JPPIPA 9(11) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Several Factors Contributing toward Flies Density at Fishing Port of Karangsong, Indramayu Regency

Marina Makbul[1*], Martini[2], Nur Endah Wahyuningsih[2]

[1] Master Program in Environmental Health, Faculty of Public Health, Diponegoro University, Semarang, Indonesia.
[2] Faculty of Public Health, Diponegoro University, Semarang, Indonesia.

Received: September 22, 2023
Revised: November 10, 2023
Accepted: November 25, 2023
Published: November 30, 2023

Corresponding Author:
Marina Makbul
marinasuswanto22@gmail.com

DOI: 10.29303/jppipa.v9i11.5432

Abstract: Flies are mechanical vectors for several pathogens that can cause diarrhea. Fly density figures are used to assess environmental sanitation in a place. The aim of this study is to analyze the density of flies at the Karangsong Indramayu fish port. This study was conducted in July – August 2023. This study used an observational survey method with a cross sectional study design. Flies were caught using fly grills and traps and the catching area was divided into 3 zones. The variables analyzed were fly activity, temperature, humidity, wind speed, light intensity and fly density. There was a relationship between fly activity patterns in each zone and fly density ($p< 0,05$). There was a relationship between the environmental temperature of each zone ($p< 0,05$). There was a relationship between environmental humidity and fly density in each zone ($p< 0,05$). There was no relationship between wind speed and fly density for each zone ($p> 0,05$). There was a relationship between light intensity and fly density for each zone ($p< 0,05$). Factors contributing to the high density of flies at the Karangsong Indramayu Fish Port are fly activity patterns, temperature, humidity and light intensity.

Keywords: Density figure; Flies; Mechanical vector; SANITATION

Introduction

Flies are mechanical vectors for several pathogens that can cause diarrhea (Husin, 2017; Khamisepour et al., 2108). Also, flies are insects that have many roles, such as in decay, as predators, parasites and some act as biological vectors. Flies are considered quite dangerous for humans and other animals because one fly can carry more than 100 pathogens (Zhang, 2018; Liu et al, 2023).

Fly density data is used to evaluate the environmental sanitation of a location. The more or denser the flies, the worse the environmental cleanliness in that location and the less hygienic the surrounding human behavior (Gerry, 2020; Masyhuda, 2017). Chemical control activities were carried out in the way of spraying to reduce the density rate as a response to the survey findings that did not meet the requirements due to it was believed that the higher the fly density rate would result in high diarrhea morbidity rates at Fish Port of Karangsong, which was based on data on the history of diarrheal disease in the Karangsong Region. There will be 145 cases of diarrhea by January to December 2022 (KKP, 2022).

Fish port of Karangsong is a fish port in the Indramayu working area which contributes to the high density of flies, this is due to sanitary conditions that do not meet requirements such as management of fish carcasses, waste that has not been processed according to standards so that it becomes a brooding place for flies and the existence of a Fish Market that contribute to the presence of flies (KKP Bandung, 2021). Efforts to control flies have been continuously carried out by using insecticides. This study aims to determine factors related to fly control efforts seen from bioecological observations and investigations (behavior/activity patterns, fly density). Environmental conditions (temperature, humidity, wind speed, light intensity) in relation to the level of fly density at the Fish Port of Karangsong Indramayu.

How to Cite:
Makbul, M., Martini, M., & Wahyuningsih, N.E. (2023). Several Factors Contributing toward Flies Density at Fishing Port of Karangsong, Indramayu Regency. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 9687–9692. https://doi.org/10.29303/jppipa.v9i11.5432

Method

This study was conducted in July – August 2023. This study used an observational survey method with a cross sectional study design. The samples in this study were flies that landed on the fly grill and flies caught in the fly trap. Determination of observation points is divided into 3 areas, namely Zone I, Zone II and Zone III at the Karangsong Indramayu Fish Port.

Measuring fly density using a fly grill is explained as follows: flies that land on the fly grill are then observed for 30 seconds. This was repeated 10 times at each observation point. From the 10 observations, the 5 highest values were taken, then the average of the 5 values was calculated which was recorded in the form, then interpreted. Measuring fly density using a fly trap is explained as follows: flies that land on the fly trap are then observed for 3 hours over a period of 9 hours. This is done to determine fly activity patterns. During the observation, temperature, humidity, light intensity and wind speed were also measured (Bell et al., 2019).

Analysis of the influence of environmental factors and fly activity on fly density was analyzed using the Chi Square test (X2) with a confidence level of 95% or α=0.05.

Result and Discussion

Based on the results, it showed that the pattern of fly activity in Zone I which includes the Karangsong Fish Market, TPI Karangsong and TPS PPI Karangsong has the highest population index at 07.00-10.00 WIB, namely 13.36, then in the Zone II area which includes Jetty 1, Jetty 2 , Jetty 3 has the highest population index at 07.00-10.00 WIB, namely 1 and the Zone III area which includes the Karangsong Beach Parking Area, Cafetaria, Karangsong Beach Area with the highest population index at 07.00-10.00 WIB, namely 2.36 (Table 1).

Table 1. Fly activity patterns based on the time period of each location

Observation sites	Period	Population Index
Zone I	07.00-10.00	13.36
	10.00-13.00	8.80
	13.00-16.00	2.84
Zone II	07.00-10.00	1.00
	10.00-13.00	0.64
	13.00-16.00	0.04
Zone III	07.00-10.00	2.36
	10.00-13.00	1.60
	13.00-16.00	0.16

In this study, high fly densities were found at several points where fly grills were placed, such as those that have the potential to become fly breeding places (near trash cans, sales areas, canteens and others). In stalls where fish are sold which have a high level of fly density, the cause is poor environmental sanitation, such as a large number of rubbish bins that do not comply with the provisions and there are piles of rubbish around the selling location, the condition of the rubbish bins being open and not watertight, which can give rise to unpleasant odors. which can attract flies and other disease-causing animals.

Table 2. Relationship between fly activity patterns and fly density

Observation Sites	*Sig. (2-tailed)*
Zone I	0.000
Zone II	0.000
Zone III	0.000

In Zone I, it shows that there is a relationship between fly activity patterns and fly density with a value of p = 0.000 < α (0.05). In Zone II, it shows that there is a relationship between fly activity patterns and fly density with a value of p = 0.000 < α (0.05). In Zone III, it shows that there is a relationship between fly activity patterns and fly density with a value of p = 0.000 < α (0.05).

Research conducted by Oematan et al., (2019) states that flies are often observed, especially from morning to noon from 09.00 to 12.00. After that, the activity of most flies will decrease and will increase again in the afternoon between 16.00 – 18.00. It is possible for flies to be trapped in the trap considering that flies are attracted to the color on the NZ1 fly trap which is blue. Apart from that, the flies seemed to be looking for shelter from the very hot direct sun in the afternoon at 12.00 and took cover behind the NZ1 trap.

Table 3. Measurement of environmental temperature at each observation location

Observation sites	Period	Temperature (°C)
Zone I	07.00-10.00	28.38
	10.00-13.00	33.68
	13.00-16.00	32.80
Zone II	07.00-10.00	28.22
	10.00-13.00	31.92
	13.00-16.00	31.04
Zone III	07.00-10.00	29.00
	10.00-13.00	31.60
	13.00-16.00	32.00

Based on the Table 3, it is known that Zone I, which includes the Karangsong Fish Market, TPI Karangsong and TPS PPI Karangsong, has the highest temperature at 10.00-13.00 WIB, namely 33.68oC. Zone II, which includes Jetty 1, Jetty 2, Jetty 3, has the highest temperature at 10.00-13.00 WIB, namely 31.92oC. Zone

III which includes the Karangsong Beach Parking Area, Eating Area, Karangsong Beach Area, the highest temperature is at 13.00-16.00 WIB, namely 32.00oC.

Table 4. Relationship between environmental temperature and fly density

Observation sites	*Sig. (2-tailed)*
Zone I	0.029
Zone II	0.048
Zone III	0.039

The statistical test results obtained in Zone I showed that there was a relationship between environmental temperature and fly density with a value of p = 0.029 < α (0.05). In Zone II, it shows that there is a relationship between environmental temperature and fly density with a value of p = 0.048 < α (0.05). In Zone III, it shows that there is a relationship between environmental temperature and fly density with a value of p = 0.039 < α (0.05). From the temperature results obtained it can be said that the optimal temperature for flies to live, where flies begin to actively fly at a temperature of 15^{o}C and the number of flies will increase at a temperature of 20 ^{o}C - 30^{o}C and will decrease in number at a temperature of 35^{o}C - 40^{o}C or 15^{o}C - 20^{o}C, then the flies are inactive or will disappear at temperatures <10 ^{o}C and at temperatures >40 ^{o}C the flies will die (Wulandari, 2017).

Table 5. Humidity measurements for each observation location

Observation sites	Period	Humidity (%)
Zone I	07.00-10.00	36.36
	10.00-13.00	29.38
	13.00-16.00	45.90
Zone II	07.00-10.00	57.00
	10.00-13.00	38.08
	13.00-16.00	43.22
Zone III	07.00-10.00	58.84
	10.00-13.00	36.74
	13.00-16.00	45.00

Based on the results of research conducted, it is known that Zone I, which includes the Karangsong Fish Market, TPI Karangsong and TPS PPI Karangsong, has the highest humidity, namely 45.90%. Zone II which includes Jetty 1, Jetty 2, Jetty 3 has the highest humidity, namely 57.00%. Zone III which includes the Karangsong Beach Parking Area, Eating Area, Karangsong Beach Area, the highest humidity is 58.84%. Where this shows that on average there is optimal humidity for the life of flies and based on the data it states that the more optimum the humidity in a location, the fly activity begins to increase. Suitable and optimum air humidity for flies is between 45% - 90%. Flies prefer places with high humidity around 70% - 90%. The optimal activity of flies is at 90% humidity (Syamsuddin dan Sumarni, 2019).

Table 6. Relationship between humidity and fly density

Lokasi pengamatan	*Sig. (2-tailed)*
Zone I	0.040
Zone II	0.048
Zone III	0.047

The statistical test results obtained in Zone I showed that there was a relationship between humidity and fly density with a value of p = 0.040 < α (0.05). In Zone II, it shows that there is a relationship between humidity and fly density with a value of p = 0.048 < α (0.05). In Zone III, it shows that there is a relationship between humidity and fly density with a value of p = 0.047 < α (0.05). Based on the average humidity results obtained, it shows that it has optimal humidity for flies to live. Where the optimum air humidity for flies is between 45% - 90%. Flies prefer places with high humidity, namely around 70% - 90%. The optimal activity of flies is at 90% humidity. Air humidity is related to air temperature, where the higher the air temperature, the air humidity will decrease so that fly activity is reduced (not optimal) (Syamsudin, 2019).

Based on research results, if the humidity is high, the fly density level is low and as the day progresses, the humidity decreases and the fly density becomes higher. Air humidity is related to temperature conditions. As the day progresses, the temperature and light intensity increase and the humidity decreases (not optimal) so that fly activity decreases. And this can also be caused by the location being outside which is directly exposed to sunlight, causing low humidity.

The results of research conducted by Susilowati (2017) stated that there was a significant relationship between humidity and the level of fly density in the Tembalang District Traditional Market with a p-value of 0.000 < 0.05. Where the majority of humidity measurement results obtained were 24 (53.3%) which fell into the appropriate or optimal category for flies, namely where flies were active at 70% humidity.

Table 7. Measurement of wind speed at each observation location

Observation sites	Period	Wind Speed
Zone I	07.00-10.00	1.06
	10.00-13.00	1.06
	13.00-16.00	0.94
Zone II	07.00-10.00	1.34
	10.00-13.00	1.44
	13.00-16.00	1.46
Zone III	07.00-10.00	2.18
	10.00-13.00	1.44
	13.00-16.00	2.58

Based on the results of the research carried out, it is known that in Zone I which includes the Karangsong Fish Market, TPI Karangsong and TPS PPI Karangsong the highest wind speed is 1.06. In Zone II which includes Jetty 1, Jetty 2, Jetty 3 the highest wind speed is 1.46 lux, while Zone III which includes the Karangsong Beach Parking Area, Eating Area, Karangsong Beach Area the highest wind speed is 2.58.

Table 8. Relationship between wind speed and fly density

Observation Sites	*Sig. (2-tailed)*
Zone I	0.754
Zone II	0.948
Zone III	0.527

Relationship between wind speed and fly density with a value of p = 0.754 ≥ α (0.05). In Zone II, it shows that there is no relationship between wind speed and fly density with a value of p = 0.948 ≥ α (0.05). In Zone III, it shows that there is no relationship between wind speed and fly density with a value of p = 0.527 ≥ α (0.05). The results of this research do not match the results of research in Semarang, namely that the stronger the wind (away from optimum), the less active the flies are (Masyhuda, 2017).

Table 9. Measurement of light intensity at each observation location

Observation sites	Period	Light intensity
Zone I	07.00-10.00	61480
	10.00-13.00	86940
	13.00-16.00	43480
Zone II	07.00-10.00	61300
	10.00-13.00	87540
	13.00-16.00	39220
Zone III	07.00-10.00	66900
	10.00-13.00	85220
	13.00-16.00	41680

Based on the results of the research carried out, it is known that in Zone I which includes the Karangsong Fish Market, TPI Karangsong and TPS PPI Karangsong the highest light intensity is 86940 lux. In Zone II, the light intensity which includes Jetty 1, Jetty 2, Jetty 3 is the highest, namely 87540 lux. At the Zone III observation location which includes the Karangsong Beach Parking Area, Eating Area, Karangsong Beach Area, the highest light intensity is 85220 lux. The light intensity criteria are divided into two, namely low (light intensity <1921 lux) and high (light intensity ≥1921 lux).

Table 10. Relationship between light intensity and fly density

Observation Sites	*Sig. (2-tailed)*
Zone I	*0.044*
Zone II	*0.035*
Zone III	*0.018*

The statistical test results obtained by Zone I showed that there was a relationship between light intensity and fly density with a value of p = 0.044 < α (0.05). Zone II shows that there is a relationship between light intensity and fly density with a value of p = 0.035 < α (0.05). Zone III shows that there is a relationship between light intensity and fly density with a value of p = 0.018 < α (0.05).

The results of this research are in accordance with the results of research conducted by Ramadhani (2019) regarding factors related to fly density in Purwodadi Village, Margoyoso District, Pati Regency, where the pattern of fly activity, as the day progresses, the intensity of light increases and the density of flies decreases. As the day progresses, the light intensity increases along with temperature conditions, while the humidity decreases so that it is not optimal for fly activity. By bridging hygienic and unhygienic settings, adult flies spread bacteria from their source to neighboring humans, food, water, and animal facilities. In livestock facilities, fly populations thrive. The hazard to the health of humans and animals is heightened when flies have unfettered access to sources of pathogens, such as waste and dung, due to inadequate manure management and poor sanitation (Amira et al., 2021; Nayduch et al., 2023; Zahn and Gerry, 2020).

Conclusion

There is a relationship between fly activity patterns in each zone and fly density at the PPI Karangsong Indramayu port in an effort to control risk factors for fly vector-borne diseases with a value of p = 0.000. There is a relationship between the environmental temperature of each zone and the density of flies at the PPI Karangsong Indramayu port in an effort to control risk factors for fly vector-borne diseases in Zone I with a value of p = 0.029, Zone II with p = 0.048 and Zone III with p value = 0.039. There is a relationship between humidity and fly density in each zone at the PPI Karangsong Indramayu port in an effort to control risk factors for fly vector-borne diseases in Zone I with a value of p = 0.040, Zone II with a value of p = 0.048 and Zone III with p value = 0.047. There is no relationship between wind speed and fly density in each zone at the PPI Karangsong Indramayu port in an effort to control risk factors for fly vector-borne diseases in Zone I with a value of p = 0.754, Zone II with a value of p = 0.948 and

Zone III with p value = 0.527. There is a relationship between light intensity and fly density in each zone at the PPI Karangsong Indramayu port in an effort to control risk factors for fly vector-borne diseases in Zone I with a value of p = 0.044, Zone II with a value of p = 0.035 and Zone III with p value = 0.018.

Acknowledgments
We thank to all staff who support this study.

Author Contributions
Conceptualization, M.M., M. and N.E.W; methodology, M.M; software, M.M. and M.; validation, M. and N.E.W.; formal analysis, M.M.; investigation, M.M. and M..; resources, M.M.; data curation, M.M., M.., N.E.W.; writing—original draft preparation, M.M.; writing—review and editing, M.M., M.. and N.E.W.; visualization, M.M.; supervision, M.and N.E.W; project administration M.M; funding acquisition, M.M and M. All authors have read and agreed to the published version of the manuscript.

Funding
This research received no external funding.

Conflicts of Interest
The authors declare no conflict of interest.

References

Amira, K,. Zina Nasr. Faïek. (2021). First Data On The Daily And Seasonal Activity Patterns Of Stomoxys Calcitrans (Diptera: Muscidae) Under Mediterranean Semiarid Climate In A Dairy Cattle Farm In Tunisia. *International Journal of Tropical Insects Science*. 1-11. Retrieved from https://link.springer.com/article/10.1007/s42690-021-00662-w

Oematan, A., Sakan, G., Moenek, D., Koten, B., & Lenda, V. (2020). Studi keragaman jenis dan pola aktivitas harian lalat di peternakan sapi semi ekstensif di kelurahan tuatuka kecamatan kupang timur kabupaten kupang. *Jurnal Kajian Veteriner*, *7*(2), 101-106. https://doi.org/10.35508/jkv.v7i2.1980

Bell, M., Irish, S., Schmidt, W. P., Nayak, S., Clasen, T., & Cameron, M. (2019). Comparing trap designs and methods for assessing density of synanthropic flies in Odisha, India. *Parasites & vectors*, 12(1), 75. https://doi.org/10.1186/s13071-019-3324-z

Gerry, A. C. (2020). Monitoring House Fly (Diptera: Muscidae) Activity on Animal Facilities. *Jounal of Insect Science*. 20(5). 1-7. https://doi.org/10.1093/jisesa/ieaa109

Husin, H. (2017). Identifikasi Kepadatan Lalat di Perumahan yang Berada di Tempat Pembuangan Akhir (TPA) Sampah Air Sebakul Kecamatan Selebar Kota Bengkulu. *Journal of Nursing and Public Health*. 5(1). 80–87. https://doi.org/10.37676/jnph.v5i1.603

Khamisepour, F., Lankarani, K. B., Honarvar, B., & Kwenti, T. E. (2018). A systematic review of human pathogens carried by the housefly (Musca domestica L.). BMC public health, 18(1), 1049. https://doi.org/10.1186/s12889-018-5934-3

Liu, Y., Chen, Y., Wang, N., Qin, H., Zhang, L., & Zhang, S. (2023). The global prevalence of parasites in non-biting flies as vectors: a systematic review and meta-analysis. Parasites & vectors, 16(1), 25. https://doi.org/10.1186/s13071-023-05650-2

Masyhuda., Hestiningsih, R., Rahadian, R. (2017). Survei Kepadatan Lalat Di Tempat Pembuangan Akhir (TPA) Sampah Jatibarang Tahun. *Jurnal Kesehatan Masyarakat*. 5(4). .560–569. https://doi.org/10.14710/jkm.v5i4.18714

Nayduch, D., Neupane, S., Pickens, V., Purvis, T., & Olds, C. (2023). House Flies Are Underappreciated Yet Important Reservoirs and Vectors of Microbial Threats to Animal and Human Health. Microorganisms, 11(3), 583. https://doi.org/10.3390/microorganisms11030583

Ramadhani, C. (2019). Faktor-Faktor Yang Berhubungan Dengan Kepadatan Lalat di Desa Purwodadi Kecamatan Margoyoso Kabupaten Pati. *Jurnal Kesehatan Masyarakat*. 7(3). https://doi.org/10.31000/jkft.v3i2.1288

Susilowati, A. (2017). *Hubungan Sanitasi Lingkungan Dengan Tingkat Kepadatan Lalat Di Pasar Tradisional Kecamatan Tembalang (Studi Di Pasar Mrican dan Pasar Kedungmundu Kecamatan Tembalang)*. Skripsi. Universitas Muhammadiyah Semarang.

Syamsuddin, S., Sumarni. Gambaran Limbah Padat Rumah Pemotongan Ayam (Rpa) Terhadap Tingkat Kepadatan Lalat Di Kelurahan Bara Baraya Timur Kota Makassar. *Media Komunikasi Sivitas Akademika Dan Masyarakat*. Vol.18. Hal.146-153. 2019. https://doi.org/10.32382/sulolipu.v18i2.1146

Wulandari, D. A. (2017). Pengaruh Variasi Warna Kuning Pada Fly Grill Terhadap Kepadatan Lalat (Studi Di Tempat Pelelangan Ikan Tambak Lorok Kota Semarang) Effect Of Variation The Color Yellow On Fly Grill To Density Of Flies (Study At Fish Ouction Place Tambak Lorok Semarang Cit. *Jurnal Kesehatan Masyarakat (Undip)*. 3(3). 130-140. 2017. https://doi.org/10.14710/jkm.v3i3.12134

Zahn, L. K., & Gerry, A. C. (2020). Diurnal Flight Activity of House Flies (Musca domestica) is Influenced by Sex, Time of Day, and Environmental Conditions. *Insects*, 11(6), 391. https://doi.org/10.3390/insects11060391

Zhang, Y. (2018). Multiple mutations and overexpression of the MdaE7 carboxylesterase gene

associated with male-linked malathion resistance in housefly, Musca domestica (Diptera: Muscidae). 2018. *Scientific Reports. Springer US*. 8(1) 1–11. https://doi.org/10.1038/s41598-017-17325-x