



## RELATIONSHIP OF SHIP SANITATION WITH THE EXISTENCE OF COCKROACH VECTORS IN PASSENGERS IN TANJUNG PERAK SURABAYA PORT

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### ABSTRACT

The ship is a small community consisting of various passengers. Opportunities for passengers interact with each other, and various foods or drinks, as well as various public facilities are very likely to occur. Pandemics that occur are caused by poor sanitation, such as ventilation, inadequate ship lighting, poor hygiene, food contaminated with viruses, scattered waste that is not disposed of in trash bins, and the lack of medical personnel is thought to be the cause of the outbreak. The purpose of this study was to analyze ship sanitation with the presence of cockroach vectors on passenger ships at the Port of Tanjung Perak Surabaya. The type of research used in this research is observational analytic with cross sectional approach. The population of the researchers is that all passenger vessels leaning on Surabaya's Tanjung Perak Port are 40 ships. The research sample was taken by simple random sampling with a sample of 36 ships. Analysis of the data used is chi-square. Data analysis showed a relationship between ship sanitation and the presence of cockroach vectors on passenger ships with a value of  $0.00 < 0.05$ . The results showed that ship sanitation showed a large proportion (61.1%) of low risk of the source of transmission of the disease so that it could improve the health status of passengers. The existence of cockroach vectors showed that most (66.7%) were not found so as not to increase the spread of a disease due to cockroach vectors. The conclusion in this study is that there is a relationship between ship sanitation and the presence of cockroach vectors. The advice given is to improve inspection of ship sanitation regularly by officers of the Class I Surabaya KKP Tanjung Perak Region.

**Keywords:** *Sanitation, Vessel, Cockroach Vector*

## **Background**

The ship is a small community consisting of various passengers. Opportunities for passengers interact with each other, and various foods or drinks, as well as various public facilities are very likely to occur. As a result, the ship becomes the location of the occurrence of disease, because in the environment of the ship allows the transmission of disease from person to person that can be a source of disease outbreaks. Passengers can also be carriers for sick people, vectors or microbes from one place to another (Mouchtouri et al., 2010)<sup>[1]</sup>. Based on data on ship sanitation assessments at the Class I Surabaya Health Office in February 2016 there were 2 vessels (3.77%) out of 53 vessels, in April there were 3 ships (4.83%) of 62 vessels, and in June as many as 6 (10.16%) of 59 vessels. In May 2017 there were 5 ships (4.50%) from 111 vessels and in November there were 4 ships (4.34%) out of 92 ships. In February 2018 there were 3 ships (3.70%) out of 81 ships and in March 4 ships (4.70%) out of 85 ships were found to have cockroach vectors. Vector control on ships is set according to the performance target by the Class I Surabaya Port Health Office with a percentage of 100%, which means it is free of vectors. Ship sanitation assessments are conducted regularly every 6 months.

Good vessel sanitation conditions will reduce the risk of health problems and poor vessel sanitation conditions can increase the risk of health problems and invite the presence of vectors in the ship (Wulandari K, et.al., 2017)<sup>[2]</sup>. The vectors on board can increase the spread of a disease on the ship so that it is necessary to take action on vessel sanitation by desinsection, disinfection, decontamination and fumigation (Putri, et.al., 2017)<sup>[3]</sup>. The existence of vectors in the ship can affect the health condition of the crew (ABK) and passengers. The existence of vectors can be found on ships with poor vessel sanitation conditions and can cause transmission of internal diseases. The vector on the ship is a cockroach. Cockroaches are one of the mechanical vectors, which play a role in delivering diseases caused by viruses, bacteria, protozoa, worms and fungi that can cause diarrhea, dysentery, cholera, and typhoid fever. Cockroaches can cause allergies, with the effects of skin dermatitis, eyelid edema, itching and other allergic reactions (Yudhastuti, 2011)<sup>[4]</sup>.

According to the Republic of Indonesia Minister of Health Regulation No. 40 of 2015, sanitation checks are carried out on all spaces and media on ships which include kitchens, food assemblies, warehouses, hatches, sleeping rooms, drinking water, liquid waste, solid waste, engine rooms, medical facilities, ballast water and other areas examined. Boat sanitation checks to obtain sanitation certificates are conducted regularly every 6 (six) months.

## **Research Methods**

The type of this study was observational analytic with cross-sectional design. The method of sampling is simple random sampling. The study was conducted in the Tanjung Perak Port of Surabaya in February to March 2019. The population in this study were all 40 passenger ships that leaned on the Tanjung Perak Port of Surabaya and a sample of 36 ships.

Primary data was obtained by conducting a study of vessel sanitation and assessment of the presence of cockroaches by using a checklist observation sheet that was already available from the Class I Surabaya Health Office. Data analysis using univariate and bivariate data analysis with Chi-Square test.

## Research Results

1. Table 1: Frequency Distribution of Kitchen Sanitation on Passenger Ships at Tanjung Perak Port, Surabaya

No	Kitchen Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Clean	23	63,9	13	36,1
2.	Good air exchange	30	83,3	6	16,7
3.	Good lighting	28	77,8	8	22,2
4.	Good washing method	31	86,1	5	13,9
5.	Free of insects and mice	26	72,2	10	27,8

Source: Primary Data, 2019

Based on Table 1, information was obtained that almost all kitchen sanitation was found in components of good washing methods (86.1%).

2. Table 2: Sanitary Frequency Distribution of Food Raft Room on Passenger Ships at Tanjung Perak Port in Surabaya.

No	Food Raft Room Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Clean	34	94,4	2	5,6
2.	Good air exchange	32	88,9	4	11,1
3.	Good lighting	27	75	9	25
4.	Good storage method	34	94,4	2	5,6
5.	Free of insects and mice	33	91,7	3	8,3

Source: Primary Data, 2019

Based on Table 2, information is obtained that almost all of the food assembly room sanitation is located on clean components and good storage methods (94.4%).

3. Table 3: Warehouse Sanitation Distribution on Passenger Ships at Tanjung Perak Port, Surabaya

No	Warehouse Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Clean	31	86,1	5	13,9
2.	Good air exchange	25	69,4	11	30,6
3.	Good lighting	25	69,4	11	30,6
4.	Free of insects and mice	32	88,9	4	11,1

Source: Primary Data, 2019

Based on Table 3, information is obtained that almost all warehouse sanitation is located in insect-free and rat-free components (88.9%).

4. Table 4: Frequency Distribution of Palka Sanitation on Passenger Ships at Tanjung Perak Port, Surabaya.

No	Palka Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Clean	26	72,2	10	27,8
2.	Free of insects and mice	26	72,2	10	27,8

Source: Primary Data, 2019

Based on Table 4, it was found that most hatch sanitation was in clean and insect-free components (72.2%).

5. Table 5: Sanitation Frequency Distribution of Rooms on Passenger Ships at Tanjung Perak Port, Surabaya.

No	Rooms Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Clean	36	100,0	-	-
2.	Good air exchange	28	77,8	8	22,2
3.	Good lighting	30	83,3	6	16,7
4.	Free of insects and mice	32	89,9	4	11,1

Source: Primary Data, 2019

Based on Table 5, information is obtained that all room sanitation is in the clean component (100%).

6. Table 6: Distribution of Frequency of Liquid Waste Sanitation on Passenger Ships at Tanjung Perak Port, Surabaya.

No	Liquid Waste Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Liquid waste disposal facilities meet the requirements	23	63,9	13	36,1
2.	Liquid waste management is carried out	2	5,6	34	94,4
3.	Free of insects and mice	30	83,3	6	16,7

Source: Primary Data, 2019

Based on Table 6, information is obtained that almost all liquid waste sanitation is located in insect-free and rat-free components (83.3%).

7. Table 7: Distribution of Frequency of Solid Waste Sanitation on Passenger Ships at Tanjung Perak Port, Surabaya

No	Solid Waste Sanitation	Indicator			
		Qualify		Not eligible	
		n	%	n	%
1.	Solid waste disposal facilities meet the requirements	25	69,4	11	30,6
2.	Free of insects and mice	27	75	9	25

Source: Primary Data, 2019

Based on Table 7, information is obtained that most of the solid waste sanitation is located in free components of insects and mice (75%).

8. Table 8: Sanitation Frequency Distribution of Ships on Passenger Ships at Tanjung Perak Port in Surabaya.

No	Ships Sanitation	n	%
1.	High Risk	14	38,9
2.	Low Risk	22	61,1
Total		36	100,0

Source: Primary Data, 2019

Based on Table 8, information is obtained that most ship sanitation with low risk (61.1%).

9. Table 9: Frequency Distribution of Cockroach Vector Presence on Passenger Ships at Tanjung Perak Port, Surabaya.

No	Cockroach Vector	n	%
1.	Found	12	33,3
2.	Not Found	24	66,7
Total		36	100,0

Source: Primary Data, 2019

Based on Table 9, information was obtained that most of the presence of cockroach vectors were not found (66.7%).

10. Table 10: Cross tabulation of vessel sanitation with the presence of cockroach vectors on passenger ships at the Tanjung Perak Port of Surabaya.

No	Ships Sanitation	Cockroach Vector				Total	
		Found		Not Found		N	%
		n	%	n	%		
1.	High Risk	11	78,6	3	21,4	14	100,0
2.	Low Risk	1	4,5	21	95,5	22	100,0
Total		12	33,3	24	66,7	36	100,0
Pearson Chi-Square						$p = 0,000$	
Phi						value = 0,766	
OR (95% CI)						77	

Source: Primary Data, 2019

Based on Table 5.13, it was found that almost all of the research (95.5%) had a low risk in terms of vessel sanitation on passenger ships in the Tanjung

Perak Port of Surabaya, which amounted to 21 ships. The chi-square test results obtained a probability value (p-value) of  $0,000 < 0,05$ . These results can be concluded that  $H_0$  is rejected, so there is a significant relationship between the relationship of ship sanitation with the presence of cockroach vectors on passenger ships at the Port of Tanjung Perak Surabaya.

The strength of a very strong relationship between variables seen in the Phi value obtained value of 0.766, which means that there is a very strong relationship between the variables of vessel sanitation and the variable presence of cockroach vectors on passenger ships at the Port of Tanjung Perak Surabaya. The statistical test results obtained an OR value (Odd Ratio) of 77,000 which means sanitation of high-risk vessels will have a chance 77 times as a place for developing cockroach vectors on passenger ships in the Tanjung Perak Port of Surabaya compared to low risk vessel sanitation.

## **Discussion**

### **1. Kitchen Sanitation**

The results of this study indicate that almost all (86.1%) samples had good washing methods. It can be interpreted that the sample on passenger ships at the Port of Tanjung Perak Surabaya has a good washing method that is equipped with hot water lines and special cleaning materials. The results of the study by Sucipto (2015)<sup>[5]</sup>. That a healthy and safe washing technique is to separate all dirt from the equipment to be washed so that it does not clog the drains then place it in place for dirty tools, soak the equipment for a few moments and wash it with cleaning detergent. Washing is done by rubbing the dirty part repeatedly until it is not slippery (food remnants that are stuck), after washing it is enough then rinse the appliance with running water, do disinfection using hot water with a temperature requirement of 82°C for 2 minutes and 100°C for 1 minute.

The kitchen is a place for processing food ingredients and washing places for kitchen equipment. Food and beverages provided are then processed, stored and served to passengers hygienically to minimize the spread of vector-borne diseases such as dysentery, cholera, poisoning and so on. Kitchen sanitation requirements must be in accordance with the Handbook for Inspection and Issue of Ship Sanitation Certificate where a clean kitchen does not look dirt, neatly arranged, and garbage is disposed of in its place. Kitchen air exchange which is either smoke, exhauster, or regular ventilation. Lighting in the kitchen is good if it can be used to read newspapers. Washing methods in a good kitchen are equipped with hot water lines and special cleaning agents and are free of insects and mice.

### **2. Sanitary Food Assembling Room**

The results of this study indicate that almost all (94.4%) samples of food assemblies are found in the cleanliness and storage methods. It can be interpreted that the sample on the passenger ship at Tanjung Perak Port in Surabaya, the clean food assembling room does not look dirt, neatly arranged and the garbage is disposed in its place and the way of storing food according to the food ingredient category.

There is one of the ships on cooked rice placed on the floor without being closed so that there are lots of flies and cockroaches. This is in line with the results of Mandagie's research (2011)<sup>[6]</sup> stated that the place of serving food in KM. Queen Maria in the form of a small shelf has a rough surface so it is difficult to clean, cutlery and cooking utensils and other items are not neatly arranged. Cooked foods are not stored in a clean and closed container but are only left in a pan and not closed tightly so that the food is easily contaminated with flies and other impurities. The container where the rice is stored in the container has a lid in fact where the rice is placed on the floor.

### **3. Warehouse Sanitation**

The results of this study showed that almost all (88.9%) warehouse samples were found in insect and mouse free components. It can be interpreted that the sample on passenger ships at the Port of Tanjung Perak Surabaya as a place for the supply of food ingredients derived from animals and plants.

Erlani's research (2015)<sup>[7]</sup> that the method of storage that meets food sanitation hygiene requirements is storage must be carried out in a special place (warehouse) that is clean and meets the requirements and items to be arranged properly so that it is easy to take, does not

allow insects or mice to nest, avoid flies / mice and for products that are easily decayed or damaged to be stored in cold temperatures. In line with the research conducted by Nurfaiah (2012)<sup>[8]</sup> that all warehouses to provide food meet the requirements.

#### 4. Hatch Sanitation

The results showed that most (72.2%) hatch samples were found in clean components and were free of insects and mice. It can be interpreted that the sample on the passenger ship at the Port of Tanjung Perak Surabaya has fulfilled the conditions with a clean hatch condition that does not show dirt, is neatly arranged and garbage is disposed of in place and no insects and rats or other disturbing animals are found.

This is in accordance with Harahap's research (2016)<sup>[9]</sup> Hatch conditions have met the requirements of being clean and free of insects or mice, so as to reduce the risk of transmitting diseases due to insects and disturbing animals, because the presence of vectors on ships can cause the Public Health Emergency of International Concern (PHEIC) which is an extraordinary event health threat for other countries.

#### 5. Room Sanitation

The results showed that all (100%) samples of the room were found in clean components. It can be interpreted that the sample on the passenger ship at the Port of Tanjung Perak Surabaya in the cleaning component did not look neatly arranged in the dirt and the garbage was disposed of in its place which meant that it had met the requirements. The room is a bed that can be used by sailors, officers, passengers and crew members (ABK).

Berdasarkan penelitian Sofyan (2017)<sup>[10]</sup> that adequate air and lighting exchanges and cleanliness can guarantee health, as well as the welfare and safety of ABK and passengers. If lighting is naturally insufficient, mechanical lighting is provided by using fluorescent lights. Lighting equipment in ships must not use candles or oil lamps. The purpose of the exchange is to enter fresh air and remove dirty air. If the room does not have a good air exchange system, it will cause several conditions that can harm health such as shortness of breath.

#### 6. Liquid Waste Sanitation

The results showed that almost all (83.3%) samples of liquid waste were found in bebase components of insects and mice. It can be interpreted that the sample on the passenger ship at the Tanjung Perak Port in Surabaya was not found by insects and rats or other disturbing animals that landed in liquid waste.

Based on Wirdah's research (2006)<sup>[11]</sup> that activities related to ship activities such as anchoring the landing of ships and the marketing of caught fish, loading sea needs, building and repairing ships, and repairing fishing equipment have the potential to become a source of environmental pollution. The negative impact of the existence of anchoring anchoring activities, landing and marketing of fish and other activities in the port environment in the form of solid and liquid waste is the cause of environmental pollution. Results of research by Culin and Bielic (2016)<sup>[12]</sup> also stated that the dominant waste produced from ships was plastic, scattered used oil and liquid waste.

#### 7. Solid Waste Sanitation

The results showed that most (75%) samples of solid waste contained insects and mice-free components. It can be interpreted that the samples on passenger ships at the Tanjung Perak

Port of Surabaya were not found by insects and rats or other disturbing animals that landed in trash cans.

This is in accordance with the Handbook for Inspection of Ships Sanitation Certificate. Mutiarani's research (2017)<sup>[13]</sup> that trash cans can be used in food preparation and storage areas, only for immediate use. The trash can is in a special room, separated from the place of food processing, easy to clean, resistant to rodents (rodent) and termites (vermin), has a handle, is made waterproof, equipped with a tight lid.

Ships that dock or lean at Bajomulyo port in Juwana are Porsen vessels and longline vessels at TPI 1 (Fish Auction Place), and trawl vessels and pole and liner vessels in TPI 2. Pollution of the marine environment occurs due to waste or waste originating from from land such as household waste around the port, industrial waste disposal, and oil discharge from motorized vehicles every day which falls into the marine environment which is the result of Mardiantari research (2017)<sup>[14]</sup>.

#### 8. Ship Sanitation

The results showed that most (61.1%) were low risk. It can be interpreted that the sample on passenger ships at the Port of Tanjung Perak Surabaya has a low risk of the source of transmission of the disease so that it can improve the health status of passengers.

Based on Putri's research (2017) the results of the assessment on the inspection of ship sanitation conditions indicate that all vessels examined have good sanitation conditions because the number of sub-variables fulfills the requirements of  $\geq 30$ , while there are two vessels that have a high risk of health problems that are said to be low if the ship meets sanitation inspection requirements and no signs or presence of vectors are found. The results of the Harahap study (2016) shows that 40.00% of motorized vessels have a high risk level of health problems for disease transmission because ships are transportation devices that can quickly move from one region to another, even to other countries, which may bring public health risk factors, namely all factors has the potential to cause disease transmission, while 60.00% have a low risk level of health problems for transmission of disease to human health.

#### 9. Existence of Cockroach Vector

The results showed that most of the (66.7%) no cockroach vectors were found. It can be interpreted that the sample on passenger ships at the Port of Tanjung Perak Surabaya has fulfilled the requirements and has a low risk of health problems so as not to increase the spread of a disease due to cockroach vectors.

The existence of a cockroach vector in Thohir's study (2018)<sup>[15]</sup> on passenger ships in the province's peacock port, Banten shows that 15 passenger vessels were not found in the presence of vectors and rodents and 15 passenger vessels were found to be vectors and rodents. According to Putri (2017), the presence of vectors was found during the inspection, the vector found in the form of an American cockroach on one cargo ship and one passenger ship. On cargo ships found cockroaches on the kitchen floor, while on passenger ships found cockroaches in some rooms such as kitchens, bathrooms, and decks. Based on the theory the Handbook for Inspection and Issue of Ship Sanitation Certificate states that no vectors and animal transmitting diseases should be found on the ship.

#### 10. Analysis of the Relationship of Sanitary Ships with the Existence of Cockroach Vector on Passenger Ships at the Port of Tanjung Perak Surabaya



The results of cross tabulation in table 5.13 between vessel sanitation variables with the presence of cockroach vectors with the chi-square test showed that Continuity Correction 0,000 <0,005 was significant so that it could be concluded that H0 was rejected, meaning that there was a significant relationship between vessel sanitation and vessel cockroaches. passenger at Tanjung Perak Port Surabaya, with strength of relationship (0.766) means that the strength of the relationship is very strong and the odd ratio of 77,000 means that high risk vessel sanitation will have a chance 77 times as a place for developing cockroach vectors on passenger ships in Tanjung Perak Port, Surabaya.

According to Mahmoud's research (2013)<sup>[16]</sup> showed that the humidity and cockroach density in the hospital had a negative relationship which meant that the lower the humidity the higher the cockroach population. Cockroaches found in humidity ranged from 50% -78% with the highest number of cockroach densities found in rooms with 75% -78% humidity. In line with Amalia's research (2010)<sup>[17]</sup> Cockroaches are most often found at 85% -91% humidity.

### Conclusion

Ship sanitation is related to the presence of cockroach vectors on passenger ships in the Tanjung Perak Port of Surabaya. Has a very strong relationship strength.

Suggestions given Improve routine inspection of vessel sanitation by Class I Surabaya Port Health Office officers in Tanjung Perak Working Area.

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