



Animal Welfare Institute

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Hawaii Department of Agriculture Proposed Regulations for the Transport of Farm Animals by Sea

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General Comments

The Animal Welfare Institute supports the HDOA's intent to require inter-island carriers of animals to submit to the Department a Shipmaster Declaration that includes the number of animals shipped and the number of animals that died or were injured, with details of the deaths or injuries.

Journeys between the islands likely last between 13 and 18 hours, not including time for loading and unloading. Longer journeys by ship, such as those involved in transporting animals between the mainland US and Hawaii, are associated with additional animal welfare issues (e.g., ammonia levels, waste management, effect on animal behavior of prolonged floor motions, ability to exercise and self-groom, requirement for bedding, greater concern for rough seas). Therefore, the following recommendations are relevant to inter-island transport of animals by sea, but would not be considered adequate for journeys to and from the mainland.

Priority Items

Loading Density

Loading density, as expressed by the provided "Interisland Livestock Shipping Standards" document (referred hereafter as the Document) as maximum number of animals per container, is important due to its impact on heat stress, waste production, and impact on animal welfare. Heat stress has been determined to be a major factor affecting animal welfare on sea voyages,¹ and since animals produce heat through their metabolic functions, increased loading density can contribute to heat stress.

The Space Requirement charts included in the Document do not represent appropriate loading densities. To begin with, the charts appear to assume a larger internal area for a shipping container than is the case. For example, under the cattle section, an animal with a body weight of 1,500 lbs. is reportedly allotted 19 sq. ft. The chart indicates that a maximum of eight animals of this weight be loaded into a 20 ft. container or 17 onto a 40 ft. container. However, a 20' standard container has the following internal dimensions: 19' 4.125" x 7' 8.5", with an area of 149.1 sq ft.; for a 40' standard container (including the "Cowtainer"), internal dimensions are: 39' 5.5" x 7' 8.5", with an area 304.3.² Given these areas, to provide 19 sq. ft. of space to a 1,500-lb cow, a 40-ft container should only be

¹ Caulfield, M. P., Cambridge, H., Foster, S. F., & McGreevy, P. D. (2014). Heat stress: a major contributor to poor animal welfare associated with long-haul live export voyages. *Veterinary journal (London, England : 1997)*, 199(2), 223–228. <https://doi.org/10.1016/j.tvjl.2013.09.018>

² <https://www.kkgloballlc.com/client-tools/container-dimensions.html>; http://www.movy.cz/mild/40-feet-high-cube-cowtainer_804.html

loaded with 16 cows, and a 20-ft container with 7 cows. These calculation errors were noted in the Space Requirement charts for all species in the Document.

Furthermore, for some of the weight classes, the area allotment described in the chart falls significantly short of space allowances recommended in the available scientific literature on the subject. For example, calves who are shipped often need to lie down. For short duration transportation, use of the following equation is recommended to determine the minimum area necessary to permit all animals to lie down simultaneously: ³

$$\text{area (m}^2\text{)} = 0.027W^{0.66}, \text{ where } W = \text{liveweight (kilograms)}$$

Utilizing these equations, a 400 lb (181.8 kg) calf should receive a minimum of 9 sq. ft., rather than 7 sq. ft. and a 40' container should be loaded with no more than 33 calves, rather than 46, as indicated by the chart in the Document. It is worth noting that the space requirements in the Document are significantly lower than federal regulations regarding shipping of animals for export.⁴ For example, per the Document guidelines, a 1,500-lb animal would receive only 19 sq. ft. of space, whereas the same animal would require 32.9 sq. ft. of space were he or she to be exported.

A study that examined the effect of space allowance on simulated sea transport concluded that 0.26 sq. meter (2.8 sq. feet) for a 28 kg (61.6 lb.) sheep – a space allowance slightly higher than that in the Document – was “likely to be inadequate” because of the promotion of pushing and aggression between the animals and failure to permit lying behaviors.⁵ A subsequent study found that increasing space allowance to 0.52 sq. meters (5.6 sq. ft.) per 25 kg (55 lb.) sheep improved animal welfare, particularly by providing more opportunity for them to step to keep their balance.⁶ This space allowance is more than twice that provided for in the Document.

Preventing Excessive Heat Stress

Farm animals being transported by sea in containers are particularly susceptible to heat stress, which has been identified in multiple studies as a major contributor to poor welfare during transport by

³ Petherick, J.C., Phillips, C.J.C. (2009) Space allowances for confined livestock and their determination from allometric principles. *Applied Animal Behaviour Science*, 117, (1–2):1-12. <https://doi.org/10.1016/j.applanim.2008.09.008>.

⁴ Animal and Plant Health Inspection Service. (2020). Program Handbook: Exportation of Live Animals, Hatching Eggs, and Animal Germplasm from the United States. <https://www.aphis.usda.gov/regulations/vs/iregs/animals/downloads/9-CFR-Part-91-Program-Handbook.pdf>

⁵ Navarro, G., Col, R., & Phillips, C.J.C. (2018). Effects of space allowance and simulated sea transport motion on behavioural and physiological responses of sheep. *Applied Animal Behaviour Science*, 208: 40-48. <https://doi.org/10.1016/j.applanim.2018.08.009>.

⁶ Navarro, G., Col, R., & Phillips, C. (2020). Effects of Doubling the Standard Space Allowance on Behavioural and Physiological Responses of Sheep Experiencing Regular and Irregular Floor Motion during Simulated Sea Transport. *Animals : an open access journal from MDPI*, 10(3), 476. <https://doi.org/10.3390/ani10030476>

ship.^{7, 8} Excessive heat stress has been identified as an important cause of livestock mortality during transport by sea, especially in sheep.⁹

In addition to the metabolic heat generated by the animals in the container, heat can radiate from hot metal surface and from nearby engine or boiler rooms. While animals have means of regulating their temperature to a degree, excessive temperatures and/or high humidity can diminish their ability to dissipate heat, resulting in illness and death.

The following measures are recommended to prevent excessive heat stress:

- Restricting loading density (see above)
- Loading practices that ensure animals are the last on and first off a docked vessel
- Restrictions on where in the vessel a container can be located, avoiding areas that produce excessive heat
- Requiring proper ventilation (see below)

Ventilation

Ventilation is essential to the welfare of all animals transported by ship as it provides fresh air (including oxygen) and removes excessive heat, humidity, and noxious fumes that may build up from the accumulation of urine and feces. Therefore, it is strongly recommended that the regulations address the provision of ventilation for all species transported by sea. The Document only discusses ventilation in the context of cattle, stating “Window openings should be at least 7% of the area of the side panel surface to ensure proper ventilation.” However, openings representing only 7% of the side panel surface may not ensure adequate air flow. It is imperative that the placement of containers and other cargo on the vessel not obstruct air circulation through the container openings. Furthermore, under certain temperature conditions, especially when the ship is stationary or the container is on a closed deck, merely having windows may not provide sufficient ventilation.¹⁰

It is essential that ventilation be provided during loading, unloading, and transport, and that a back-up ventilation system (including emergency power supply) be available and in good working order. Potential minimum standards of ventilation include requiring a minimum of 30 air changes/hour with air speed of at least 0.5 m/s (1.64 ft./s).¹¹ The adequacy of any mechanical ventilation should be evaluated using the engineering report.

⁷ Caulfield, M. P., Cambridge, H., Foster, S. F., & McGreevy, P. D. (2014). Heat stress: a major contributor to poor animal welfare associated with long-haul live export voyages. *Veterinary journal (London, England : 1997)*, 199(2), 223–228. <https://doi.org/10.1016/j.tvjl.2013.09.018>

⁸ Phillips, C. J., & Santurtun, E. (2013). The welfare of livestock transported by ship. *Veterinary journal (London, England : 1997)*, 196(3), 309–314. <https://doi.org/10.1016/j.tvjl.2013.01.007>

⁹ Collins, T., Hampton, J. O., & Barnes, A. L. (2018). A Systematic Review of Heat Load in Australian Livestock Transported by Sea. *Animals : an open access journal from MDPI*, 8(10), 164. <https://doi.org/10.3390/ani8100164>

¹⁰ Caulfield, M. P., Cambridge, H., Foster, S. F., & McGreevy, P. D. (2014). Heat stress: a major contributor to poor animal welfare associated with long-haul live export voyages. *Veterinary journal (London, England : 1997)*, 199(2), 223–228. <https://doi.org/10.1016/j.tvjl.2013.09.018>

¹¹ Phillips, C. J., & Santurtun, E. (2013). The welfare of livestock transported by ship. *Veterinary journal (London, England : 1997)*, 196(3), 309–314. <https://doi.org/10.1016/j.tvjl.2013.01.007>

Condition of Animal Containers

The current Document features several requirements that address the environment within the animal shipping containers. AWI recommends that these items be included in the HDOA regulations to ensure the health and safety of transported animals. This includes: a solid roof to protect animals from sun, rain, and to contain animals; structurally sound containers without protruding or sharp objects that could injure animals; nonslip flooring to prevent slips and falls; and a minimum of 2 inches of absorptive bedding to maintain animal comfort. We also recommend that the regulations address waste management during the journey to maintain the integrity of the environment within the containers (such as the nonslip flooring and absorptive bedding).

Provision of Food and Water

According to the Document, for trips lasting less than 24 hours, only horses are required to have feed available, and it is recommended, but not required for pigs. For trips lasting less than 24 hours, water is required only for pigs traveling more than 12 hours (though it is not specified when “transit” officially begins, i.e., at time of entering the container or when the ship departs the first port) and for horses. “Some form of watering system” is required in case a delay prolongs the journey.

Fasting prior to and during transport, for a short period, may have some benefits to certain animals, as it decreases fecal contamination and, for pigs, may decrease travel sickness and gastric compression of the vena cava.¹² However, prolonged food and water deprivation can be harmful to animals; for example, it causes dehydration (especially when water loss is accelerated by heat stress) and hunger, and can increase risk of enteric infections due to changes in rumen function.¹³

For some groups of animals, even relatively short periods can be detrimental. For example, after 18 hours of fasting, pigs’ show behavioral indicators of frustration and fatigue due to hunger.¹⁴ Young calves and cull animals may be at particular risk of negative effects on health and welfare. Depending on their age, unweaned calves with free access to milk feed on average 12 times per day, or every 2 hours. The transport process increases energy expenditure above baseline. Thus, they are rapidly susceptible to hunger, and mild to moderate dehydration is likely to develop during transport, potentially increasing risk of mortality post-shipping.¹⁵

The regulations should require access to water for all animals undergoing a journey longer than 12 hours and should specify that the system of water delivery be one to which the animals have been acclimated. As described in regulations for transport of animals by ship for export, the system should be designed to minimize soiling of pens and to prevent animal waste from contaminating water. For

¹² Rioja-Lang, F. C., Brown, J. A., Brockhoff, E. J., & Faucitano, L. (2019). A Review of Swine Transportation Research on Priority Welfare Issues: A Canadian Perspective. *Frontiers in veterinary science*, 6, 36. <https://doi.org/10.3389/fvets.2019.00036>

¹³ Hogan, J. P., Petherick, J. C., & Phillips, C. J. (2007). The physiological and metabolic impacts on sheep and cattle of feed and water deprivation before and during transport. *Nutrition research reviews*, 20(1), 17–28. <https://doi.org/10.1017/S0954422407745006>

¹⁴ Rioja-Lang, F. C., Brown, J. A., Brockhoff, E. J., & Faucitano, L. (2019). A Review of Swine Transportation Research on Priority Welfare Issues: A Canadian Perspective. *Frontiers in veterinary science*, 6, 36. <https://doi.org/10.3389/fvets.2019.00036>

¹⁵ Roadknight, N., Mansell, P., Jongman, E., Courtman, N., & Fisher, A. (2021). Invited review: The welfare of young calves transported by road. *Journal of dairy science*, 104(6), 6343–6357. <https://doi.org/10.3168/jds.2020-19346>

specific classes of animals, such as calves less than 8 months old and pigs, feed should be required if a journey is anticipated to exceed a specific length. Since troughs and other apparatuses for food and water will take up room in the container, the stocking density should be reduced accordingly.

Fitness to Travel Criteria

It is essential that animals be inspected by an official prior to being loaded onto the ship to assess their fitness to travel. Allowing shippers, who are not experts in animal health assessment, self-certify on this matter creates a conflict of interest that will inevitably lead to shipment of unfit animals. In addition to the criteria of unfitness described in the Document (injured, obviously ill, unable to bear weight on all 4 limbs, are likely to give birth during transport, or those that have not been weaned and are traveling separate from the mother), the regulations should forbid the transport of lame animals (for whom adjusting to the constant floor motion would be impossible or very uncomfortable), females traveling without young that have given birth within the previous 48 hours, animals that are pregnant and within the final 10% of their gestation period at the planned time of unloading, and animals with unhealed wounds from recent surgical procedures such as dehorning, castration, or branding. Many of these criteria are included in federal regulations regarding travel by ship of animals for export.

If an animal is deemed unfit for travel, arrangements should be made by the owner or agent for the humane care and treatment of the animal.

Means of Monitoring Animals and Caring for Animals Becoming Sick or Injured, and Humane Euthanasia

To ensure adequate animal safety and welfare, animals aboard a ship should be regularly observed by at least one qualified individual with previous experience with sea vessels that have handled the kind(s) of livestock to be carried and who can intervene in the event of an emergency. Unless a means of humanely euthanizing sick or injured livestock is available, procedures must be in place for stopping at the nearest port in the event of an emergency.