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ANIMAL CARRIERS

SEMINAR WORK

SPLIT, May 2021.

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STUDIJ: CARGO HANDLING II

ANIMAL CARRIERS

SEMINAR WORK

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SPLIT, May 2021.

ABSTRACT

In this study, animal carriers, legal regulations, standards, and ships used in animal transport are investigated. According to investigated researches, the strictest regulations are created by Australia. The total number of animal carriers which is 150, represents only %0.034 of the total DWT capacity in the World. Livestock ships, usually built by converting from other types of ships, can be built in two different types, closed and open—their capacity changes between 2,000 DWT to 25,000 DWT.

Keywords: animal carriers, livestock vessels

CONTENTS

1. INTRODUCTION

According to the International Maritime Organization, more than 80% of world trade is carried out by sea today. Maritime transport and ports have an important place in world trade and economy, both for the transportation of consumed goods and for the supply of raw materials for production. The globalization of the world economy, the cross-border production and consumption relations, and the advantages offered by sea transport played a role in this increase. These advantages are cheaper sea routes than air, land, and railways, less pollution to the environment, lower energy consumption, and the ability to transport large quantities of raw materials at once and safely. In maritime transport, specific cargo and ship types are developed. Products such as iron ore, coal, and grain constitute dry cargo and are subject to dry bulk cargo transportation. Liquid bulk shipping includes products such as crude oil, petroleum products, and gas. In container transportation, which enables the vehicle of different types of products together and easier to transfer, the loads are transported in large-sized containers made according to international standards. Ships are also classified according to the type of cargo they carry, such as dry cargo, liquid cargo (tanker), container, bulk cargo ships, and Ro-Ro vessels that carry wheeled vehicles. The listed types of ships constitute the most used ship types in world trade and more specialized ship types. According to 2019 data, in the total of 96,698 ships, the most common type are general cargo ships with 19,041. The number of general cargo ships are followed by bulk carriers with 11,619 and tankers with 10,953. (UNCTADSTAT).

With the increase of the livestock industry in the 1950s, the need to transport live animals to greater distances by sea arose. Livestock carriers, which are generally built with the method of converting old ships to meet this need, provide the transportation of animals by sea.

Figure 1 Conversion from the container ship to livestock ship (Sefine Shipyard).

Ships that are used for the purpose of transferring cattle across the seas are known as livestock carriers or cattle ships. Without the help of such ships, livestock transportation and livestock

shipping would have been extremely difficult or completely impossible. The animals carried in such livestock carriers include sheep, goats, cows, and other forms of cattle.

Today, more than half of the livestock trade in the World is carried out by the sea. (AVUSTRALYA'DA DENİZYOLU İLE CANLI HAYVAN TAŞIMACILIĞI VE MEVZUAT DÜZENLEMELERİ, 2019). Despite this, only 150 of the 96,698 ships in the World are livestock carriers. Of these 150 livestock carriers, 1 is over 40,000 DWT, 5 are between 20,000-40,000 DWT and 7 are between 10,000-20,000 DWT. The total carrying capacity of 150 ships is approximately 700,000 DWT, and this rate constitutes 0.034% of the World total DWT trade volume (UNCTADSTAT) which was 2.1 Billion DWT as of January 2020.

Figure 2 World's biggest animal carrier "MAWASHI EXPRESS"

2. TRANSPORTATION OF ANIMALS BY SEA

Livestock transportation is increasing its importance in the World today, as livestock productivity varies from country to country. Inadequate and improper transportation causes deaths and diseases in animals, leading to a decrease in food quality and economic losses. Due to the vitality of the cargo carried, planning and information are of great importance to minimize animal loss and maximize profit by prioritizing animal health and welfare. It is one of the most sensitive areas of logistics as live animals are transported. Although it is possible to transport all kinds of creatures, cost and time analysis are crucial issues to be considered in terms of profitability.

The most stringent regulations apply to animal carriers. Many countries have rigorous requirements, mostly followed organizations:

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) (www.defra.gov.uk)
- United States of America Animal and Plant Health Inspection Service (APHIS) (www.aphis.usda.gov)
- Argentina Secretaria Nacional de Sanidad Animal (www.senasa.gov.ar)
- Australian Department of Agriculture, Fisheries, and Forestry (DAFF) (www.daff.gov.au)

Being an important example of live animal transportation, Australia is the leading country in this regard and has set strict rules for livestock ships. The most accepted and recognized certification received by ships carrying animals in the world AMSA "Australian Maritime Safety Authority" is awarded by Australia and demands the highest standards in livestock transport. Livestock transport rules by sea are the rules that emerge after the long-term experience. These rules are developing more and more every day, and every country should have a developer contribution to the issue. In this part of the study, rules determined by Australia regarding the transportation of animals will be given. In the next section, the characteristics of ships carrying live animals will be discussed.

2.1. SOME REGULATIONS IN TERMS OF ANIMAL HEALTH

Animal transportation by sea takes a long time. For this reason, animal health becomes essential. Transport of animals in an efficient and low-risk manner has been adopted as a principle. The following regulations are given in the Animal Welfare Act in 1999 to keep the animals healthy. According to this:

- A suitable and sufficient amount of feed and water should be provided.
- Enough place to sleeping should be provided.
- There should be enough place to animals' movements.
- Physical handling should be avoided to avoid injuries and stress.
- There should be protection from important diseases and rapid diagnosis.

The Ministry requires Animal Welfare Export Certificates (AWECs) for animal export.The information contained in the document must include the following information:

- Animal export application.
- Capacity.
- Number and types of animals.
- Age of animals and their physical condition.
- Advised transport method.
- The duration and conditions of the voyage.
- The susceptibility of animals to stress and diseases.
- Other countries' requirements.

- Relevant international standards.
- The date the animals left the country.
- Other documents requested by the authority.

2.2. LOADING DECLARATION

The ship should be ready for control 48 hours before. The information to be notified is as follows:

- Ship's name.
- The day the ship will be ready for inspection.
- Name of the port where the ship will be inspected.
- Description of cattle, number, breed, the weight of the animals.
- Port of destination, estimated voyage time, ports of call.
- Food and freshwater details.

2.3. LOADING PLAN

The loading plan includes the location of the animals on the ship and the loading details. The loading plan should consider the following information:

- The state of the ship during the voyage.
- The location of the animals on board.
- Details of the loading of feeds and animal need to the ship, showing that the animals will be fed well and of high quality.

2.4. PRE-EXPORT PROCESS

The necessary procedures during loading and unloading activities should be as follows:

- Loading and unloading should be carried out and managed in a way that does not endanger animal health. For this:
    - There must be sufficient handrails and equipment. Animals must be prevented from escaping or loading difficulties by means of guardrails.
    - Ship should have suitable walking paths and anti-skid coating.
    - Loading should be at close range for animals, and suitable points should have large gathering areas.
    - Ship should be suitable for animal protrusions.
- No force should be applied to animals, and loading and unloading should be done without difficulty, without stressing the animal. If electroshock is used, it should not be used more than once. Electroshock should never be applied to the head and genital area.
- Materials such as fences and handrails should be used in a minimum amount without putting the animals in a bad situation. Appropriate and sufficient spaces should be provided for the animal to sleep and rest. There should be sufficient amount of drinking water and troughs.

- The exporter should create plans to show the feed and grass needs of the animals and ensure that the animals are fed before and after export in a way that does not impair animal health. Feeds and herbs should be nutritious in accordance with the specified rules. It should be ensured that each animal consumes enough meal and grass. Established mechanisms for automatic feeding should be monitored and controlled at least every 24 hours. Feeding animals should be provided in such a way that animals should not be allowed to be injured or have health problems.
- Nutritional management is critical in the adaptation of the animal to the ship and transportation conditions.
- It is not appropriate to keep the animals tightly and densely before export. For this reason, accumulation points should be established that provides a large area for the animal to lie down and walk around. The site should be such that it can be cleared from the aggressive animal in case of pet fighting, and there should also be ease of feeding and watering.
- Exporting of pregnant animals should be done in the first months of pregnancy. Animals that are pregnant for more than six months must obtain permission for export. Animals with neck wounds should not be exported.
- Horn wound length should not exceed 7.5 cm. An animal with a bleeding horn should not be transported.
- Before the animals arrive at the loading port, final checks should be made at the loading points of the farm, and animals that do not comply with the export criteria and instructions or do not have health certificates should not be exported.

2.5. SHIP'S STATUS

The suitability of the ship for animal transport and the settlement and living activities of the animals on board should be suitable for animal health. For this reason, the inspection of the ship, including the previous animal transport expedition, is made to determine the adequacy of the vessel. In addition, she must have the following ship documents:

- Valid ship documents suitable for animal transport must be class certificates and survey examinations.
- Have valid cargo ship safety documents and up-to-date approvals of surveillance.
- Valid Australian livestock transport document (ACCL) Documentation issued by the Australian maritime safety authority.

Shipbuilding and deck construction should prioritize animal health and safety. Previous time records, especially illness, etc., should be considered by the authority. The ship's structure should be such that it allows the animal to be fed, watered, ventilated, and rested.

Before the animals are loaded on the ship, the ship is inspected by the surveyors, the compliance of the loading should be checked with the ship's standards. The surveyor must then grant the ship permission to transport livestock. The shipowner or agent must inform the Surveyor at least 6 hours before the loading process is completed. After loading, Surveyor makes its final inspection,

and if the ship is eligible, the Surveyor should report its suitability, and the ship should be ready for the voyage.

2.6. VENTILATION

The health and vitality of animals are essential. The clean air needs of the animals should be met continuously with fans in the places where the animals are located; even during loading and unloading, the need for clean air should be completed. Ammonia odor should not exceed 25 ppm; 10-15ppm is acceptable.

2.7. DRAINAGE

It is imperative to quickly and cleanly evacuate the wastewater and dirt of the places where animals live, sleep, and spend time. The ship must have a good drainage system and be equipped with this system.

2.8. ANIMAL FENCES AND DESIGNS

The barriers and fences surrounding the animals should be designed by considering the situations that may cause danger due to injury, cutting, or the collapse of the guardrails while the animals struggle with each other. Guiding rails and other materials in crossing paths should be carefully constructed and organized.

2.9. CONTAINER DESIGN AND LOCATION ON THE DECK

Containers modified for transporting animals are sometimes used on cargo ships to transport a small number of animals.

- Animals cannot be transported in containers without the surveyor permission.
- The animal should be located away from ship machinery, exhaust, and other hazardous environments.
- A container should be placed where it is possible to observe, feed and water the animal.
- There should be sufficient light and ventilation.

In addition to these, the container must meet the following criterias:

- It should not have a slippery floor.
- External doors must not be accidentally opened and must be solid.
- Waste must be able to be stored.
- Containers should be built without dangerous protrusions.
- There should be labels and markings on the exterior of the container showing the following situations:
    - Livestock carried.
    - Careful handling is required.
    - It must always have “this way up” tag.

- The compartments in the container should be sized to separate large cattle and have fast unloading mechanisms. When the animals are in a difficult situation, the compartments should be in a structure that can be easily separated.
- There should be a minimum space for an animal to be comfortable.

2.12. STOCKING DENSITY

When keeping animals together, there should be compatibility, i.e., gender and pregnancy should be considered. Fences should be enough to create an environment that separates the animal (sick or injured) from the others when needed. The following rules must be followed:

- All animals must be able to lie down and stand up without the risk of injury.
- For animals over 600 kg, there should be extra space and additional sleeping space.
- When placing the animals, a per animal assessment should be made.
- Animals should be grouped according to their weight, class, and gender.
- Aggressive, angry animals should be divided into separate groups.
- There should be enough space for each animal (Table 1 shows below).
- Cattle should be separated from other animals by barriers.

Table 1 shows the minimum areas required for the cattle to be exported. Conditions needed for animals to live in more places: Age, gender, pregnancy, voyage time, and environmental conditions (e.g., temperature and humidity).

Live Weight (kg)	Area for each cattle (m^2)
100	0.77
150	0.84
200	0.90
250	1.04
300	1.18
350	1.31
400	1.45
450	1.62
500	1.79
550	1.90
600	2

Table 1 Areas for each cattle (AVUSTRALYA'DA DENİZYOLU İLE CANLI HAYVAN TAŞIMACILIĞI VE MEVZUAT DÜZENLEMELERİ, 2019).

2.13. FOOD

- It should not be less than the amount required for body functions needed throughout the voyage.
- 12.5% more of the total feed should stocked.
- It should be appropriate within the purposes defined and required by other rules.
- Personnel in charge should ensure that sufficient and calculated feed and animal food are loaded on board and check that they are loaded correctly.
- It should be checked whether the feeding tests of the loaded feeds comply with the data of the laboratory certificates (obtained by the exporter) and the metabolic energy (ME) values.

When the following conditions are met, the remaining feeds from the previous expedition may remain in the feed tanks or tanks if suitable for the consumption of cattle:

- Tanks should be emptied every 90 days.
- Feed that is not suitable for consumption should be entirely emptied before new meals arrive.
- Accurate records of emptying tanks should be kept and available for inspection.
- Feeding management should ensure that all cattle can access and feed themselves during feeding times in each pen.
- Feeding should be in a way that eliminates or does not cause digestive disorders, bloating, etc.

2.14. WATER

During the voyage, clean and safe water should be available for all animals. Sufficient water storage and capacity should be available onboard for adequate irrigation.

Water in the amount of 10% more than the amounts stated in Table 2 should be on board. The ship’s freshwater production equipment should be in sufficient quantity and functioning as follows:

- Freshwater production activities should have an alarm system connected to central observation panels. There should be a system that functions and informs in case of malfunction.
- During the voyage, there must be a mechanism to test the quality of the water.
- There should be mechanisms that control the taste.
- The test form should test the fluctuations of values - documentation of tests and results should be made.

Live weight (kg)	Liters per day per animal
Up to 200	20
200-300	25
300-400	30
Above 400	35

Table 2 Minimum water requirements according to the weight of the cattle (AVUSTRALYA'DA DENİZYOLU İLE CANLI HAYVAN TAŞIMACILIĞI VE MEVZUAT DÜZENLEMELERİ, 2019)

2.15. FLOOR AND LAYING MATERIALS

It is recommended to provide suitable floors and sleeping places for the animals. It should be ensured that the floor is not slippery, dry and that the animal is not left on the wet floor. The floor and bedding materials should be changed frequently, fresh bedding materials should be brought, and the floor should be constantly refreshed.

2.16. LOADING ARRANGEMENTS AND FACILITIES

The aim should be to load animals without injury and stress. Loading regulations should follow the practices below:

- Port facilities should have lighting, accommodation, shelter, and facilities should meet the needs of animals.
- Plans that include unexpected events should provide solutions to problems that arise during cargo handling.
- Loading and unloading facilities should be designed and configured to allow animals to stay and transport safely. At a minimum, the following are strongly recommended:
    - Side barriers should be high and long enough to prevent animals from escaping.
    - The walking paths of the animals should be created to prevent the animals from slipping and making their walking easier.
    - Appropriate arrangements should be made at the loading point of entry to the ship.
    - There should not be any protrusions that the animal cannot cross at the loading points.
    - The loading and unloading facilities of animals should be organized to prevent the gaps between the ship and the loading vehicles during loading and unloading.
    - Since the tide will affect the loading ramps, it should be taken into consideration at the port when planning loading and unloading.
    - When unloading the animals, the port surface must be the same as the level of the vehicle.
    - If animals are unloaded in containers with cranes, crane operators must be warned and informed that the containers are livestock containers. The operator must avoid rapid and sharp unloading that will harm or stress the animals.

2.17. LOADING AND UNLOADING

When moving animals, force must be exerted with the least amount of strain. Since the keeper of animals has knowledge about the animals' behavior, they can minimize the amount of handling required for loading and unloading animals. When the animals are ready to load, it is recommended that the animals be separated according to size, gender, age, and horned or not, and loaded accordingly.

2.18. PROCEDURES FOR A CAPTAIN

Before the ship's departure, the animal exporter must convey the instructions in writing to the ship's captain or his representative, covering the following concerns:

- The amount and type of animal feed and the frequency of feeding according to animal categories during the voyage should be stated.
- Requirements for the cleaning of pens should be specified.
- In urgent cases or when necessary, contact phones with the exporter should be provided 24 hours a day, seven days a week.
- Reporting procedures should be specified during and after the voyage.

2.19. MANAGEMENT OF ANIMALS DURING THE VOYAGE

The comfort and health of animals must be preserved throughout the voyage.

2.19.1 VETERINARY

Whether the veterinarian should accompany the animals before the voyage is discussed between the exporter and the ministry officials, under the proposed export conditions. The situation in which the shepherd is allowed to lead the animals and reach the veterinarian whenever he wants is recommended.

2.19.2 NUMBER OF SHEPHERDS

One shepherd is recommended for every 1500 animals. If the veterinarian is accompanying the voyage, he can be counted as a shepherd.

2.19.3 SURVEILLANCE OF ANIMALS

It is recommended that the animals be observed at least four times a day. If stress is observed in animals, appropriate observation hours and numbers should be arranged.

2.20. VETERINARY EQUIPMENT

Depending on the number of animals transported, the ship should have veterinary tools and equipment, and the equipment should be loaded on the ship before departure.

2.21. CULLING ANIMALS

Gerekirse, hayvanlara hızlı ve insanca ötenazi yapılmalıdır. Ötenazi, veteriner hekim veya çoban tarafından mümkün olan en kısa sürede acı çekmeden insanca uygulanmalıdır.

2.22. REMOVING THE DEAD ANIMAL

An animal that dies before loading or when it arrives at the port should be removed from the port in accordance with local health and environmental conditions. No animal dead should be destroyed without the consent of the veterinarian or shepherd. In the event of the animal's death at sea, the animal's ear tag must be taken before the cadaver is destroyed. The cadaver should be thrown into the sea at distances of 12 to 100 miles and the animal should be cut into small pieces.

2.23. REPORTING THE VOYAGE

The navigation report is written by the veterinarian or shepherd, completed, and signed by the exporter. It is the exporter's responsibility to submit the information to the relevant Ministry by the exporter within 20 days after the voyage is completed. The relevant Ministry will not grant the exporter's new export permits without the report.

2.24. CONSIDERABLE SITUATIONS

The following events are noteworthy, but incidents cannot be limited to these; -If the fatality rate on the ship is equal to or greater than 0.5%

- The recipient does not receive the animals at the destination port.
- The suspicion of a diagnosis of epidemics at the delivery of the animals.
- The ship's buoyancy problems.
- The ship's failure and the desire to return to the port.
- The pirate or terrorism incidents.

The exporter must notify the relevant Ministry within 24 hours of the incident, along with the resolution of the incident.

3. SHIPS USED IN THE TRANSPORTATION OF LIVESTOCK AT SEA

Live animals may be transported on various types of ships. Sea transferring method of animals is more common on short navigations (e.g., ferries) and usually involves relatively small numbers of animals. Livestock carriers are those ships, which specialize exclusively in the transportation of large numbers of animals together with their requirements for the voyage (food, water, medication, etc.). Voyages on livestock carriers generally last from three days to three or four weeks.

The construction of livestock carriers requires highly complex engineering and a creative flair. In addition to the shipbuilding process itself, attention must also be paid to other aspects, such as the correct and proper accommodation of animals at sea (mostly sheep and cows), the cleaning and maintaining, and the supply of food, water, and fresh air. Highly durable materials are needed to handle the feces and humid conditions on board (NauticExpo).

There are mainly two different types of animal carriers. The difference is not about the carrying capacity but about the storage aspect of the livestock that these ships carry. In terms of the

weight-carrying capacity, the ships used for livestock transportation can haul and carry around 2000 to 2500 deadweight tonnage (DWT). This is relatively high especially considering the amount of cargo required to be ferried in the form of livestock.

Today, the new-built livestock ship almost non-existent. In general, container and RORO ships that are 15-20 years old turn into animal ships after the conversion processes we call ‘conversion’. Dozens of fans work for ventilation, depending on the size of the ships: feeder systems, irrigation systems, high-pressure water washing systems for cleaning, extra lighting, etc. Many systems increase loads of the ships. Consequently, the costs of operating these ships increase.

Typically, container ships with one main engine and three auxiliary engines (generators) can be transformed into animal ships, depending on their power, but an average of 3 more generators are added.

For instance, a 7000-ton container ship (120-160 meters on average) is taken. With severe changes in the cargo space of this ship, the height of the freeboard is increased approximately ten floors until the bridge's height. In each compartment, sections that can accommodate 6 to 8 cattle are made. The systems we just mentioned are added. The floor is painted with a special non-slip paint that is mixed with grid sand and applied. For the operation of the systems and the operation of the ship (cranes, fans, surveillance systems, alarms, etc.) 3 generators with an average power of 1000 kW are built. Accommodation for seafarers involved in loading, unloading, and feeding these animals is built. Electrical and electronic systems, lighting, and structural changes cost a total of around 20 million dollars. In a middle-class shipyard, the certification process takes 6-8 months with all equipment and conversion operations, stability calculations, load tests, and drawings. It is possible to transport an average of 7000-9000 cattle with a ship of this scale (Kastanyola, 2018).

3.1 OPEN LIVESTOCK CARRIER VESSELS

These types of livestock carrying vessels store or pen the animals openly. ‘Openly’ does not mean that the animals are left without proper containment. It means that the cages or storage areas for the animals are situated on the deck-side area of the ship (MarineInSight, 2019).

Ventilation is a critical factor in the transport of live animals. When animal pens become poorly ventilated, oxygen depletion and a build-up of toxic gases develop rapidly. Circumstances vary according to ambient conditions, but a failure of ventilation systems in some tropical conditions can result in the asphyxiation of animals in as little as two or three hours (Wikipedia , 2021).

This type of animal penning ensures that all the animals get ample breathing space, and there is no possibility of suffocation. But the major disadvantage of this sort of penning is that since these pens are located on the decks, the continuous sea winds that blow increase the possibility of the animals getting adverse reactions to such winds (MarineInSight, 2019). On the other hand, in practice, natural ventilation alone is not adequate for all situations. One obvious limiting factor would be in following wind conditions at sea when the air moves at the same speed as the ship. In

that condition, the natural airflow ventilating the animal pens can be insufficient. On most open livestock carriers, there is also some additional mechanical ventilation installed in critical zones and appropriate backup equipment for emergencies. (Wikipedia , 2021). These are why in order to solve this problem, the concept of Closed or Mechanical Livestock Carrier Vessels emerged (MarineInSight, 2019).

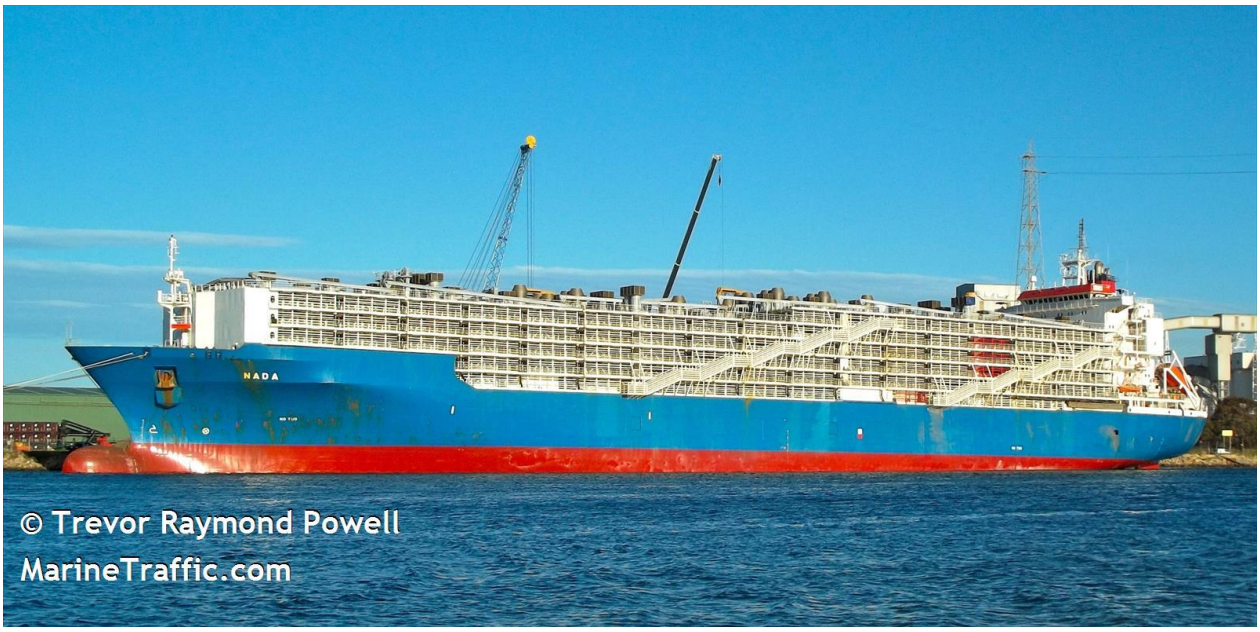

Figure 3 Open type animal carrier "NADA"

3.2 MECHANICAL (CLOSED) LIVESTOCK CARRIER VESSELS

The continuous winds and the ill-effects that these winds tend to have on the livestock led to the concept of mechanized or closed pens. These closed pens are not located on the deck but are situated in the ship's interior (below decks), where the winds cannot reach the animals. Such closed pens require continuous monitoring because if they are carelessly left untended, then due to the lack of cleanliness and hygiene, the animals could contract diseases and die even before reaching the intended port of destination (MarineInSight, 2019).

This has the advantage of providing a more controlled environment in which the animals and their feeding and watering arrangements are sheltered from adverse weather. However, ventilation is almost entirely dependent on mechanical systems, and construction rules require specific ventilation standards for the internal spaces. These usually stipulate the minimum number of air changes per hour. Regulations also require backup systems and auxiliary power arrangements, which are separate from the main engine room. This ensures that adequate ventilation, lighting, watering, and feeding can be maintained for the animals in the event of fire or machinery failure in the main engine spaces (Wikipedia , 2021).

It has to be noted that such livestock carriers also needed to carry vast and enormous amounts of food, water, and any other material that could be required by the animals at any point in time.

Also significant is the number of crew present in such cattle ships. Since the animals are more in number, the amount of crew also needs to be more so as to effectively handle the livestock present in the ships (MarineInSight, 2019).

Figure 4 Closed type animal carrier "AWASSI EXPRESS"

3.3 SIZES AND CAPACITIES

The size of this type of ship varies, according to market demands in different parts of the World at other times. In the latter half of the twentieth century, the principal livestock exporting nations were Australia and New Zealand, and the leading importers were nations in the Middle East. Vessels engaged in that trade have ranged in size from 2,000 tonnes deadweight (DWT) to 25,000 DWT. The limiting factors on ship size are complex. Bigger vessels can achieve economies of scale in their operations and require more extensive port facilities to handle the more significant numbers of livestock likely to be loaded or discharged.

Livestock carriers carry more crew members than conventional cargo ships of a similar size. Experienced stockmen are an essential part of the crew. The total number of stockmen required varies according to the number of animals and depends on factors such as the arrangement of the livestock pens and the extent of automated systems installed for feeding and watering.

During the last three decades of the twentieth century, there was a progressive trend towards large vessels carrying more significant numbers of animals. Prior to that, a significant limitation had been freshwater storage capacity on ships. To maintain condition, average-sized cattle require at least forty liters of water per head per day. Sheep need at least four liters per head, per day. Developments in water production technology (saltwater evaporators or reverse-osmosis systems) eventually led to livestock carriers with equipment capable of producing up to 600 tonnes of freshwater per day. Sheep and cattle also require fodder amounting to at least 2% of their body weight per day. Livestock carriers must carry sufficient feedstuffs for the maximum length of the voyage and adequate reserves for emergencies.

Medium-sized vessels with a capacity of about 30,000 to 40,000 sheep (or 3000 to 4000 head of cattle) are a typical size for this type of ship. However, during the last two decades of the twentieth century, there were a small number of sheep carriers that had a capacity of 130,000 sheep. There were at least two other large livestock carriers that specialized in combined cargoes of cattle and sheep. One had a capacity of about 7,000 cattle and 70,000 sheep, and the other could carry 14,000 cattle and 20,000 sheep. In 2007 the livestock carrier *Deneb Prima* was loading cargoes amounting to 20,000 cattle and 2000 sheep.

The numbers detailed above are only general indications. The space allocated to animals on livestock carriers is officially regulated according to their size and weight ranges. Larger and heavier animals are given proportionately more space per head.

4. CONCLUSION

Livestock transport can be done by road, air, rail, and sea. The rules of transportation are common and can be adapted to all types of transport because animals' needs are the same both on land and at sea. Livestock transport vessels, where animal transportation by sea is carried out at high tonnages, are among the ships that the rules must be followed strictly because disease and simple neglect on this ship can cause the death of thousands of animals.

Livestock ships are the only type of ships on which a living creature is transported as “cargo.” Almost every procedure used in other cargo ships is applied on these ships, but there are additional procedures.

It cannot be said that the hygiene and safety situation of live animal carriers that have not received a certificate from the competent authorities is heartwarming. In addition, tremendous pressure is exerted by non-governmental organizations on ships that do not follow the procedures correctly.

The characteristics of these ships are similar to high-deck vessels such as container ships. Since the features of the animals to be loaded are clear, the animals are kept by separating them according to their weight and the area they need.

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