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Conservation of Abrasion Platforms to Support the Sustainability of Lobster (*sp. Panulirus)* in the Nature Reserve Forest (Nrf) of Sancang Area

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Abstract: ***The development of community activities needs to consider the sustainability of an area. The purpose of the study is Analyze the efforts of the NRF of Sancang management to limit community activities and the form of conservation and develop a lobster catching system in the abrasion platform. Descriptive methods are used in the study to describe the activities that occur in the abrasion platforms and coral reefs of the NRF Sancang area. To map the abrasion platforms by analyzing Landsat 8 imagery in 2024, ground checks and interviews with fishermen and tourists. Interviews were conducted with 14 fishermen living in the Sancang abrasion platforms. Sancang fishermen carry out fishing activities, especially lobsters (sp. locusta). On the abrasion platform of Sancang fishermen carry out activities of catching adult lobsters (sp. locusta) and lobster seeds (sp. infantem locustam) traditionally. Traditional lobster catching with boat catching gear, nets and petromax or LED lamps. This lamp functions to attract lobsters and lobster seeds to the center of light that has been provided by nets and feed. Although has high value, if lobster seeds are caught, it will disrupt the sustainability of lobsters (sp. locusta). To protect the sustainability of lobsters in abrasion platform without disrupting the lives of fishermen, it is necessary to limit fishing, only lobster are suitable for consumption. While lobster seeds are returned to their habitat. Lobster fishermen need to develop knowledge and lobster seed breeding through training, so that lobster life in the abrasion platform is sustainable.***

Keywords: Abrasion platform, traditionalfishing, Lobster seeds (sp. infantem locustam), Sustainability, training.

1. Introduction

The abrasion platform in the NRF Sancang area is a rock formed from coral animal fossils. These fossils contain calcium carbonate and have died and settled for a long time since the Pleistocene era and have formed coral limestone and Plio - Pleistocene limestone, limestone containing 95% calcium carbonate (Sismiani A, 2017; Aryaseta B, et al, 2022). Because it is formed from fossils of coral animals, it is known as coral reefs. The deposition of these fossils forms sedimentary rocks that form limestone and reef limestone. Coral reefs are formed on the shallow seabed, due to plate movements, so that these rocks are lifted to the surface of the sea. The lifted rocks each appear on the dynamic sea surface, so that they are abraded by waves, ocean currents and the surface of the rocks becomes flat. The coral - seawater interface is an important, highly dynamic microenvironment for reef - building corals (Nocella E, et al, 2024). Geomorphologically, the formation of limestone rocks is known as karst topography. In limestone or karst, it will experience dissolution. Dissolution is a very important process in karst areas. (Susanti N. E, 2019). Dissolution of limestone in addition to abrasion also causes rocks to become hollow. The cavities in the rocks become breeding grounds for plants and animals that are unique to their environment. The growth of coral reefs in sea water is strongly influenced by the quality of waters such as chemical oceanographic characteristics of lobster seed life, namely water temperature, salinity, pH, DO, nitrate, phosphate (Muhlis, 2011; Louhenapessy D, 2023; Lengka, et al, 2013). The formation of coral reefs with their characteristics forms an ecosystem with a diversity of flora and fauna. Coral reef is one of the important coastal ecosystems that have high biodiversity (Sahetapy D, et al; 2021) and Coral reefs are one of the most diverse and productive ecosystems on the planet (Vanwonterghem I & Webster, 2020). The diversity of coral reefs in Sancang is located in the Sancang Forest area which functions as a protected forest. The coral reef ecosystem is a habitat for coral animals, especially lobsters, so that the Sancang NRF area is maintained, so life in the abrasion plains and its organisms should be protected.

Coral reefs are formed from fossils of coral animals with calcium carbonate content, so that these rocks dissolve and are easily eroded by waves and ocean currents. Stony corals, a type of coral characterized by their hard skeleton, are the Badrock of the reef. Stony coral colonies are composed of hundreds of thousands of individual living polyps. Polyps are capable of drawing dissolved calcium from seawater, and solidifying it into a hard mineral (calcium carbonate) structure that serves as their skeletal support (EPA, 2024). Abrasion is the erosion of land due to the activity of waves, currents or sea tides (Witari M. R, et al; 2021). Easily abraded, the coral reefs that are lifted will be abraded, so that in a relatively long time the coral reefs become flat which is known as abrasion platforms. The process of forming plains over a long time. Most active abrasion occurs in the upper part of the intertidal zone, but weathering is slowly destroying formerly abraded surfaces at lower elevations and Coral reefs grow very slowly (R. Blanco - Chao, et al; 2007, Monterey Bay Aquarium; 2024). At high tide, sea water rises so that the abrasion platforms are inundated with a depth of <1 meter above the coral reef, while at low tide the sea level drops. At low tide the abrasion platforms appear with a height of <1 meter below

sea level. The raised coral reefs form a cape, so that it becomes a concentration of waves and ocean currents. The formation of abrasion platforms significant at the northern end of the cape, where the waves were concentrated (Kan H, et al; 2022). Coral reefs with abrasion platforms are not flat but have many small depressions. These depressions become traps for sea fish during high tide and when the sea water recedes, sea fish cannot return to the sea.

The abrasion platform include the NRF of Sancang area as a protected area, also, such as; catching, has beautiful scenery, so it is used as a place for several activities. Visitor activities to the abrasion plains such as; catching, camping and enjoying the beauty of the beach. Visitor visits and activities will affect and disturb the existence of the abrasion plain reef in the NRF Sancang area. With the condition of the abrasion platform, such as the beautiful view towards the open sea, a place to play on the abrasion platform, a stretch of sand and a place of shelter attracts many visitors from outside areas to enjoy it. Beach tourism is a form of tourism activity carried out in coastal areas that generally utilize coastal resources (Putra et al., 2013). With the morphology of abrasion platforms and bordering the coast, abrasion platforms have great potential. Both for local people or outsiders to visit. Beach tourism with supporting elements and its characteristics has represent a highly valuable resource from the aspect of natural, social, economic and recreational potential (Dodds, R & Holmes, M. R, 2019; Zadel Z, et al, 2018). Naturally, the abrasion platforms are bordered by forests and mangroves. Socially, there is interaction between the community and visitors. Economically, the abrasion platforms are widely used by fishermen to catch sea fish, especially lobsters, and the natural beauty of the abrasion platforms presents stunning views. Beaches provide multiple recreational opportunities, such as swimming, surfing, catching, walking or just enjoying being by the seaside (Pascoe S, 2019).

Coral reefs with the form of abrasion platform are the habitat of coral organisms, especially lobsters. ThSe growing market demand and rising lobster prices pose a threat to resource sustainability due to overexploitation (Zulbainarni N, et al; 2024). Dampak kebutuhan lobster tinggi secara tidak sadar akan mengurangi tingkat keberlanjutan kehidupan lobster, karena penagkapan semua ukuran lobster. The high exploitation rate due to increasing global demand caused spiny lobster vulnerable to overfishing (Mukminin A, 2022). Economically, lobster catching will increase the economic needs of the community, but it will result in the destruction of lobster life. Therefore, efforts are needed so that the environment and lobster life are sustainable. These efforts are not only through lobster fishing, but also by maintaining and breeding lobsters. to create an environment that supports and accelerates the process of sustainable lobster cultivation, with a positive impact on the local economy and environment (Reztrianti D, et al; (2023).

The Sancang abrasion platform is part of the Sancang Nature Reserve Forest Area (NRF). The NRF of Sancang is located in the South of Garut Regency. With geographic coordinates between 108° 01’15.66” E – 109° 00’00” E and 7° 01’12.96” S – 7° 46’44.4” S. The NRF of Sancang area has a land area as a forest with an area of 2, 157 ha]. while the mangrove and coral reef areas with an area of 1, 150 ha (KSDAE; 2013). The NRF of area is used by the government as a protected forest and conservation. The purpose of protection is as an effort to maintain and protect the sustainability of vegetation, animals and fungi. The forms of conservation employed were tree planting, the forms of conservation employed were tree planting, catching restrictions and the size of fish caught catching restrictions (Sugandi D; 2014).

The beach in the NRF of Sancang displays its attraction for visitors to enjoy the natural beauty. Although NRF of Sancang is a conservation area, it has its own attraction. The beauty of the beach and the uniqueness of the biota that live on the beach have long been an attraction for tourists (Oroh D. R. S.; 2023). Although beach tourism has a positive impact. Tourism has an impact on the economic, social, and cultural sectors (Purwadinata S & Ambarwati; 2023). But over time it will disrupt the NRF of Sancang area as a conservation and protection forest, so community involvement is needed. One of the efforts to conserve resources is to link local community wisdom to sustainable forest conservation (Rahman B, et al; 2020). Therefore, conservation does not mean eliminating and stopping people's livelihoods, but it requires restrictions. The location of Sancang NRF is shown in Figure 1

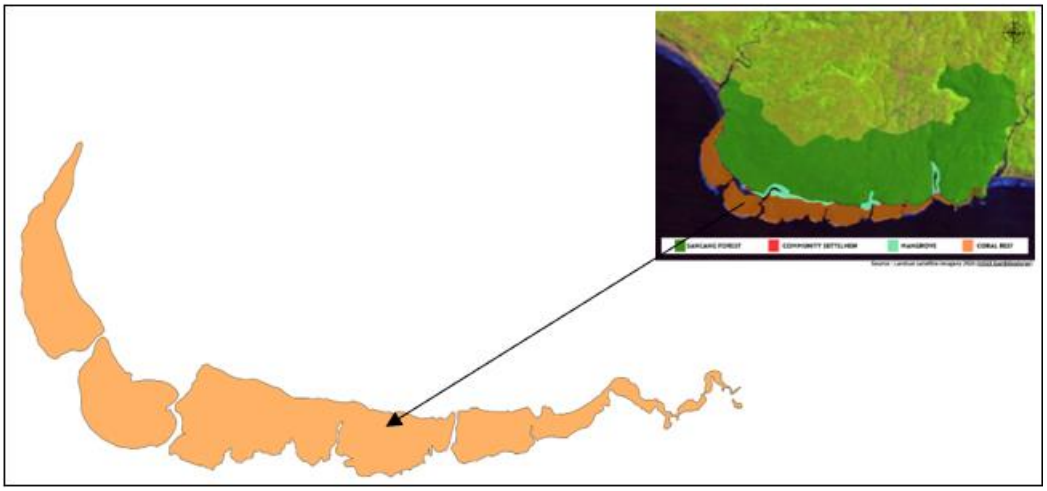

Figure 1: Abrasion Platform in NRF of Sancang area

In sustainable development of an area, not only attention is paid to improving the economy, social and community activities, but developing community activities can improve the economy but destroy the potential sustainability of forests, animals and fungi. Therefore, protection efforts are needed in the NRF of Sancang area by considering the socio - economic community. Therefore, this study aims to:

1) Analyze the efforts of the NRF of Sancang management to limit community activities in the abrasion platform
2) Analyze the form of conservation and develop a lobster catching system in the abrasion platform

2. Methodology

The method used in this study is descriptive with a qualitative approach. Descriptive method with a qualitative approach is used for social and cultural observations of the community to answer the research objectives (Cresswell J. W, 2012). This method is appropriate because the community who are active in the coral reef located in the NRF of Sancang Area is prohibited, because visitors for tourism purposes are uncertain. The Sancang abrasion platforms include the NRF of Sancang area as a protected forest, so that activities in this area are not disturbed and are used as tourist visits. However, the public's enthusiasm for visiting the abrasion platforms continues to grow. The abrasion and mangrove plains have an area of 1, 150 ha with plants, mangroves and forests bordering the abrasion platforms, so that visitors have a shelter with a stretch of sand. Therefore, the stretch of sand with tree protection is used as a camping ground, a resting place with a beautiful view of the beach. Data collection was obtained from interviews with people who do activities on the abrasion platforms. Interviews were limited to fishermen, anglers, and campers. From the results of this interview, an analysis was carried out. For mapping abrasion Platform areas using Landsat 8 imagery in 2024. Steps in interpreting the image are as follows:

1) Digital image analysis
   a) Membuka software Envi Classic
   b) Cropping to select the area to be studied
   c) Perform radiometric, atmospheric corrections, radiance corrections, Reflectance corrections, and TOA Reflectance/at surface reflectance corrections

The formula used is;
$\rho\lambda' = M\rho . Qcal + A\rho$
Keterangan
$\rho\lambda'$: Nilai *At Surface Reflectance*
Qcal: Nilai Pixel (DN)
Mρ: konstanta *rescalling (REFLECTANCE_MULT_BAND)*
Aρ: konstanta penambah (*REFLECTANCE_ADD_BAND*)
θ_{SE}: Sudut Matahari

2) Red Green Blue (RGB) Visualization
Select Band from RGB color (Red, Green, Blue)

3) Supervised digital analysis
- Interpretation
- Classification
- Sampling

4) Validate analysis

For comprehensive analysis and evaluation of interview results of fishermen, anglers and tourists activities along the abrasion platforms. Interviews were conducted qualitatively with 4 fishermen out of 21, 2 anglers and 5 visitors for tourism purposes. The survey to the NRF of Sancang was conducted in April 2024.

3. Result and Discussion

Fishermen

Although the Sancang abrasion platform is located in a protected and conservation area, the activities of the surrounding community have a high motivation to catch fish in this area. Geologically, this is a coral reef, but morphologically it is a plain that is abraded by ocean waves. Abrasion platforms with almost flat surfaces with small depressions. At high tide the sea water rises with sea fish and at low tide the sea fish are trapped in these depressions. Under the abrasion platforms there are many gaps due to rocks dissolving due to the influence of waves and ocean currents. These gaps and tunnels are a breeding ground for lobsters.

The catching location and boat dock are around the Sancang abrasion platform. The catching boat dock is shown in Figure 2.

Figure 2: Catching Boat

Meanwhile, to meet other needs, fishermen and their families must leave the NRF of Sancang at a distance of 5 - 6 km from the community settlement. The distance is quite far, so that the fishermen from 21 fishermen live with their families by building houses. In order to meet the needs of the family, they must leave the NRF of Sancang using motorbikes and river crossing boats. Fishermen who catch fish are not for consumption, but for special fish, namely lobsters, although in the catch they only get fish for consumption. The fishermen only catch lobsters, because they have high economic value. Therefore, Sancang fishermen only catch lobsters. These lobsters live and breed on coral reef beaches, so fishermen are not far from abrasion platform in Sancang area. The location of abrasion platform is shown in Figure 3.

Lobster catching (sp. Locustam) by fishermen is done traditionally. Lobster catching is done at night around 19.00 - 05.00 in the morning. The boat used is about 4 meters in size with a width of 1.5 meters with a distance from the coast of about 2 km - 4 km. To attract lobsters, lighting equipment such as petromak or LED lights are used, while nets are used to catch lobsters. When the location is right, the net is spread into the sea and the net is given food. This lobster catching system cannot select fish, crabs, lobsters (sp. Locustam)

Figure 3: The Abrasion Platform

or lobster seeds (sp. infantem locustam). With the catch, fish, crabs for consumption and lobsters and lobster seeds for sale. This means that lobsters (sp. Locustam) and lobster seeds (sp. infantem locustam) have high economic value, so that fishermen assume that the proceeds from the sale can replace operational costs and meet family needs. The lobster catch and its seeds are sold directly to middlemen in the fishermen's settlements. The selling value of lobsters is shown in Table 1.

Table 1: Selling Value of Adult Lobster

No	Harga Lobster dewasa		Ukuran (kg)
1	Nelayan ke Tengkulak (mentah)	Rp.180.000 – Rp.250.000/kg ($.11.44 – $.15.89/kg)	1 kg
2	Tengkulak ke konsumen (mentah)	Rp.320.000 – Rp.380.000/kg ($.20, 33 – $.24, 15)	1 kg
3	Pengolah ke konsumen (masak)	320.000 – Rp.380.000/kg ($.20, 33 – $.24, 15)	0.25 kg - 0, 3 kg

Lobster has a fairly high economic value that can increase the income of fishermen, because Sancang fishermen in particular, so the middlemen always wait every day in the fishermen's settlements who live on the Sancang abrasion platforms. The results of netting lobsters vary between 1 tail and a maximum of 16 tails per boat. But in the lobster catch, and those caught in the net, will be sold or consumed by the fishermen's family. The sales results from high - value lobsters are used to meet other than food needs, such as; operational costs, housing, school, health, and other needs. The traditional lobster catching system will maintain the sustainability and development of lobsters. Because the catching is done with nets, the catching is not only for the parent, but also for lobster seeds and lobster seeds that have high economic value. The Selling Value of Lobster Seeds is shown in table 2

Table 2: Selling Value of Lobster Seeds

No	Lobster Seed Price		Size (cm)
1	Fishermen to Middlemen	IDR.2.500 - 4.500/ head ($.0, 16–$.0, 29)	2, 0 - 7, 1
2	Middleman to Caregiver	IDR.8, 000 – 50, 000/ head ($.0.51–$.3, 19)	2, 0 – 7, 1
3	Caregiver to consumer (cook)	IDR.320, 000 – 380.000/kg ($.20, 44–$.24, 27)	0, 25 kg - 0, 3 kg
4	Maintenance time	40 days - 47 days	Depends on the size of the seed

The economic value of lobsters and lobster seeds has a major impact on the sustainability of lobster life. This means that development is not only thinking about the economy and income and welfare of the community relatively short, but it is necessary to think about the sustainability of lobsters and sustainable lobster seeds, so that it has an impact on the sustainability of the economy and income of fishermen.

Conservation and Income

The economic needs of coastal communities, then the community will utilize the surrounding resources. With limited coastal resources only Farming with agricultural land with low value, so that coastal communities utilize coastal resources. Therefore, catching communities utilize coral reefs in the abrasion platforms as fishermen and catch fish around the abrasion platforms. The lobster catching system and economic value are high, so fishermen choose biota resources that will have economic value, with catching patterns and family needs can be met. In catching with nets, not only adult lobsters but also lobster seeds are caught. Lobster catching can be directly sold and consumed, but lobster seeds must be maintained so that they can be consumed. The impact of catching lobster seeds will affect the existence and sustainability of lobster life in the coral reef abrasion platforms of the NRF of Sancang area. With the capture of lobster seeds, the sustainability of lobsters is threatened. Adult lobsters are sold for consumption, while lobster seeds are sold and brought and sold to be maintained. The lobster seeds are taken out or exported abroad to be maintained, so that adult lobsters and lobster seeds in the NRF of Sancang will become extinct. To maintain the sustainability of lobster life in the Sancang abrasion platforms, conservation of the area and lobster life is needed, so that lobsters can breed and be sustainable. By conserving the abrasion platform area does not mean that it will eliminate jobs that will automatically threaten the lives and incomes of fishermen. For conservation, a change in the function of jobs is needed, through training for fishermen. The training that needs to be developed by fishermen is by trying to develop and improve the maintenance and methods of breeding lobster seeds until they are suitable for sale and consumption. Through this training and skills, fishermen can maintain and breed lobster seeds into adult lobsters. Automatically, jobs and income are available, so that coral reefs with flat shapes and the lives of lobsters and other animals can be sustainable.

The condition of the abrasion plain area in the NRF of Sancang with a stretch of sand and plants along the edge of the abrasion plain has the natural beauty of the beach. The abrasion plain makes the area an ideal place to enjoy the beauty of nature, so that it becomes a special attraction for people outside the Sancang abrasion Platform Area. The natural beauty and coastal resources are used as tourist areas. If this is allowed to continue, it will make the NRF of Sancang area a Nature Tourism Park (NTP). Tourist activities visiting the abrasion platform are catching, camping, where the activities of visitors who stay on the abrasion platform by making a campfire. Allowing tourists to visit the abrasion

platform will disrupt the security and comfort of the Sancang Protected Forest. If this has natural beauty and tourist visits and the abrasion platform is made a tourist area, then the existence of tourists will slowly the NRF of Sancang become Nature Tourism Park (NTP). If the abrasion platform will be made permanent as a protected forest, then the NRF of Sancang area needs to be expanded to replace the abrasion platform land. To maintain the sustainability of lobster life in the NRF Sancang area, it is necessary to conduct socialization and skills training in maintaining and breeding lobster seeds. The maintenance and breeding of lobster seeds into adult lobsters that are suitable for consumption, then the life of lobsters in the NRF Sancang abrasion plain area can be sustainable.

4. Conclusions

The traditional system of catching lobsters using small boats, spreading nets carried out by fishermen is quite good at maintaining and protecting the sustainability of lobsters. But the weakness of the catching cannot select adult lobsters or lobster seeds. This catching system affects the sustainability of lobster life in the abrasion platform of the NRF Sancang area. To maintain sustainability, caught lobster seeds should be returned to their habitat.

Therefore, conservation on the abrasion platforms in the NRF of Sancang, coral reefs requires public awareness efforts and strict prohibitions. Lobster catching is limited to adult lobsters only, while lobster seeds are only to be maintained and bred by local fishermen. For the maintenance and breeding of lobster seeds through training in the maintenance and breeding of lobster seeds until they are suitable for consumption will affect the sustainability of lobster life and the lives of catching communities. Therefore, efforts to conserve the abrasion plains in the NRF Sancang area require public awareness efforts and strict prohibitions. Lobster catching is limited to adult lobsters only, while lobster seeds that are caught must be returned to their habitat. Except that lobster seeds will be bred and maintained by fishermen. To breed lobster seeds, socialization and training on techniques for maintaining lobster seeds until they are suitable for consumption is needed.

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Conflict of Interest
The authors declare no conflict of interest

References

[1] Aryaseta, Bagas, Wardhani P. C, Zainab S.2022. “Eksperimental Sifat Fisik dan Mekanik Batu Gamping. ” *Jurnal Ilmiah Teknik Sipil* 8 (1), p.37 - 42.
[2] Blanco - Chao R, Pérez - Alberti A, Trenhaile A. S, Costa - Casais M, Valcárcel - Díaz M.2007. “Shore platform abrasion in a para - periglacial environment, Galicia, northwestern Spain.” *Science Direct, Geomorphology*.83, p.136 – 151.
[3] Cresswell J. W.2012. “Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research, *Person Education*, New Jersey.”
[4] Dodds R, Holmes M. R.2019. “Beach Tourists; What Factors Satisfy Them and Drive Them to Return. ” *Ocean & Coastal Management*.168. P.158 - 166.
[5] EPA (Environment Protection Agency).2024. “Basic Information about Coral Reefs. ” Avalaible o**nline:** https: //www.epa. gov/coral - reefs/basic - information - about - coral - reefs#where, accessed 12/07/2024. accessed on 7/7/ 2024.
[6] Kan H, Hayate Klmura H, Sano W, Sannoh M.2022. “Abrasion platforms off basalt sea cliff. ” Chikei/Transactions. *Japanese Geomorphological Union*.42 (3), p.69 - 81.
[7] Lengka K, Kolopita M, Asma A.2013. “Teknik Budidaya Lobster (Cherax quadricarinatus) Air Tawar di Balai Budidaya Air Tawar (BBAT) Tatelu (Hatchery Technique of Freshwater Lobster (Cherax quadricarinatus) at BBAT Tatelu). ” *Jurnal Budidaya Perairan*, 1 (1), p.15 – 21.
[8] Louhenapessy D.2023. “Studi Parameter Kualitas Air Bagi Kegiatan Budidaya Lobster (Panulirus Sp) Dengan Sistem Keramba Jaring Apung Di Teluk Ambon Dalam.” *TRITON: Jurnal Manajemen Sumberdaya Perairan*, 19 (2), p.114 - 121.
[9] Monterey Bay Aquarium.2024. “Coral reefs“. Avalaible online: http: //https: //www.Monterey - bayaquarium. org/, accessed on 7/7/2024.
[10] Muhlis.2021. “Ekosistem Terumbu Karang dan Kondisi Oseanografi Perairan Kawasan Wisata Bahari Lombok. ” *Jurnal Berk. Penelitian. Hayati*, 16, p.111–118.
[11] Mukminin A, Indra, Sarong M. A (2022). Analysis of spiny lobster fishery sustainability the using ecosystem approach toMfisheries management (EAFM) in Pulo Aceh. DEPIK, Jurnal Ilmu - Ilmu Perairan, Pesisir dan Perikanan, 11 (1), p.68 - 75.
[12] Nocella E, Fassio G., ·Zuccon D, Puillandre N., Modica M. V, Oliverio M.2024. “From coral reefs into the abyss: the evolution of corallivoryn the Coral - liophilinae (Neogastropoda, Muricidae) Coral Reefs. ” *Springer*, 2024, Avalaible online: https: //doi. org/10.1007/s00338 - 024 - 02537 - 1, Accessed on 7/14/2024. [In Italy].
[13] Putra A, Hari F, Pratiwi A., Niken, T. M, Setyo, B.2013. “Kajian Keberlanjutan Pengelolaan Wisata Pantai di Pantai Pasir Putih Bira, Bulukumba, Sulawesi Selatan. ” *Jurnal Penelitian dan Pengembangan Kepariwisataan Indonesia*.8 (3). P.241 - 254.
[14] Rahman B, Pratiwi A, Sa’idah S. F.2020. “Studi Literatur: Peran Masyarakat Terhadap Konservasi Hutan. ” *Jurnal Pondasi*. ” 25 (1), p.50 - 62.
[15] Sahetapy D., Siahainenia L, Selanno D. A. J.,. Tetelepta J. M. S., Tuhumury N. C.2021. “The Status of Coral Reef at Hukurila Village Coastal Waters.” *Jurnal Triton*, 17, 1, 35 - 45.
[16] Sismiani, Ary.2017. “Karakteristik Batu Gamping Dan Nilai Faktor Keamanan Pada Lereng Kuaridi Desa Temandang Kecamatan Merakurak Kabupaten Tuban Jawa Timur. ” *Techno*, Issn 1410 - 8607 Volume 18 (1), H.042 – 049.

[17] Sugandi D.2014. "A Model of Environmental Conservation for Sagara Anakan. " *International Journal of Conservation Science*, 5 (1), p.95 - 106.
[18] Susanti N. E, and Nilai I. M.2019. Laju Pelarutan Batu Gamping Pada Mataair Sumber Agung Di Kecamatan Sumbermanjing Wetan Kabupaten Malang, *Jurnal Pendidikan dan Ilmu Geografi.4* (1), p.51 - 59.
[19] Witari M. R, Saidi A. W, SariasihK.2021. "Dampak Abrasi Terhadap Lingkungan dan Sosial Budaya di Wilayah Pesisir Pantai Pabean, Gianyar. " *Jurnal Teknik Gradien.1*3 (01), p.27 – 35.
[20] Vanwonterghem I and Webster N. S.2020. Coral Reef Microorganisms in a Changing Climate. *IScience Review*, 23 (4), p.1 - 15.
[21] Zadel Z, Gračan D, Milojica V.2018. "Beaches as a Factor in Achieving Competitiveness of a Tourist Product - Case Study: Istrian County, Multidisciplinary Scientific. " *Journal of Maritime Research.3*2. p.102 - 114.
[22] Pascoe S.2019. "Recreational beach use values with multiple activities. " *Ecological Economics.* 160. p.137 - 144.
[23] KSDAE.2013. "Pengenalan Ekosistem Hutan Di Cagar Alam Leuweung Sancang. " Institut Pertanian Bogor, Indonesia *Dirjen Konservasi Sumberdaya Hutan*. " Avalaible online on: https: //kshe. ipb. ac. id/praktek - pengenalan - ekosistem - hutan - di - cagar - alam - leuweung - sancang - garut/, accessedat 6/25/2024. [Indonesia].
[24] Oroh. D. R. S, Kontu T. M, Lintong O, Sinolungan L.2023. "Kesesuaian Wisata Pantai Untuk Rekreasi di Pantai Lakban Kabupaten Minahasa Tenggara. " *Jurnal Pesisir dan Laut Tropis.1*1 (1), p.15 - 20.
[25] Purwadinata S, Ambarwati.2023. "Analisis Potensi Dan Daya Tarik Obyek Wisata Pantai Saliper Ate Kabupaten Sumbawa. " *Jurnal Ekonomi dan Bisnis.*11 (1), p.61 - 71.
[26] Zulbainarni N, Haj M. H, Novindra (2024). "Sustainability level of the pearl lobster (*Panulirus ornatus*) aquaculture business using the systems of floating - net cage and fixed - net cage: A case study in South Sulawesi Province, Indonesia". *Aquaculture and Fisheries.9* (5), p.851 - 859