of the voyage. Animals were fed a standard shipper pellet at 3% body weight (as fed). Water was available *ad libitum* in automatic watering troughs. Daily injury, mortality and disease were recorded in each of the experimental pens during the voyage. Total shipment mortality and morbidity was also recorded. Dry bulb temperature, humidity, wet bulb temperature and any problems with ventilation were recorded daily and daily feed intake (total per pen) was recorded in experimental pens.

It was found that there was no significant difference in the behaviours of cattle between the treatment groups. There were no mortalities on board and no injuries were recorded within any of the experimental pens. Feed intake (per day) increased from d 1 to 3 and then remained between 1.5 and 2.5% of initial body weight from d 3 to d 12. There was no significant difference in feed intake between treatments.

Point sampling was also used at 10 minute intervals throughout the first 10 days of the voyage and the behaviours recorded included number of animals lying down, standing, feeding, drinking, and physical interaction between the animals. Two pens of 7 *Bos taurus* x *Bos indicus* cattle were examined, with penning of the animals to Australian Standards for the Export of Livestock (ASEL, 2006).

From analysis of the footage the cattle were lying down at the majority of time points. However, for the first 24 hours there were significantly fewer animals lying down and more physical interaction at each time point than in the final 24 hours recorded.

This work has shown that continuous video recording of animals on a commercial shipment for several days is possible, producing video footage of quality that can be analysed for aspects of animal behaviour. In the pens studied, it was shown that segregating the cattle according to whether or not they had horns was unnecessary; and that during the initial 24 hours there was more physical activity and interaction than for the last 24 hours.

References

Australian Standards for the Live Export of Livestock (2006) Version 2.1 Department of Agriculture, Forestry and Fisheries, Australian Government. http://www.daff.gov.au/animal-plant-health/welfare/export-trade/v2-1

9.3 Appendix 3:

Poster presented at the International Ethological Conference 2009

What is the impact of sea transport on cattle behaviour?

C. Stockman, A. Barnes and D. Beatty

What is the behavioural response of cattle to sea transport?
Does it change over the course of the voyage?

Video cameras were used to monitor behaviour of *Bos tarus* x *Bos indicus* cattle during live shipment from Australia to the Middle – East.

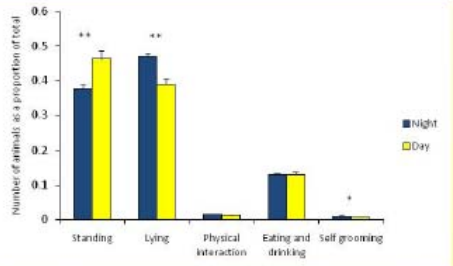

Figure 1. Mean number of cattle as a proportion of total exhibiting behaviours at night (1800 to 600 hours) compared to during the day (550 to 1750 hours).. Within behaviour groups significant difference indicated at $p<0.01$ (**) and $p<0.05$ (*)

Point sampling was used to observe behaviour at 10 minute intervals in 2 pens each of horned, polled and mixed horn length cattle.

There was no difference in behaviour of cattle between the horned, polled and mixed horn length pens.
During the voyage cattle spent the majority of time lying down and standing stationary compared to other behaviours observed ($p<0.01$). More time was spent lying down at night than during the day (Figure 1).

Cattle were observed spending more time standing stationary and less time lying down, eating, drinking and self grooming on day 1 than on d 2 to 10 ($p<0.01$) (Figure 2).

Physical interaction between cattle was observed more often on d 2 than d 1 and the end of the study (d 9 to 10) ($p<0.01$).

Lateral recumbancy was observed more on d 8 and 9 than d 1 to 3 ($p<0.05$).

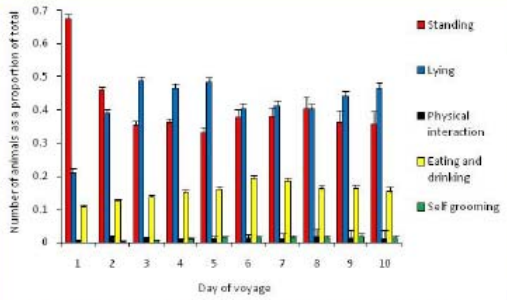

Figure 2. Daily mean number of cattle as a proportion of total exhibiting behaviours

This study found that segregating cattle according to whether or not they had horns was unnecessary; and that at the beginning of the voyage there was more interaction and less eating, drinking and lying down than for the last 24 hours of monitoring.