

## Research Article

# Effect of Moon Phase on Physical Parameters at the Mouth of the River

Winda Setya, Epa Paujiah, Yusri Amalia, Subagja Burhaanuddin

Universitas Islam Negeri Sunan Gunung Djati, Bandung, West Java, Indonesia

**ORCID**Winda Setya: <https://orcid.org/0000-0003-2878-1497>Epa Paujiah: <https://orcid.org/0000-0002-8295-892X>**Abstract.**

Light from the sun is the need for living things both on land and in the air. The moon, as a medium that reflects sunlight in one month, has several phases. This phase affects the situation on earth, especially river mouths. This study aims to determine the effect of the moon phase on physical parameters (water temperature and air temperature) at the mouth of the river. This research was conducted in 4 moon phases on the physics parameters at three coastal estuaries during the day and night. Based on the study results, it was found that the moon phase of the physical parameters is very influential on the number of micro-organisms. The number of organisms in each estuary also shows different characteristics according to moon phase conditions.

**Keywords:** moon phase, physical parameter

Corresponding Author: Winda Setya; email: suratwindasetya@uinsgd.ac.id

**Published:** 27 March 2024

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Selection and Peer-review under the responsibility of the ICMScE Conference Committee.

## 1. INTRODUCTION

Indonesia, as an archipelago country, has a lot of marine biodiversities. Indonesia has a tropical climate characterized by humidity, rainfall, and warm temperatures. The tropical climate causes an abundance of sources of sunlight that are needed for the survival of marine life, one of which is mollusks. Mollusks are animals that live in the intertidal zone that have soft-bodied, bilateral symmetry-shaped, closed body mantle, have hard shells, and ventral legs [1]. Many and few mollusks in the coastal estuary area can be seen from the number of individuals that can be found at the time of sampling. According to [2] and [3], stated that one of the marine ecosystems with high species diversity is the gastropod mollusk class.

According to [4] stated that the results of mollusk density in the Karang Papak Coast of West Java were strongly influenced by the phase of the moon. Number of mollusks the highest obtained in the dark moon phase and the lowest value is in the third quarter moon phase. This shows that the habitat can be occupied by mollusk. The

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density and distribution of gastropods or bivalves can be affected by several factors, such as: environmental physical conditions, the presence of food sources, predation and competition. According to [5, 6] environmental changes can affect the number and type of soft bottom mollusk structure.

The phases of the moon are affected by sunlight reflected by the moon at night. The phase of the moon changes the shape of the moon which is influenced by the position of the moon with respect to the sun when viewed from the earth causing some of the moon's surface to appear dark. The eight phases of the moon are the new moon phase, the initial crescent phase, the first quarter phase, the initial convex phase ( $\frac{3}{4}$  circle), the full moon phase, the convex phase ( $\frac{3}{4}$  circle), the third quarter phase, the old crescent phase, and return to the new moon phase. This month's phase has a significant influence on anglers [7]. State that moonlight can determine aspects of animal biology in Indonesia including mollusks. The same thing is stated by [8] that the phases of the moon influence the exploitmolluscs natural resources such as mollusks. Sunlight has many effects on life on earth. The intensity of moonlight greatly affects the temperature around the beach and sea water.

Advances in technology automation has brought several innovations that can automatically carry out certain tasks. Microcontroller has an important role in the world of electronics that can control system on a single chip for automate systems designed so that produce precise results [9]. Sea water is a place to live for mollusks. To find out the temperature around the estuary and sea water, it can be done using a thermometer. Thermometers are commonly used in automatic temperature monitoring [10]. This temperature measurement has advantages such as easy to use, economical, its use requires less energy, is more convenient to control temperature, and easy to use. Therefore, to take measurements automatically can be done using sensors [11].

Automatic room temperature control system is an automatic temperature control system that can information temperature periodically [12]. The temperature sensor that is often used is temperature sensor (DHT11) [13]. According to value temperature in the surrounding environment, the microcontroller (arduino) will compare temperature reading generated by the sensor with the set value as well as making the appropriate decision on the LCD display [14]. Therefore, this study aims to determine the effect of sunlight on the physical phases of the moon in the estuary of Cidamar, Cipandak, and Ciujung, West Java.

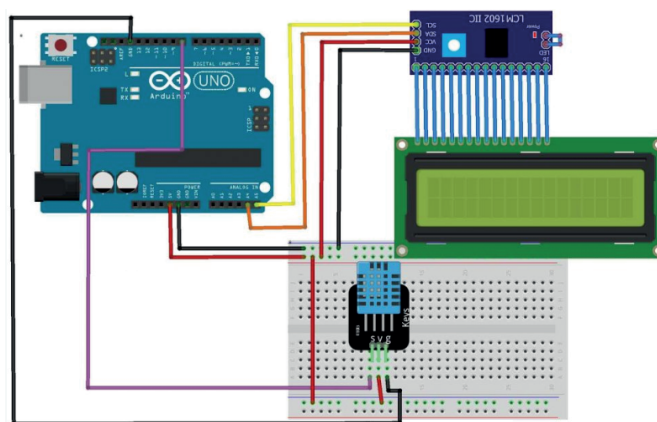
## 2. METHOD

This study uses the Research and Development method which consists of planning, production, and evaluation stages. The planning stage is carried out by studying literature or collect information related to characteristics in the area around the coastal estuary. After that enter the production stage by making a digital thermometer using the DHT11 sensor. The final stage is an evaluation by testing a digital thermometer, to ensure the device can work properly.

Places for data collection were carried out in the estuary areas of Cidamar, Cipandak, and Ciujung, West Java. Physical quantities observed were air temperature at the beach and sea water temperature using a digital thermometer. This thermometer is used to collect data on the new moon phase (DM), the first quarter phase (Q1), the intact phase (FM), and the third quarter phase (Q2) at noon at 14.00 WIB and at night at 22.00. WIB.

## 3. RESULT AND DISCUSSION

At the planning stage was carried out through literature studies and collecting information related to temperature differences in the coastal estuary area that refers to the research previously namely, Paujiah et al [3]. Based on these results, obtained what components will be used and the design of the tool to be made. Making a digital thermometer begins with assembling the components as shown in Figure 1.



**Figure 1:** Temperature sensor circuit design.

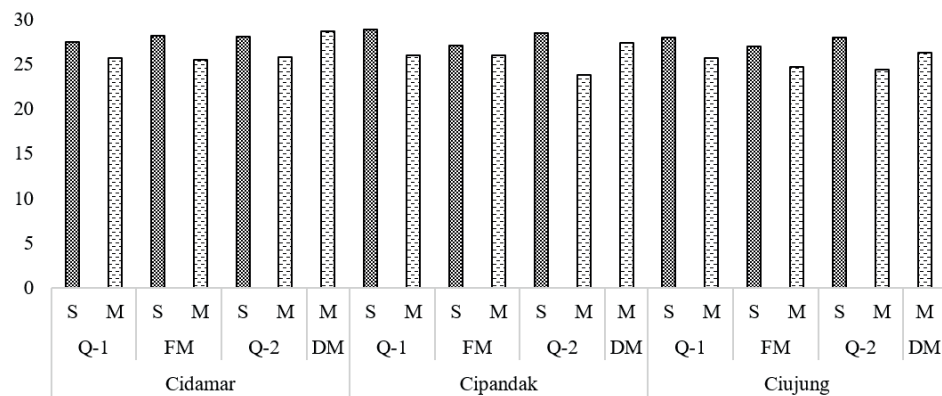
Arduino Uno in Figure 1 functions as the main component that is connected to the DHT11 sensor and 16x2 LCD output. Next, software design is carried out to create program code using Arduino IDE (Integrated Development Environment) software. Before assembled, every electronic component used is tested first to ensure that these

components can still function properly. After that just do the merging of all components to produce a digital thermometer.

At the evaluation stage, an Arduino-based digital thermometer was tested to measure temperature. The test results obtained data on the air temperature around the coastal estuary which is shown in Figure 2 and the temperature of the sea water which is shown in Figure 3. The following is an explanation of the results of measuring air temperature and water temperature in the estuary area using an Arduino-based digital thermometer.

### 3.1. Air temperature

The result of measurement of air temperature around the estuaries of the Cidamar, Cipandak, and Ciujung rivers during the day (S) and night (M) at each change of the moon phase are shown in Figure 2.

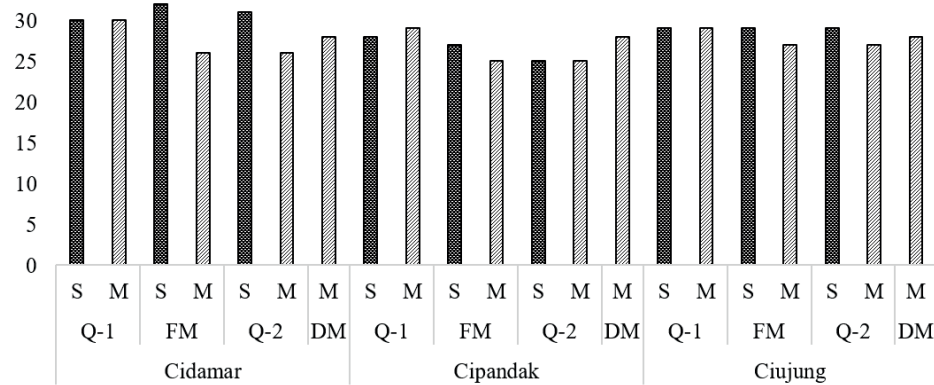


**Figure 2:** Effect of air temperature during the day and night on the moon phase.

Based on Figure 2, air temperature during the day is higher than at night. This is caused by night sunlight reaching the earth reflected by the moon. However, at night the moon phases affect the air temperature around the mouth of the river during the new moon phase.

### 3.2. Water temperature

The result of measurement of water temperature around the estuaries of the Cidamar, Cipandak, and Ciujung rivers during the day (S) and night (M) at each change of the moon phase are shown in Figure 3.



**Figure 3:** Effect of seawater temperature during the day and night on the moon phase.

Based on Figure 3, seawater temperature during the day is higher than at night. This is caused by night sunlight reaching the earth reflected by the moon. The moon phase which greatly influences the water temperature at night is the first quarter phase.

The temperature at the Cipandak estuary tends to be cooler than the Cidamar estuary and Ciujung coastal estuary because it is surrounded by a wider area of mangrove forest than other coastal estuaries. Moreover, the tendency of the wind during the day is greater than at night. This is in line with research [14] that the magnitude of the wind speed blowing in an area is affected by the time (day and night) where the wind blowing during the day is stronger than at night. This condition too is influenced by the movement of land winds and sea breezes. During the day there is a sea breeze, which is the wind moving from the sea to the land because the air temperature in the sea is cooler. At night, land conditions occur because the land is colder than the ocean, so the wind moves from the ocean to the land. This is due to the nature of the land which receives heat quickly and receives cold, while the oceans are slow to absorb or release heat. This wind also causes changes in the baseline during the day and night [3].

Another factor that causes the situation during the day to have higher temperatures is the greater amount of sunlight intensity. It is the same with the condition of the full moon, when the moon is dead the water temperature and air temperature at the estuary are higher because the moon reflects sunlight from night to the earth's moon. This sunlight will affect the temperature in and around the sea water and the number of maluska in the epa sea waters [4].

## 4. CONCLUSION

The four phases of the moon are the new moon phase (DM), the first quarter phase (Q1), the full moon phase (FM), and the third quarter phase (Q2) at noon at 14:00 WIB and the evening at 22.00 WIB. The new moon phase (DM) greatly affects the physical parameters of air temperature and water temperature in three estuaries on the coasts of Cidamar, Cipandak and Ciujung, West Java.

## Acknowledgments

The author expresses his appreciation and thanks to the Research and Publishing Center of UIN Sunan Gunung Djati Bandung for providing financial support for the publication of this article.

## References

- [1] Okto S, Arthur F. M, and F. Jemi, "Kelimpahan dan keanekaragaman gastropoda pada zona intertidal di Pulau Bangka bagian timur,,". *Jurnal Enggano*. 2018;3(1):10–21.
- [2] Pramuka P, Seribu K, Rizkya S, et al. "Journal of Management of Aquatic Resources. Online di: <http://ejournal-s1.undip.ac.id/index.php/maquares> Studi kelimpahan gastropoda (lambis spp. ) pada daerah makroalga di penulis penanggung jawab jurnal of management of aquatic resources. Volume 1. " *Journal of Management of Aquatic Resources*. vol. 1, pp. 1–7, 2012.
- [3] Supratman O, Farhaby AM, Ferizal J. Kelimpahan dan keanekaragaman gastropoda pada zona intertidal di pulau Bangka Bagian Timur. *Jurnal Enggano*. 2018;3(1):10–21.
- [4] E. Paujiah, T. Cahyanto, I. Sariningsih, W. Setya, and I. Zulfahmi, "Density of Mollusks community from a rocky intertidal zone in Karang Papak Coastal, West Java, Indonesia,," *Journal of Physics: Conference Series*. vol. 1467, no. 1, p. 2020. <https://doi.org/10.1088/1742-6596/1467/1/012011>.
- [5] Rumisha C, Elskens M, Leermakers M, Kochzius M. Trace metal pollution and its influence on the community structure of soft bottom molluscs in intertidal areas of the Dar es Salaam coast, Tanzania. *Mar Pollut Bull*. 2012 Mar;64(3):521–31.
- [6] Cabrini TM, Barboza CA, Skinner VB, Hauser-Davis RA, Rocha RC, Saint'Pierre TD, et al. Heavy metal contamination in sandy beach macrofauna communities from the Rio de Janeiro coast, Southeastern Brazil. *Environ Pollut*. 2017 Feb;221:116–29.

- [7] Chapman JW, Klaassen RH, Drake VA, Fossette S, Hays GC, Metcalfe JD, et al. Animal orientation strategies for movement in flows. *Curr Biol*. 2011 Oct;21(20):R861–70.
- [8] Nishida AK, Nordi N, Alves RR. The lunar-tide cycle viewed by crustacean and mollusc gatherers in the State of Paraíba, Northeast Brazil and their influence in collection attitudes. *J Ethnobiol Ethnomed*. 2006 Jan;2(1):1–12.
- [9] M.A.A. Mashud, D. Yasmin, M.A. Razzaque, and M.H. Uddin, “Automatic room temperature controlled fan speed controller using PT-100.,” *International Journal of Scientific & Engineering Research*. vol. 6, no. 8, p. 2015.
- [10] F. Puspasari, T.P. Satya, U.Y. Oktiawati, I. Fahrurrozi, and H. Prisyanti, “Analisis akurasi sistem sensor DHT22 berbasis arduino terhadap thermohygrometer standar.,” *Jurnal Fisika dan Aplikasinya*. vol. 16, no. 1, p. 40, 2020. <https://doi.org/10.12962/j24604682.v16i1.5776>.
- [11] W. Setya, D.N. Fariha, W. Handayani, and A. Syafe’l, “Design of Simple Harmonic Motion (SHM) devices based on IR obstacle sensors.,” *Journal of Physics: Conference Series*. vol. 1869, no. 1, p. 2021.
- [12] Zungeru AM, Mangwala M, Chuma J, Gaebolae B, Basutli B. Design and simulation of an automatic room heater control system. *Heliyon*. 2018 Jun;4(6):e00655.
- [13] Najmurokhman A. A, Kusnandar, “Prototipe pengendali suhu dan kelembaban untuk cold storage menggunakan mikrokontroler Atmega328 Dan Sensor Dht11.,” *Jurnal Teknologi Universitas Muhammadiyah Jakarta*. 2018;10(1):73–82.
- [14] Debele GM, Qian X. “Automatic room temperature control system using arduino UNO R3 and DHT11 sensor.,” *2020 17th International Computer Conference on Wavelet Active Media Technology and Information Processing, ICCWAMTIP 2020*. no. December 2020, pp. 428–432, 2020. <https://doi.org/10.1109/ICCWAMTIP51612.2020.9317307>.