

Distribution and Environmental Parameters of *Solen* spp around the Pamekasan Coastal Water

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Abstract. *Solen* sp. has grown to be a significant and economically valuable resource, particularly for the residents of Pamekasan, Madura Island; therefore, overfishing occurs if it is only used for natural purposes. The purpose of this research is to ascertain the density and environmental parameters of *Solen* sp around the Pamekasan southern coast. In September 2024, the study was required a descriptive methodology. *Solen* sp and environmental factors (temperature, salinity, pH, and substrate) served as the research materials. The gravimetric approach was used for the substrate analysis at the Oceanography Laboratory, Department of Marine and Fisheries, University Trunojoyo Madura. The results showed 1) *Solen* sp density of 8-12 individuals/m² and 2) environmental parameters, including temperature 29-33°C, salinity 31-33 ppt, pH 7.9-8.2, and substrate type of sandy mud. The density of *Solen* sp is thought to be related to environmental parameters that are still in accordance with sea water quality standards for marine biota, so that it becomes a habitat for growth and development of *Solen* sp.

Keywords: distribution, environmental parameters, Pamekasan, *Solen* sp, substrate

1. Introduction

One of the bivalve species with high economic value is *Solen* spp. [1, 2], including on the island of Madura [1, 3, 4]. As a result, it has become a significant commodity [5, 6, 7], with a tendency to be high and rising demand each year [4, 5]. An important reason to seek cultivation [8] is the high risk of overfishing [3, 4, 7, 9, 10, 11] due to people's habit of depending on the availability of *Solen* in nature [12], not least on Madura Island [4, 5]. There has been quite a lot of research on bivalve aquaculture [9, 13] although it has not been detailed because it focuses on one particular study, such as spawning characteristics [14]. Generally, the condition of *Solen* in some waters of the world, including in Pamekasan Regency [15], is very vulnerable to overfishing [9] as an implication of the high dependence of the community on the availability of *Solen* in nature [12] which is always utilized for various needs, one of which is community consumption [1, 2] although still on a traditional scale, thus affecting fluctuations in the price of *solen* commodities [3, 4, 5]. *Solen* sp was found on Madura Island with a variety of sizes and showed a fairly wide distribution of *Solen* sp [3]. Environmental characteristics suitable for *Solen* sp habitat include moderately warm temperatures [16], muddy substrates and/or muddy sand [17], and small changes in salinity [16]. Characteristics of the Madura Strait and Java Sea are quite similar to the general coastal waters around the world, two waters flanking Madura Island, include waves [18, 19] and weak currents [20, 21], temperatures tend to be warm throughout the year [16], and salinity is quite high (generally tropical areas) [16] and dominated by muddy substrates [3, 4, 22]. The water and environmental characteristics as described above are suitable habitats for *Solen* growth and development [23]. Therefore, the study of environmental parameters and distribution of *Solen* distribution is important as a first step to create a laboratory-scale experimental design to match the natural habitat of *Solen* as an effort to cultivate, so as to minimize the potential for overfishing *Solen*.

2. Methodology

Measurements of environmental parameters including DO, temperature, salinity, pH, and substrate, were conducted at the coastal village of Pragaan (Pamekasan) (Figure 1) in September 2024. The method of measuring environmental parameters is in accordance with [24]. Solen samples were morphologically analyzed to determine their density, surface water and sediment were sampled at the same time using physics parameters supported to explain the relationship between biotic and abiotic factors. DO, temperature, pH, salinity, and substrate have been measured. Water sampling uses seawater and a grab sampler. Sediment substrate are analyzed to estimate the grain size used the granulometric method (6, 7). Grain size separation was carried out. with sieves sized: >2; 1.4; 1; 0.5; 0.250; 0.150; 0.090; 0.063; and <0.063mm. Grain size classification is done by classification [25]. Type determination sediment based on classification Shepard's Triangle Diagram [26].

3. Result and Discussion

Environmental parameters measured during the study included DO, temperature, salinity, and pH as well as sediment substrate (Table 1). The DO value in 2023 was not measured [23], so it cannot be compared with the measurement value in 2024. The range of DO values shows 5.6 - 6.1 mg/L and is suitable for Solen sp habitat [24]. The range of sea surface temperature in 2023 was 28 - 30°C, while in 2024 it was 29 - 31°C, thus showing an increase in sea surface temperature by 1°C and still reflecting the general characteristics of sea surface temperature patterns in the tropics [27] which tend to be warm throughout the year [28]. The salinity range in 2023 is 32 - 33 ppt, while in 2024 it is 31 - 33 ppt. In general, the value of the salinity range only differs at the lower interval, and is still suitable for Solen habitat [3] and reflects salinity conditions in the tropics [4]. The pH range shows the same range in 2023 and 2024, namely 8.0 - 8.2. Generally, in the tropics, the pH range is quite small and is suitable for Solen habitat [3, 23]. The substrate type shows no change (in 2023 and 2024), which is a muddy substrate.

The density of Solen during the measurement of environmental parameters was 8-12 species (week 1), 10-12 (week 2), 9-12 (week 3), and 11-12 (week 4), respectively. The relatively similar species density indicates that the differences in environmental parameter measurement values (Table 1) are not significant enough to affect the distribution of Solen. A decrease in salinity value will affect the survival of Solen [29], because Solen cannot adapt to low salinity [30, 31]. Sea surface temperature at the study site tends to be warm [32] and very small fluctuations, so it does not affect the survival of Solen [33]. Small fluctuations in all measured environmental parameters are not expected to affect the abundance or survival of Solen. However, in laboratory-scale experiments, exposure to temperature [33] and salinity [30, 31] significantly affected Solen survival.

4. Conclusion

For the environment of Solen sp., the range of environmental characteristics and circumstances is adequate and reasonable (DO 5.6 – 6.1 mg/L, temperature 29–31 °C, pH 8.0–8.2, salinity 32–33 ppt). According to the in-situ measurement, the condition is quite good. The Solen abundance is 8 – 12 species/m². Temperature and salinity became the important environmental parameters (in laboratories scales) effecting on survival of *Solen* spp. We highly suggest to analysis the relationship between the environmental parameters and the abundance of *Solen* spp. based on statistical methods.

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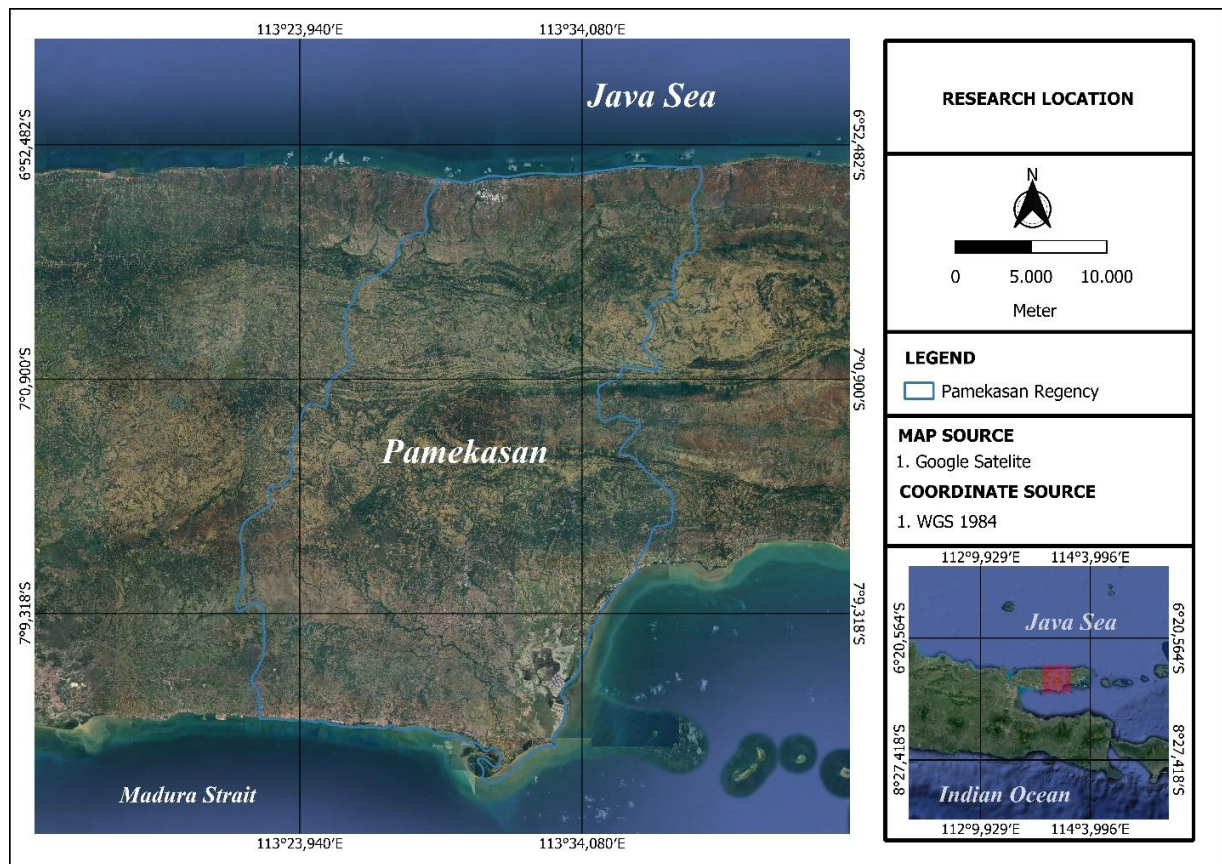


Figure 1. Research location

Table 1. Environmental Parameters of Solen in Pamekasan

Time	Weeks	DO (mg/L)	Temperature (°C)	Salinity (ppt)	pH	Substrate	References
July 2023	1	-	30	32	8.1	Muddy Sand	[23]
	2		30	33	8.1		
	3		31	32	8.0		
	4		31	32	8.0		
August 2023	1		31	33	8.0		
	2		30	32	8.2		
	3		29	33	8.1		
	4		30	33	8.0		
September 2024	1	5.6	31	33	8.0	Current research	
	2	5.8	31	32	8.0		
	3	6.1	31	32	8.1		
	4	6.1	31	32	8.0		

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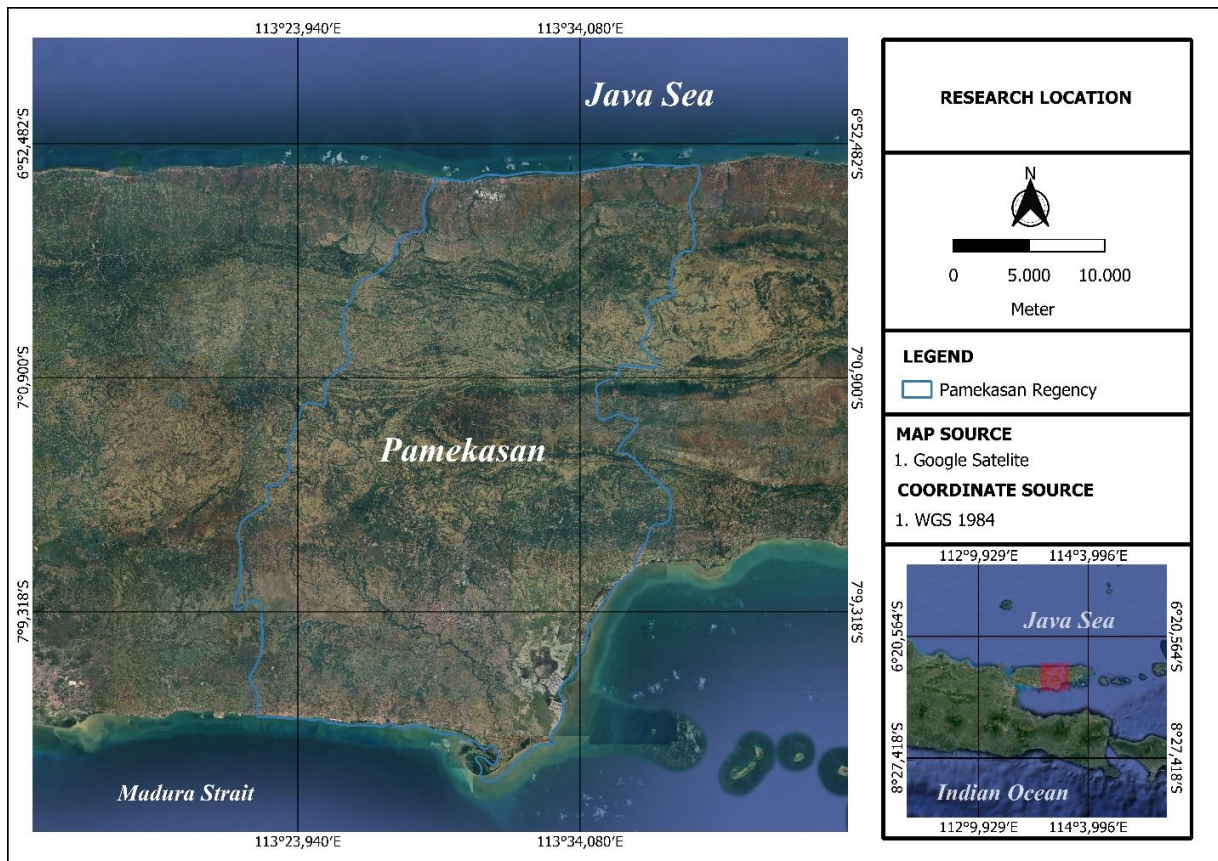


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	4		31	32	8.0		
August 2023	1		31	33	8.0		
	2		30	32	8.2		
	3		29	33	8.1		
	4		30	33	8.0		
September 2024	1	5.6	31	33	8.0	Current research	
	2	5.8	31	32	8.0		
	3	6.1	31	32	8.1		
	4	6.1	31	32	8.0		