Tridacnidae's habitat preferences in Bama waters, Baluran National Park, Situbondo Regency, East Java, Indonesia

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Abstract. The existence of clams on a different substrate indicates that not all types of substrates are tolerated by certain types of clams. Clams naturally attach and sink their shells in coral reefs. The status of clams (*Tridacnidae*) which are endangered makes this biota included in the CITES Appendix II record. The distribution of clams in the world counts as many as 9 species and 7 of them are spread in Indonesian waters, including the Bama waters of Baluran National Park. This study aimed to determine the community structure and substrate preferences for clam shells in Bama Waters, the Baluran National Park conservation area. The location for data collection was determined by random sampling, during the East Monsoon season, namely August 2022. Habitat analysis used the Ivlev Electivity Index which was displayed on a diagram for each substrate type. The results revealed the presence of 4 types of clam populations: with various densities: *Tridacna crocea* (0.52 ind m^{-2}), *Tridacna maxima* (0.18 ind m^{-2}), *Tridacna squamosa* (0.14 ind m^{-2}) and *Hippopus hippopus* (0.03 ind ha^{-1}). The chemical abnormality index belongs to the low category, ranging from 0.41 to 0.66. Based on the habitat analysis based on the Ivlev electivity index, it was inferred that *T. squamosa* and *H. hippopus* prefer the rubble substrates with (E) 0.32 and 0.53, respectively, while *T. crocea* prefers rock substrate with an Ivlev Electivity Index of 0.77 and *T. maxima* prefers hard corals with an Ivlev Electivity Index of 0.01-0.22.
Key Words: selection index, density, diversity, Bama Baluran National Park.

Introduction. *Tridacnidae* is a type of giant clam belonging to the bivalves class, phylum molluscs, which are often found around coral reef ecosystems and some even attach to corals to immerse themselves inside and have a coat associated with algae (zooxanthellae) (Rabiyanti et al 2019). Substrate is one of the most important parameters in supporting the survival of shellfish. Not all types of shellfish occupy the same type of substrate. Each type of shellfish has a relationship with certain substrate conditions based on their life habits (Tapilatu et al 2021). The presence of clams on a different substrate indicates that not all types of substrate are the preferred habitat for certain types of clams. Habitat preference is the ability of clams to complement life needs and ensure the sustainability of their populations. In addition, the necessities of life for clams include clear water conditions and plankton, as food and for body coloring (Arbi 2017). Habitat preference in fish can indicate an intense relationship between physical factors and the biological environment.

Clams is not only important for marine ecosystems, but also as a commodity that is in great demand as a significant food source in Asia and the South Pacific and is of interest for the shell trade (Ma et al 2019). Scientifically, clam shells have two genera, namely *Tridacna* and *Hippopus* (Arbi 2017). There are 9 clam species (*Tridacnidae*) in the world, of which 7 species are found in Indonesian waters, including *Tridacna gigas, T. maxima, T. parcellanus*. Ecologically, clam shells have an important role in the natural biofiltering process as absorbers of ammonia and nitratesdissolved in seawater for the needs of zooxanthellae, producing nitrogen for their growth processes (Iriansyah et al

2021). Clams has a colored pigment in its shell, which protects its sensitive organs against excessive light and causes ultra violet radiation. Clams gets most of its nutrition from algae (as much as 70%) and the rest from its role as a "filter feeder" (Hasni et al 2017).

Bama waters has an area of 640.83 ha with its unique and interesting regional topography, with atolls (coral islands) scattered with various types of clams (*Tridacnidae*). Although the shellfish in Bama waters are quite diverse, there has been no research specifically showing the presence of clams (*Tridacnidae*) in Bama waters, Baluran National Park, even though this information is very important to maintain their survival in nature. Previous research on the clams species diversity and habitat characteristics in the Baluran National Park concerned the Tanjung Bilik waters, located at approximately 16 km to the west of Bama beach, and studied the different water and substrate qualities (Setiawan et al 2021). The current research was conducted to obtain information on the coral reef cover, clam abundance and diversity, clam (*Tridacnidae*) preferences related to the habitat substrates, and water quality in Bama waters, Baluran National Park.

Material and Method

Location and time of sampling. The research area is located in Pantai Bama Waters, Baluran National Park area, Situbondo Regency, Jawai Timuri. The research was carried out for 6 months, starting from July-December 2022. Data collection was carried out in August-September 2022, during the day, being adjusted based on the activity of the clams. These carry out the process of photosynthesis and eating during the day. During this process, the clam shells open and it is easier to identify. The distribution map of sampling points is shown in Figure 1. Point 1 is at coordinates 7°50'44.17"S and 114°27'43.25"E, point 2 is at coordinates 7°50'39.51"S and 114°27' 51.77"E, point 3 at coordinates 7°50'43.04"S and 114°27'54.61"E and point 4 at coordinates 7°50'44.90"S and 114°27'47.19"E.

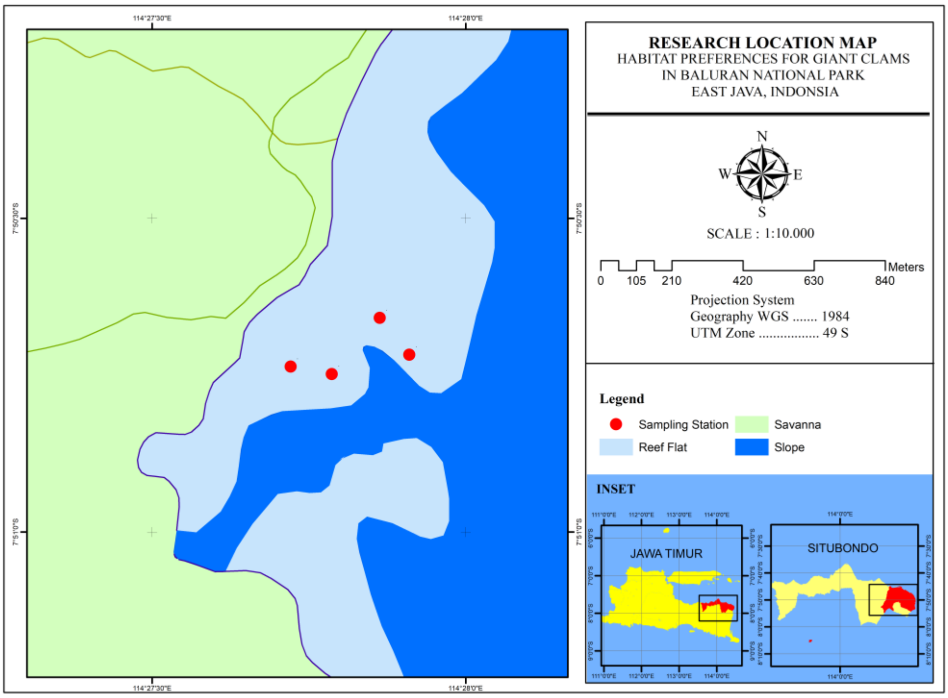

Figure 1. Research location map.

Density of Tridacnidae. Density is the number of individuals per unit area and is calculated using the following formula (Odum 1993):

$$Individual\ Abundance\ (Ind\ m^{-2}) = \frac{Number\ of\ Individuals\ (Ind)}{Transect\ area\ (m^2)}$$

Diversity index (H'). A mathematical description of the state of an organism's population is carried out to provide information about the number of clams in a body of water. The diversity index uses the Shannon Index of Diversity (Odum 1993), presented in the following equation:

$$H' = \sum_{i=1}^{s} pi \ln pi$$

$$pi = \frac{ni}{N}$$

Where:
H' - Shannon-Weiner diversity index;
Pi - proportion of the number of individuals (ni / N);
ni - number of individuals of type i;
N - the total number of all individuals.

After calculating the diversity index (H'), it is then analyzed based on the diversity value criteria (Table 1, Wijana et al 2019).

Table 1

Value of diversity criteria

Diversity criteria	*Value*
H' is low, environmental pressure is strong	H'≤2.0
H' is medium, environmental pressure is moderate	2.0≤H'≤3.0
H' is high, the ecosystem is balanced.	H'≥3.0

Tridacnidae habitat preferences. The Ivlev's index is employed to determine coral abundance on each settlement structure in relation to the availability of settlement structure on the reef (Yadaf et al 2016), as shown in the following Equation (Ivlev 1961):

$$\mathbf{E} = \frac{\mathbf{ri - pi}}{\mathbf{ri + pi}}$$

Where:
E - Ivlev Electivity Index;
ri - percentage of population that uses a particular habitat structure;
pi - area percentage or fraction of each habitat structure type (from the total area of the potential habitat).

The electivity index value (E) ranges from -1 to +1, as it can be seen in Table 2 (Yadav et al 2016).

Table 2

Habitat electivity index criteria

Electivity index criteria	*Value*
Habitat is used preferentially	0<E<1
Habitats are not used	-1<E<0
There is no habitat selection	E=0

Coral ‘‘choice’’ was defined as the presence of a disproportionate number of recruits on a settlement structure than would be expected by its availability on a reef. Conversely, ‘‘avoidance’’ indicates a lower abundance of recruits on a settlement structure than would be expected by its availability on a reef. Structures that had E values close to zero were neither chosen nor avoided (Yadaf et al 2016).

Results and Discussion

Density of Tridacnidae. The density of clam shells at the study site represents the number recorded of clam shells for each species, by unit of observation area, as it can be seen in Figure 2.

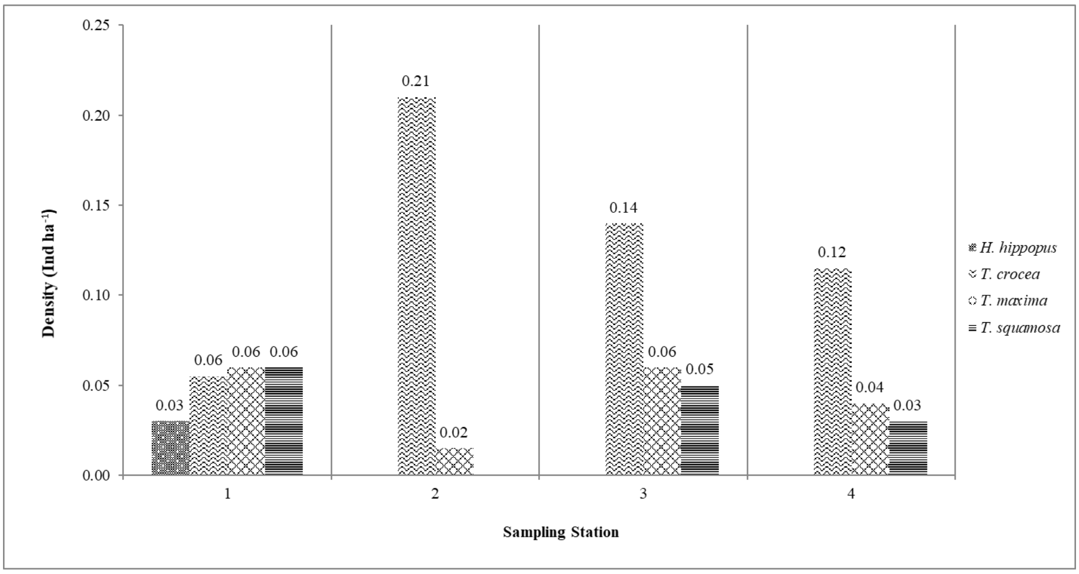

Figure 2. Density (ind ha^{-1}) at each sampling point.

The density of clam shells (all species) at the whole research location (ind ha^{-1}) was found to be 0.87 ind ha^{-1}, of which: *Tridacna crocea* with 0.52 ind ha^{-1}, *Tridacna maxima* with 0.18 ind ha^{-1}, *Tridacna squamosa* with 0.14 ind ha^{-1} and *Hippopus hippopus* with 0.03 ind ha^{-1}. The high value of the species density of *T. crocea* is probably influenced by the large area of hard coral substrate found at the study site. Meanwhile, the density value of *H. hippopus* is the lowest, presumably because it is easier to be picked up by wild anglers who have crossed the boundaries of the fishing area (Perengan Beach and Kajang Beach). As seen in Figure 2, in the Bama Beach waters of Baluran National Park, 4 clam species with thigher density were found: *T. crocea* species, in the range of 0.06 ind ha^{-1} to 0.21 ind ha^{-1}, followed by *T. maxima*, with density values ranging from 0.02 ind ha^{-1} to 0.06 ind ha^{-1}. Similarly, Arbi (2017) in North Sulawesi waters, and Susiana et al (2014) in the Spermonde Archipelago, also found higher densities of *T. crocea*. The species immerses its entire body in the coral reefs, and only the mantle is visible from above, being quite difficult to collect. Most surveys of clam populations report that clam densities in Indonesia are <1 ind m^{-2}, reflecting a decline in natural populations, given the unequal abundance and number of species. In addition, it has been proven that the clam shell population is dominated by *T. crocea* and *T. maxima*, while other species are very rare and *T. gigas* is no longer found in western Indonesian waters. Triandiza et al (2019) and Susiana et al (2013) also observed the decline of clam populations of the 3 (three) species with the largest size: *T. gigas, Tridacna derasara* and *Hippopus porcelanus*, which were no longer found.

The least common species, *H. hippopus*, is mostly found on sand substrates (Setiawan et al 2021), while at the study site, it was more often found on dead coral fracture substrates with algae (DCA), because sand substrates covered a limited area. According to Al-Risqia et al (2021), macroalgae are competitors for coral animals in fighting over space resources (sunlight), causing corals death and algae covering (dead coral algae). In addition, the influence of the high exploitation of this species is evidenced by the frequent empty shells of *H. hippopus* around the beach area Figure 3.

Figure 3. *Hippopus hippopus* shell.

According to Nijman et al (2015), *H. hippopus* has become a favorite commodity in Indonesia because it has a relatively large size (20-40 cm) and is very easy to collect. *H. hippopus* does not attach its byssus to the substrate so that it is easier for the community to exploit.

The total density values at the sampling point 1 was of 0.21 ind m^{-2}, at the sampling point 2 it was of 0.23 ind m^{-2}, at the sampling point 3 it was of 0.25 ind m^{-2}, and at the sampling point 4 it was of 0.19 ind m^{-2}. The highest density value is found at the sampling point 3. It is suspected that the large number of individuals at that location is due to the dissolved oxygen content which tends to be stable, compared to other location points. According to Tamrin & Aris (2020), dissolved oxygen (DO) is needed by all living things for breathing needs, metabolic processes, and energy production for growth. The small number of individuals at point 4 affects the density value at that location which is lower than at the other sampling points. This is presumably because the velocity of the current passing through the sampling point is higher, namely in the range of 0.026-0.033 ms^{-1}. This is based on Nurhasanah's research (2022), explaining that the movement of water caused by currents can have an important influence on the benthos. This can affect the surrounding environmental conditions, such as sediment size, turbidity and the amount of dust fraction, which can have an impact on the physical stress experienced by bottom organisms.

Diversity of Tridacnidae. Figure 4 presents the values of the diversity index in Bama Waters, Baluran National Park.

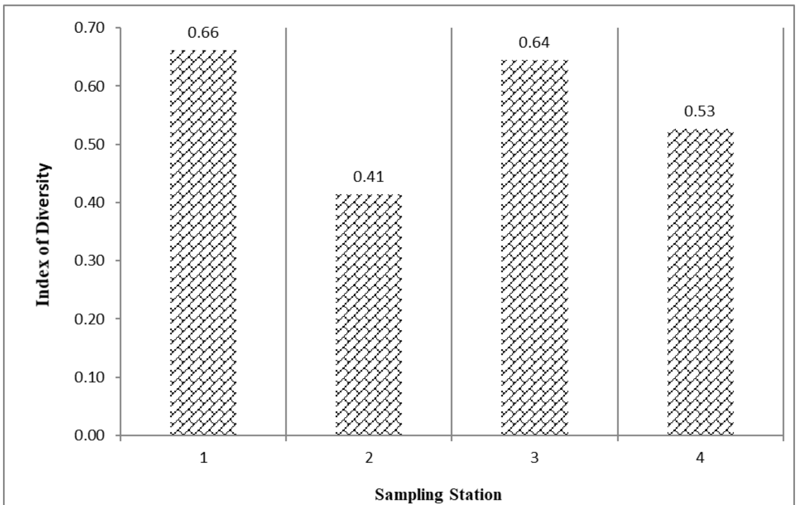

Figure 4. Index of diversity in Bama Waters, Baluran National Park.

Figure 4 shows a diversity index (H'), at the study sites, ranging from 0.41 to 0.66, which means that there is a heavy pressure and the ecosystem is unstable. The diversity index value is higher at the sampling point 1 (0.66), due to the higher densities of species and populations than at the sampling points 2, 3 and 4. According to (Wilhm & Dorris 1968), the diversity of biota in waters depends on the distribution of species and their communities. A low diversity often indicates the dominance of a species, which is consistent with the high density of *T. crocea* found in this study.

Tridacnidae habitat preferences. Observation of the clam distribution based on the habitat substrate in Bama waters of Baluran National Park allowed to visually identify the preferred clam substrates. The assessment of the habitat conditions, based on the lifeform categories and codes, determined 4 habitat categories spread over the study site: (1) the hard coral (HC) (Figure 5.A), found in reef areas based of Acropora and non-Acropora corals of branching, massive, encrusting, foliose, tabulate, and mushroom types (English et al 1998); (2) the dead coral algae (DCA) (Figure 5.B), with clams embedded in dead coral and overgrown with algae (Rizkifar et al 2019); (3) the rubble (Figure 5.C), with its dead coral rubble substrate (Rizkifar et al 2019); (4) the rock (Figure 5.D), characteristic of boulders (Setiawan et al 2019).

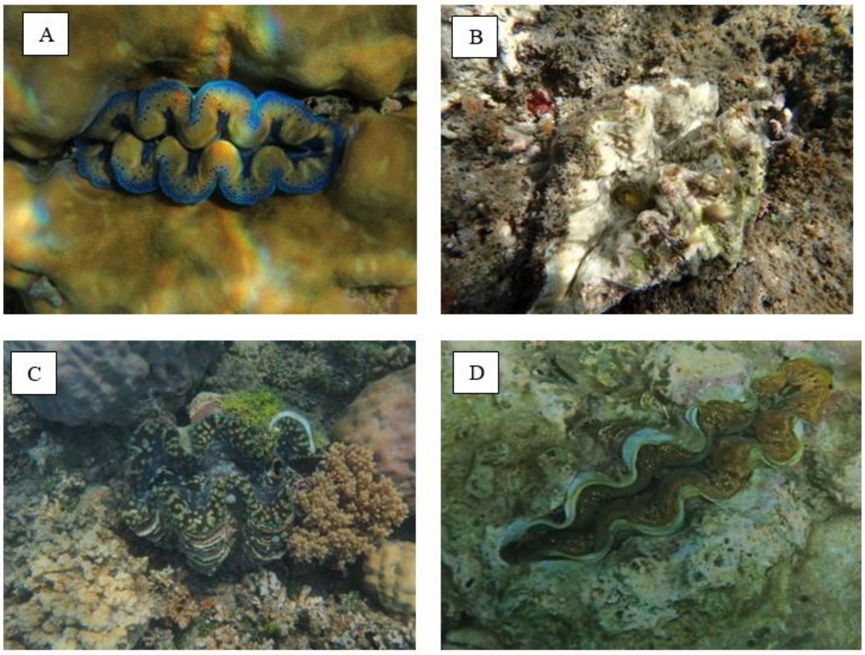

Figure 5. Giant clam habitat substrates in Baluran National Park Waters: (A) hard coral, (B) dead coral algae, (C) rubble, (D) rock.

Of the 7 clam shell species living in Indonesian waters (Iriansyah et al 2021), 4 species were found during this study in the Bama waters of Baluran National Park, namely *T. squamosa* (Figure 5.A), *T. maxima* (Figure 5.B), *T. crocea* (Figure 5.C), and *H. hippopus* (Figure 5.D). The clam shells of the types *T. gigas* and *T. mediterania* were not found at the study site, which is in accordance with the status of vulnerable species (IUCN 2017). The presence of clam species is influenced by the habitat conditions, including the substrate type, and the level of exploitation (Triandiza et al 2019). Conditions inherent in a certain behavior can be determined by the individual themselves; these include preferences for a particular habitat and interactions with other factors such as food distribution and habitat utilization that are caused by unfavorable environmental conditions. Based on the classification of Yadav et al (2016), the elected habitat index value ranges from +1 to -1, where the value $0<E<1$ indicates a habitat that is favored or used exclusively, whereas if $-1<E<0$ means the habitat is avoided or not preferred. The value of $E=0$ shows a neutral attitude towards the habitat.

The results of the calculation of the habitat electivity index on hard coral substrates can be seen in Figure 6. The hard coral habitat substrate has an electivity index value of 0.22 for the *T. maxima* habitat, while, the scaly clam (*T. squamosa*), hole clam (*T. crocea*), and sand clam (*H. hippopus*) have no interest in hard coral substrates. Based on the results of Saputra et al (2016), there is a positive relationship between the percentage of coral reef cover (especially massive and sub-massive coral lifeforms) and the distribution of clam shells.

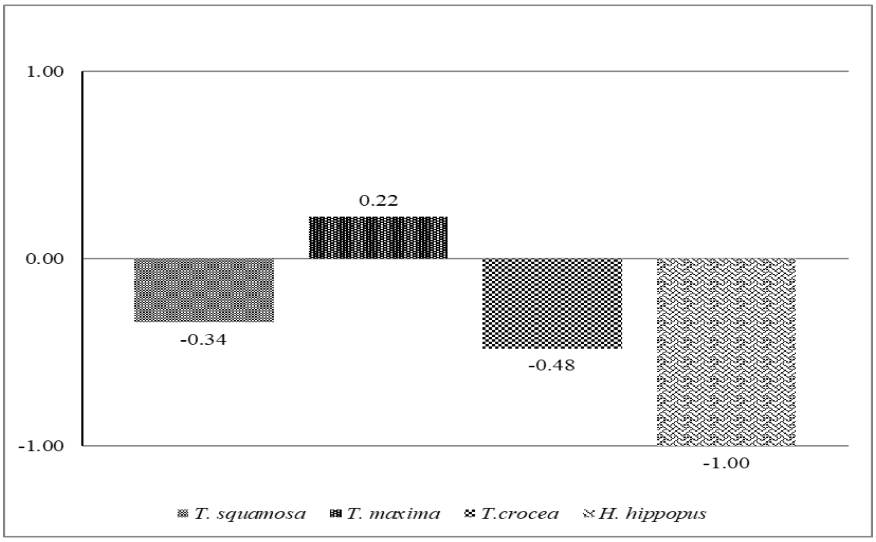

Figure 6. The Ivlev Electivity Index (E) of clams for hard coral substrates.

The results of the calculation of the habitat electivity index for the rubble substrate can be seen in (Figure 7). Coral fracture substrate is highly favored by the *H. hippoopus* sand clam with an E value of 0.53. Similarly, Arbi (2017) reported that *H. hippopus* was found on sand and rubble. In addition to *H. hippopus*, *T. squamosa* also occupies a coral reef substrate, with a E value of 0.32, according to Arbi (2017) explaining that the *Acropora* genus coral reef is the main habitat for *T. squamosa, T. gigas*, and *T. mediterania. T. maxima* and *T. crocea* with an E value of -1 did not like the rubble substrate because both species need a place to immerse either all or part of their body, such as the coral. As explained in the study of Iriansyah et al (2021), *T. maxima* will be more dominantly found firmly attached to the hard substrate of boulder corals or submerged in massive corals.

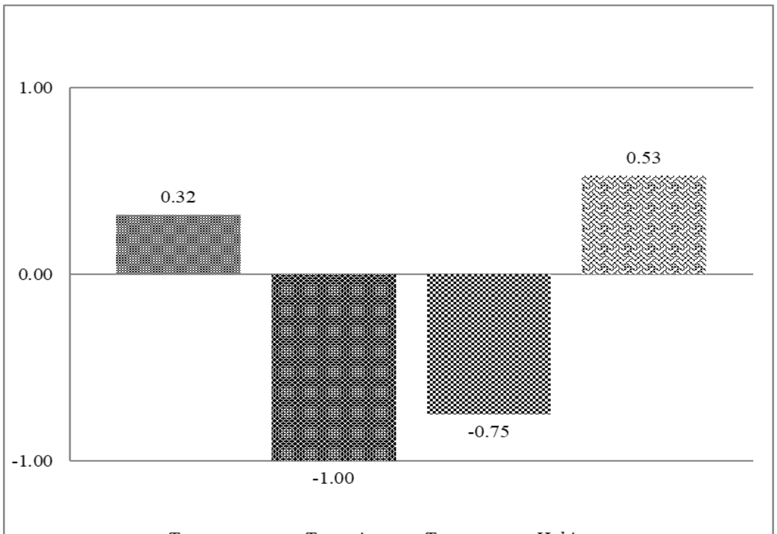

Figure 7. The Ivlev Electivity Index (E) of clams against rubble substrates.

The results of the calculation of the E on dead coral substrate with algae (DCA) can be seen in (Figure 8). DCA is the preferred habitat for all types of clams found at the study site, with an E value of more than 0 but less than +1, namely: 0.19 for *T. squamosa,* 0.01 for *T. maxima*, 0.24 for *T. crocea,* and 0.36 for *H. hippopus*. The results of these calculations are in line with the research of Iriansyah et al (2021), which states that most clams live on DCA substrates and also on corals from the genus *Poritidae*. The study stated that 63.4% of the clams were found on the DCA substrate. This is because some clams immerse themselves in the substrate, but natural factors can affect the release of zooxanthellae on the coral.

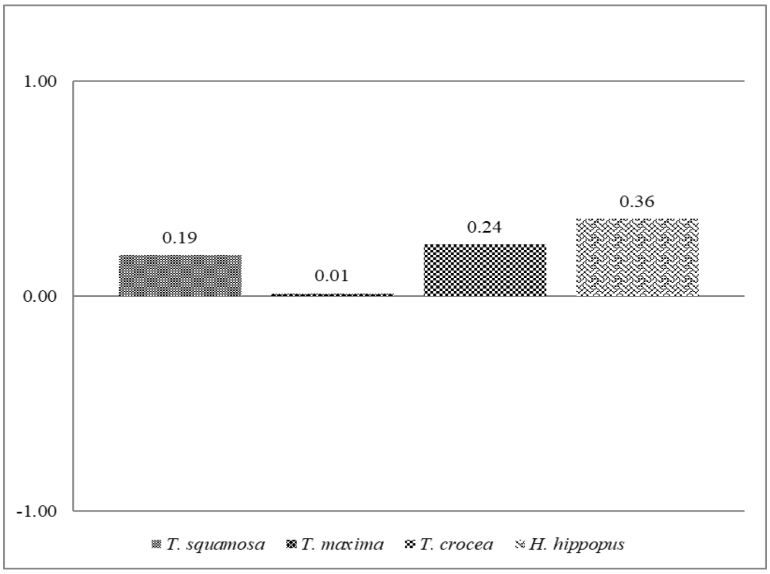

Figure 8. The Ivlev Electivity Index (E) for dead coral algae.

The results of the calculation of the preferred E for the rocky substrates (rock) can be seen in Figure 9.

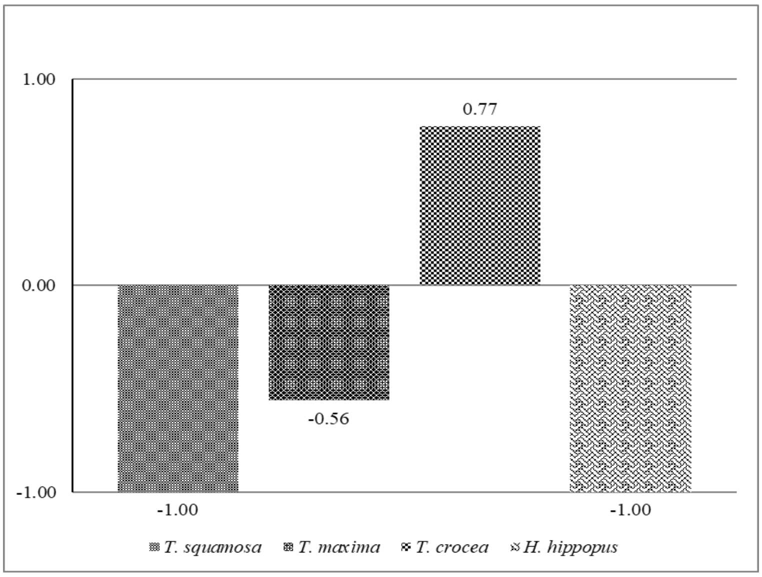

Figure 9. The Ivlev Electivity Index (E) of clam against rock substrate.

Rock refers to the substrate remaining from the dead coral. This habitat condition is highly favored by *T. crocea*, with an Ivlev Electivity Index value of 0.77, which means that it is close to 1 or can be categorized as a habitat that is used exclusively, while other clams (*T. squamosa, T. maxima, and H. hippopus*) occupy a rock habitat not because they prefer it, but only as a place to stop. This is evidenced by an E approaching -1 for rock. *H. hippopus* and *T. squamosa* were not found on the rocky substrate, which is reflected by an E value of -1, showing that *H. hippopus* really disliked the rock habitat, followed by *T. maxima* which also disliked the rock habitat with an E value of -0.56. Dumas et al (2014) reported that the *Tridacna* genus is more commonly found in coral reef areas which are characterized by rocky substrates with low sedimentation rates.

An analysis by species shows that *T. squamosa* prefers the Rubble type of habitat substrate with an E value of 0.32. In and the DCA substrate with an E value of 0.19. Hard coral substrate is not the preferred habitat for *T. squamosa*, as indicated by the E value of -0.34. The *T. maxima* species uses 2 types of substrates, namely dead coral algae 0.01 and hard coral 0.22. Rubble and rock substrate types are disliked by *T. maxima*. The results showed that this clam species was not found at all on the rubble substrate, so its value of E was -1 and for the rock substrate it was -0.56. The clam *T. crocea* uses rock as the preferred habitat with a higher E value, of 0.77. In addition to the rock habitat substrate, *T. crocea* also uses DCA as its preferred habitat, with an E value of 0.24. The habitat that was not selected for *T. crocea* was Rubble, with an E of -0.75. The hard coral habitat was not a preferred habitat, but several specimens have been found on this substrate, therefore an E value of -0.48 was obtained. *H. hippopus* clams have never been found on coral substrates that form rocks, so the E value for this substrate is -1. The preferred habitat for *H. hippopus* is the Rubble, with E of 0.53, and the Dead Coral Algae, with E of 0.36. The habitat substrate which is the most frequently used by all types of clams is the DCA with an E value range of 0.01-0.36. The rock substrate is only favored by *T. crocea*. As for the hard coral habitat substrate, it was only chosen by *T. maxima* and the Rubble was selected by *T. squamosa* and *H. hippopus*. Arbi (2017) stated that sandy area substrates were suitable as *H. hippopus* habitat, while hard coral substrates were suitable for *Tridacna*. Coral reefs preference is related to its growth supporting qualities. The planktonic phase of the clam is influenced by local environmental conditions, especially temperature, food availability and habitat. Clams that find the most suitable habitat can maximize their chance of survival (Dumas et al 2014). As evidenced for the coral reef cover found in Bama waters, Baluran National Park has a higher percentage of dead coral than of live coral. The results of the water quality testing are in accordance with the water quality standards for marine biota, especially for the clam breeding, as demonstrated by Neo et al (2013). High temperatures are known to increase the initial fertilization process, but lower temperatures improve the quality of life. The phytoplankton found in the Bama waters is dominated by the Bacillariophyta class, with blue pigments, and by the Cyanophyta class, with brown pigments.

Conclusions. *Tridacnadae* depend on the substrate as a habitat to survive. The waters of Baluran National Park (Bama Beach) are characterized by a variety of substrate types, namely hard coral, coral fragments, coral rocks and dead coral algae. The results showed that *T. squamosa* and *H. hippopus* preferred coral fragments as substrate. Meanwhile, *T. crocea* preferred rock substrates and *T. maxima* hard coral substrates.

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Conflict of interest. The authors declare no conflict of interest.

References

Al-Risqia S., Kurniawan K., Ambalika I., 2021 Density of sea urchins (*Diadema setosum*) in the coral reef ecosystem in dry reef in Bedukang waters, Bangka Regency. Journal

of Tropical Marine Science 4(2):84–93.
Arbi U. Y., 2017 Density and habitat conditions of clam shells (Cardiidae: Tridacninae) in several locations in North Sulawesi Waters. BAWAL Widya Riset Perikanan Tangkap 3(2):139–148.
Dumas P., Tiavouane J., Senia J., Willam A., Dick L., Fauvelot C., 2014 Evidence of early chemotaxis contributing to active habitat selection by the sessile giant clam *Tridacna maxima*. Journal of Experimental Marine Biology and cology 452:63–69.
English S., Wilkinson C., Baker V., 1998 Survey manual for tropical marine resources. Australian Institute of Marine Science, pp. 197-235.
Hasni H., Sadarun B., Ira I., 2017 Diversity and density of chemical types in the waters of Wawosunggu Island, South Konawe Regency. Sapa Laut 2(4):113–118.
Iriansyah I., Tapilatu R. F., Hendri H., 2021 Abundance, distribution patterns and habitat conditions of giant clam (Family: Tridacnidae). Musamus Fisheries and Marine Journal 95–106.
Ivlev V. S., 1961 Experimental ecology of the feeding of fishes. Yale University Press, New Haven, Connecticut, USA, pp. 43-45.
Ma H., Zhang Y., Zhang Y., Xiao S., Han C., Chen S., Yu Z., 2019 The complete mitochondrial genome of the giant clam, *Tridacna maxima* (*Tridacnidae Tridacna*). Mitochondrial DNA 4(1):1051–1052.
Neo M. L., Todd P. A., Teo S. L. M., Chou L. M., 2013 The effects of diet, temperature and salinity on survival of larvae of the fluted giant clam, *Tridacna squamosa*. Journal of Conchology 41:369–376.
Nijman V., Spaan D., Nekaris K. A. I., 2015 Large-scale trade in legally protected marine mollusc shells from Java and Bali, Indonesia. PLoS One 10(12):e0140593.
Nurhasanah N., 2022 The effect of anthropogenic activities on water quality with macrozoobenthos indicators in East Tanete Riattang District, Bone Regency. Universitas Hasanuddin, pp. 128-135.
Odum E. P., 1993 Fundamentals of ecology. Gadjah Mada University Press, Yogyakarta, pp. 53-55.
Rabiyanti I., Yulianda F., Imran Z., 2019 Analysis of the suitability of kima-based marine tourism in Morella State Waters, Central Maluku. Jurnal Pariwisata 6(2):136–140.
Rizkifar M. A., Ihsan Y. N., Hamdani H., 2019 Density and habitat preferences of kima (tridacnidae) in the waters of Semak Daun Island, DKI Jakarta. Jurnal Perikanan Kelautan 10(1):74-83.
Setiawan R., Sudarmadji S., Mulyadi B. P., Hamdani R. H., 2019 Habitat preferences for sea shell species (Molluscs: Bivalves) in the intertidal ecosystem of Tanjung Bilik Baluran National Park. Natural Science: Journal of Science and Technology 8(3):165–170.
Setiawan R., Wimbaningrum R., Siddiq A. M., Saputra I. S., 2021 Species diversity and habitat characteristics of clams (Cardiidae: Tridacninae) in the intertidal ecosystem of Tanjung Bilik Baluran National Park. Jurnal Kelautan: Indonesian Journal of Marine Science and Technology 14(3):254–262.
Susiana S., Niartiningsih A., Amran M. A., 2013 Abundance and density of kima (Tridacnidae) on the Spermonde Islands. Agrikan: Jurnal Agribisnis Perikanan 6(5):55–61.
Susiana S., Niartiningsih A., Amran M. A., Rochmady R., 2014 Suitability of locations for restocking tridacnadae kima in the Spermonde Islands. Jurnal Ilmu Dan Teknologi Kelautan Tropis 9(2):475–490.
Tamrin T., Aris M., 2020 Health condition of *Tridacna* sp. in the waters of Obi Island, Indonesia. Jurnal Ilmiah PLATAX 8(2):234–241.
Tapilatu J. R., Siburian R. H. S., Tapilatu M. E., 2021 Species identification, density, and type of substrate of clam (*Tridacnaidae*) in Kali Lemon coastal water-Kwatisore, Cenderawasih Bay, Papua, Indonesia. Aquaculture, Aquarium, Conservation & Legislation 14(5):2662–2671.
Triandiza T., Zamani N. P., Madduppa H., Hernawan U. E., 2019 Distribution and abundance of the giant clams (Cardiidae: Bivalvia) on Kei islands, Maluku, Indonesia. Biodiversitas 20(3):884–892.

Wilhm J. L., Dorris T. C., 1968 Biological parameters for water quality criteria. Bioscience 477–481.

Yadav S., Rathod P., Alcoverro T., Arthur R., 2016 Choice and destiny: The substrate composition and mechanical stability of settlement structures can mediate coral recruit fate in post-bleached reefs. Coral Reefs 35(1):211–222.

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