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AN ANALYSIS OF BIODIVERSITIES PRESENT AT SAND STRIP FROM VILA BEACH IN IMBITUBA - SC: THROUGH THE STUDIES OF SHELLS.

AN ANALYSIS OF THE BIODIVERSITIES PRESENT IN THE SAND STRIP OF VILA BEACH IN IMBITUBA - SC: THROUGH THE STUDIES OF SHELLS.

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SUMMARY

This article aims to evaluate the marine and terrestrial life on the village beach in the Municipality of Imbituba in Santa Catarina, the study provides an assessment of the life existing in the sand strip, with the analysis of the different species that survive in this niche, as well as , the variations of species over a pre-determined period of time, demonstrating changes that are produced in the environment, by the constant movement of people on the beach, and the constant presence of waste left by the population. An analysis will be made of the different species found, demonstrating the interactions of living beings that inhabit this location with the need for survival, often amidst trash and the constant presence of people, who use the beach for leisure. The study sought to identify the main species that inhabit this location.

Key words: Vila Beach. Marine life. Sand Strip. Shells. Species. Debris

ABSTRACT

This article aims to assess marine and terrestrial life on the village beach in the municipality of Imbituba in Santa Catarina., as species variations over a predetermined period of time, with demonstrations of changes that are produced in the environment, by the constant movement of people on the beach, and the constant presence of residues left by the population. An analysis of the different species found will be done, demonstrating the interactions of living beings that inhabit this location with the need for certain ones, often in the midst of garbage and the constant presence of people, who use the beach as leisure. The study sought to identify the main species that inhabit this location.
Keywords: Vila Beach. MarineLife. Sand Strip. Shells. Species. Debr.

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1. INTRODUCTION

Imbituba is located in the center-south of the country, in a region where the continental shelf extends least towards the Ocean. In the village beach region, the waves arrive with more energy on the coast, for this reason, there are differences and peculiarities, in relation to other regions of Brazil. The sandbank is almost fixed, with the presence of two islands (Santana de Dentro and de Fora).

The first ancestral people of Imbituba, who inhabited the place, were the Indians of the Carijós culture, who inhabited the coastal region of Vila Nova and Laguna, they lived in straw huts with a chief in the tribe, just like the indigenous culture of the time. . The sambaquis existing in the Roça Grande and Barbacena regions prove the indigenous proliferation in the Imbituba region. (Imbituba City Hall, History, 2014)

The different populations, initially indigenous, and later with the arrival of the Azorean Portuguese, used fishing and seafood extraction for their food and thus, to have the energy necessary for the survival and habitation of the region. The different species of mollusks in the area served as food for these populations.

In this way, we can observe the real importance of marine invertebrate animals, as a source of energy from our ancestors, through colonizers, to contemporary men.

In addition to food, molluscs are also indicators of water quality in their habitat, are used in handicrafts, and drive the local economy in many regions.

2 THEORETICAL FRAMEWORK

The presence of different species of molluscs is not limited to the open sea, but there is also a strong presence in river basins, in different regions, with a diversity of mollusc species being common. According to Mansur & Pereira, the number of species found in the Rio dos Sinos basin, in the southern region of the country, is higher than the number of species known in other basins in Rio Grande do Sul. The number of species of limnic bivalves was higher towards the mouth

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of the Rio dos Sinos (MANSUR; PEREIRA, 2006, p. 1144). The biodiversity of marine molluscs is the result of several studies in the southern region of Brazil.

Bruno and Santos describe that solid waste, mainly plastic, is a concrete, challenging fact that requires a collective effort from society and government bodies in order to be reversed. The environmental and aesthetic consequences and economic losses are enormous, with the reduction of attractions and cleaning of environments, being determining factors in the adoption of an approach in relation to waste, seeking prevention measures (BRUNO; SANTOS, 2012, p. 68.)

The community study showed the importance of causal research into man's actions throughout history. It is observed that over the years, pollution occurs, both in the oceans and in the sand strips on the coast. The bad behavior of contemporary man. This being the effect, the cause would be several environmental impacts. Justifying it with history and understanding the importance of bivalves in the local gastronomy. The presence of certain molluscs in the water, such as the cockle (Tivela mactroides), indicates that the environment is suitable for bathing, as this mollusk does not survive in polluted regions (SILVA, 2019).

Benthos fauna are considered filter feeders, and feed by removing organic particles through the water filtration process. Since, in addition to food, they make up microalgae and organic matter. These animals can accumulate toxic substances or organisms that are harmful to human health when consumed.

Cockles are an example of water filtering organisms, also serving as a source of income and human food. These molluscs serve as food, fishing bait and craft production (SILVA, 2019)

In the aquatic sphere, many microscopic organisms live in their natural habit that produce substances called marine biotoxins. And it is clear from studies that these substances are dangerous to human health and other animals. Biotoxins when exposed to heat and are not eliminated by cooking or other types of processing. Due to their resistance to high temperatures, even after cooking, they can harm humans. Demonstrating that feeding molluscs requires some care. According to Vale and Burri; These toxins are produced by a small number of microalgae species, whose concentrations in the marine environment increase

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casually when environmental conditions favor its growth. Due to the potent activity of these compounds, they can have relatively small proliferations of cells that do not change the color of the water, not causing the phenomenon called “red tide”.

When the community feeds on bivalve molluscs contaminated with biotoxins, the result in some cases is serious health complications, such as diarrhea, vomiting, abdominal pain, amnesia, cardiac, nervous and respiratory disorders, convulsions and, in extreme cases, coma and death. According to Silva (2019, p. 63), the risks caused to ecosystems by human action must be mitigated with the counterpart of actions to guarantee biodiversity and marine health.

It is observed at the study site that there is a lot of lighting coming from the Port of Imbituba at night, and this artificial lighting of the beach at night, which reflects illuminating on the sand, could possibly be causing interference in the ecosystem, as talking to native surfers , it was also noticed by them, the decrease of some representatives of the mollusca phylum on the beach, such as the popular “Busela”.

So this factor of artificial light is helping to increase the degradation curve, together with the decrease in biota, damaging the functioning and resilience of coastal systems (AZEVEDO, 2018). In Brazil, factors such as chemicals, heavy metals, coal, vinasse effluents, landfills, pesticides, dumping of garbage and oil from ships and real estate speculation affect the beaches, accelerating their degradation (BRASIL, 1990). The effects of natural dynamics, combined with human disturbances, can lead to a destabilization of the integrity of this system, inducing profound changes in physiographic units, almost always with a significant reduction in biodiversity (PORTZ, 2012), which threatens the its ability to provide the flow of services continuously (AZEVEDO, 2018).

According to data from the IBGE website, the city of Imbituba varies between third and fourth position in the ranking of cities with the largest number of inhabitants by the Association of Municipalities of the Laguna Region - Amurel. Therefore, population growth was recorded during the period.

Law 7661 of 1988, which established the National Coastal Management Plan, in its second single paragraph article, provides the definition of coastal zone, which according to this diploma

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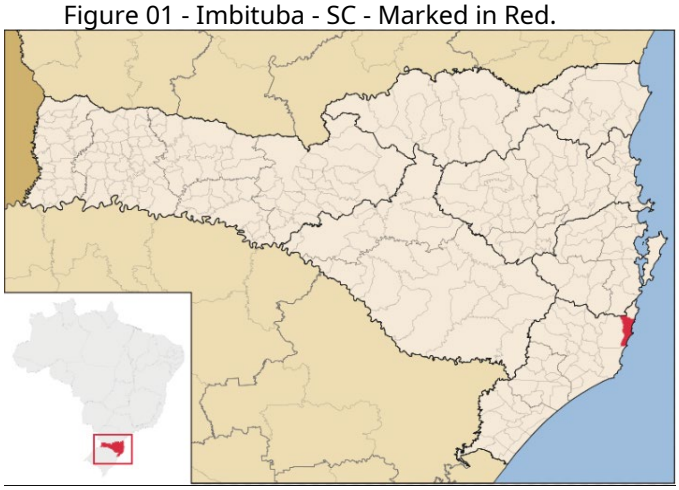
Legal is “the geographic space of interaction of air, sea and land, including their renewable or non-renewable resources, covering a maritime and a terrestrial range, which will be defined by the Plan” (BRASIL, 1988). Therefore, this article aims to evaluate and verify the different species of coastal molluscs present on the beach in the village of Imbituba in the state of Santa Catarina.

3 METHODOLOGY

The research methodology will be sampling, with the village beach as its delimitation, the species will be evaluated, through the existence of their shells, that live and have their habitat in the sand strip.

Figure 01 - Imbituba - SC - Marked in Red.



Source: Google Earth.

The collections and research and sampling locations are located in the stretches of the lagoon bar, in the place called Jangadeiro and ends at the corner of the beach, these locations will be analyzed, and materials will be collected. As can be seen, there is a high incidence of representatives of bivalve species on the beach of the village located in Imbituba, SC in three collection sections. The research was carried out from September 1, 2020 to November 10, 2020, observing that from 11/01 the summer season began, that is, more tourists, causing greater interference with collection.

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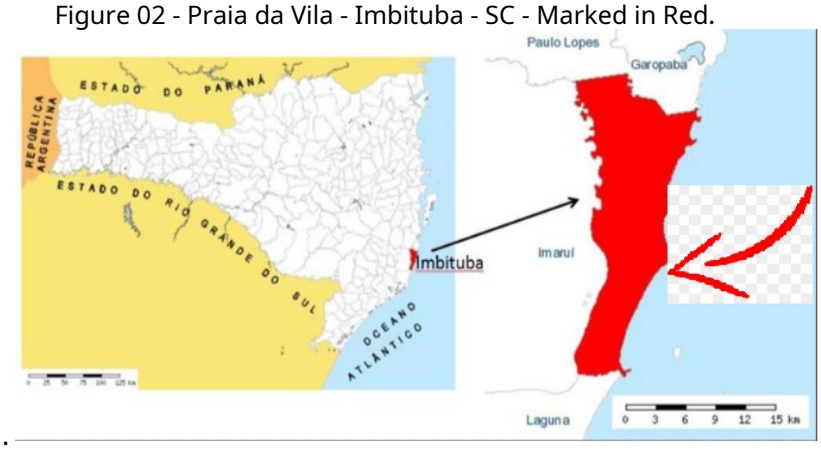
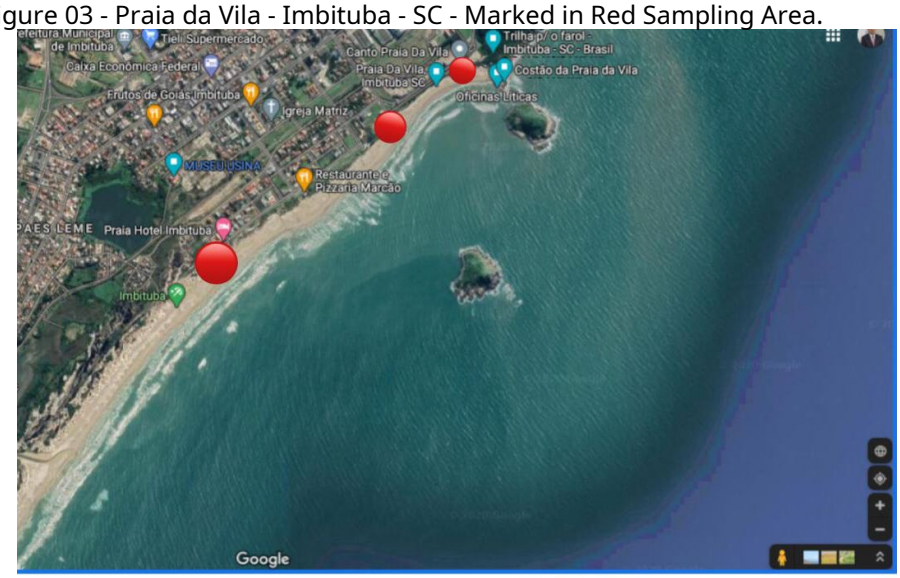
Figure 02 - Praia da Vila - Imbituba - SC - Marked in Red.



Source: Google Earth.

Collection will be carried out at the location of Imbituba, located in the south of Brazil, State of Santa Catarina. Your geographic coordinates of the loco area would be Latitude: -28.2405, and Longitude: - 48.6703 28° 14′ 26″ South, 48° 40′ 13″ West.

Figure 03 - Praia da Vila - Imbituba - SC - Marked in Red Sampling Area.



Source: Google Earth.

According to the literature, the reproductive cycle of bivalve molluscs begins in September, followed by a mature phase from February to April and there were two spawning periods, one that begins in March/April and the other in May/June, this will be housed in stone, like mussels. Energy storage and use cycles translate into a seasonal pattern of biochemical composition that can vary according to species and origin

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geographical (OJEA*et. al.,*2004). For Trindade, energy reserves are of considerable importance in reproduction, seasonal energy storage and use in bivalves are closely correlated with environmental conditions and annual reproductive cycles. According to the temperature of the aquatic environment and the variety of foods, these are the indicators that significantly alter the time and rate of energy storage in bivalves. It is clear that the result of these variables is complex and depends specifically on energy storage and consumption.

Its life cycle has not been studied on Praia da Vila. It is known that young representatives of the species initially occupy the submerged part of the sand strip, up to approximately 5 m deep. Throughout their lives, most molluscs allow themselves to be carried, rolling, by tidal currents until they reach the adult stage (larger than 20 mm). It is observed with empirical studies during the reproduction cycle all year round. Male and female individuals release their gametes into seawater and fertilization, external fertilization (occurs outside the organism), without copulation. The eggs fertilize after gametogenesis, in compact floating eggs, which, when hatched, release floating larvae (planktonic). After spending a period in the aquatic environment, the larvae migrate inland and into the sediment, where they undergo metamorphosis, transforming into a small mollusk with shells.

According to stories from the natives of the region, you can see that molluscs in general, such as cockles, which are used as a typical food in caiçara communities, have tasty meat and are prepared in various dishes: stews, spaghetti, omelettes, vinaigrette, pies , pancakes, moquecas, soups, soufflés and risottos. In this way, the preservation of its reproductive period is defined, so that there is no extinction.

4 RESULTS AND DISCUSSION

The study was carried out in the city of Imbituba, geographically located to the north with Garopaba and Paulo Lopes, to the south with Laguna and to the west with Imaruí. The municipality of Imbituba has an estimated population of 40,170, has a demographic density of 219.59 kilometers per inhabitant, its territorial unit has 182,929 square kilometers. Law 11,959, of 2009, was analyzed, which provides for the National Development Policy

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Sustainable Aquaculture and Fisheries, the legislator sought with this regulation to organize the activity and mainly the socio-economic, cultural and professional development of those who carry out fishing activities, as well as their communities. (BRAZIL, 2009). This legislation classified in its article 8, fishing activity as commercial and non-commercial, namely;

> Art. 8 Fishing, for the purposes of this Law, is classified as: I – commercial: a) artisanal: when practiced directly by professional fisherman, autonomously or in a family economy regime, with their own means of production or under contract partnership, disembarked, being able to use small vessels; b) industrial: when practiced by an individual or legal entity and involves professional fishermen, employees or in partnership on a share basis, using small, medium or large vessels, for commercial purposes; II – non-commercial: a) scientific: when carried out by an individual or legal entity, for the purpose of scientific research; b) amateur: when practiced by a Brazilian or foreigner, with equipment or paraphernalia provided for in specific legislation, with the purpose of leisure or sport; c) subsistence: when practiced for the purpose of domestic consumption or non-profit barter and using equipment provided for in specific legislation.

The main fishing activity occurring on the town's beach is subsistence fishing, carried out for domestic consumption or non-profit barter purposes and using gear provided for in specific legislation, which does not cause considerable damage to the environment. The only fishing not practiced in the region close to the coast is industrial, which is practiced further away from the sand strip. During the research, the following species were identified:

N	Species Name
01	Amiantis purpurata (Lamarck, 1818)
02	Pitar rostrata (Koch, 1844)
03	Anadora Brasiliana (Lamarck, 1819)
04	Anadora ovalis (Bruguiére, 1789)
05	Barbatia Candida
06	Olivancillaria carcellesi klappenbach (1965)
07	Donax hanleyanus (Philippi, 1842)
08	Perna perna (Linnaeus, 1758)
09	Diodora dysoni (Reeve, 1850)

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10	Lucapina aegis (Reeve, 1850)
11	Tegula Viridula (Gmelin, 1791)
12	Lottia subrugosa (d Órbigny, 1846)
13	Thais haemastoma (Linnaeus, 1767)
14	Bostrycapulus odites Collin, 2005
16	Olivancillaria contorturplicata (Reeve, 1850)

Source: Authors, 2020.

The collections were made in different periods and with wide climatic variations. He was identifying climate data to verify possible climate interference in the presence of species. As well, collections were made in the morning, in 2020, always close to sunrise. The climatic variations are shown below:

Table 01 - Climatic Data on the day of Collection

N	Data Climate	01/09	10/09	09/20	09/30	10/10	10/11
01	Temperature environment	17°W	19°W	13°W	24°W	23°W	18°W
02	Time	Rain	Cloudy	Cloudy	Cloudy	Cloudy	sunny
03	Moisture	89%	92%	65%	76%	70%	72%
04	Wind	10km/h	35km/h	11km/h	18km/h	10m/h	10m/h
05	Tide	Dry	Dry	Dry	Dry	dry	high
06	Waves	2 m	1.4m	1.8m	1.4m	1 m (6.3 Moon)	1.4m
07	Moon	Increasing	Waning	Flood	Full	Decreasing	Full

Quantities of collections were made in different periods and with wide variation in climate. Below are the species found and their quantities:

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Table 01 - Species of molluscs found in the sand

N	Species	01/09	10/09	09/20	09/30	10/10	01/11
01	Amiantis purpurata (Lamarck, 1818)	18	48	02	29	52	02
02	Pitar rostrata (Koch, 1844)	06	36	01	11	44	0
03	Anadora Brasiliana (Lamarck, 1819)	103	138	26	53	109	29
04	Anadora ovalis (Bruguiére, 1789)	06	11	03	1	3	02
05	Barbatia Candida	02	00	00	00	1	0
06	Olivancillaria carcellesi klappenbach (1965)	03	03	01	0	0	0
07	Donax hanleyanus (Philippi, 1842)	84	223	44	205	280	255
08	leg leg (Linnaeus, 1758)	78	127	61	46	44	14
09	Diodora dysoni (Reeve, 1850)	02	14	0	4	14	0
10	Lucapina aegis (Reeve, 1850)	02	02	02	5	5	3
11	Tegula viridula (Gmelin, 1791)	01	0	0	0	0	0
12	Lottia subrugosa (d'Orbigny, 1846)	00	03	0	0	0	0
14	Thais haemastoma (Linnaeus, 1767)	00	00	02	0	0	1

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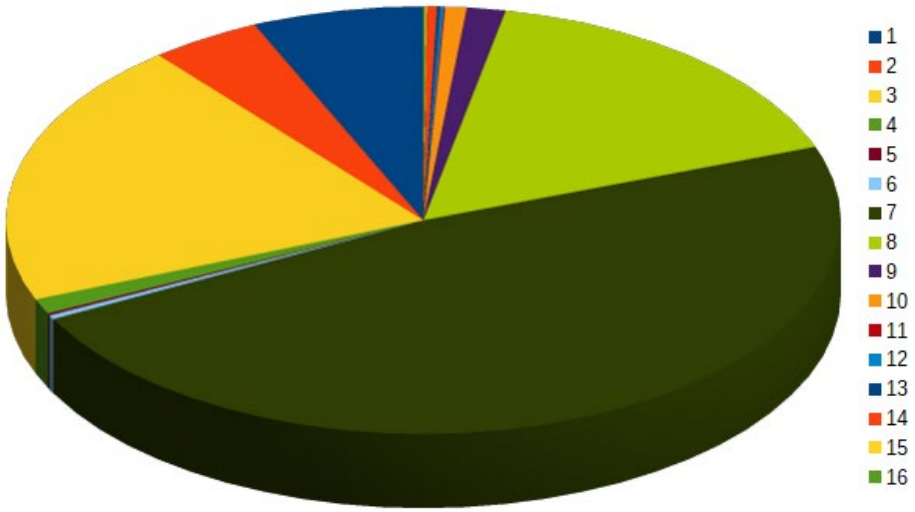
15	Bostrycapulus hate Collin, 2005	0	0	0	two	4	3
16	Olivancillaria contorturplicata (Reeve, 1850)	0	0	0	1	0	0

Source: Authors, 2020.

The data demonstrated the following species with greater quantities on the beach, demonstrating a predominance of the species *Donax hanleyanus.* The main species found was *Donax hanleyanus* (PHILIPPI, 1842), followed in second place by Anadora Brasiliana (LAMARCK, 1819) and in third place by *leg leg* (LINNAEUS, 1758), the variation in predominance of these species on certain days in relation to others was observed:

Figure 01 – Percentages of mollusk species found in the sand



In addition to the species *Donax hanleyanus* (PHILIPPI, 1842), Anadora Brasiliana (LAMARCK, 1819) and *leg leg* (LINNAEUS, 1758), the constant presence of Amiantis purpuratus (LAMARCK, 1818), Olivancillaria auricularia (LAMARCK, 1810) was observed.

1. Amiantis purpuratus (Lamarck, 1818)

Shells with oval to subtrigonal shape, thick valves with visible muscular scars. Very strong external ligament, heterodont hinge, with three cardinal teeth.

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Left valve with a bifid cardinal tooth, a prominent anterior and a lateral tooth. Umbos prosogyrous, lunula smooth. Deep pallial sinus. 256 Identification of Conchliological Remnants. External sculpture with fine concentric lines of growth. Approximate size 6.3 cm long and 5.6 cm high. It can reach 8.5 cm in length and 7.3 cm in height (figure 32). Typical external coloration in purple tones, internal coloration in porcelain white. It occurs at shallow depths, on sandy bottoms and, often, together with Mactra isabelleana. Edible species, commercially exploited in the Gulf of San Matias, Argentina. In Brazil, it is distributed from Espírito Santo to Rio Grande do Sul.

2. Anadara Sp.

Brazilian anadara(named, in English : incongruous ark; in the Portuguese translation: "incongruous ark") is a species of littoral marine Bivalvia mollusc of the family Arcidae, classified by Jean-Baptiste de Lamarck in 1819; described as the Brazilian Ark.

*Anadara chemnitzii,*Chemnitz ark clam common name, is a saltwater mollusk in the family Arcidae, ark shells. This species is found in the Caribbean Sea from Texas to the West Indies and Brazil.

*Anadara ovalis (*Bruguiére, 1789) Valves with trapezoidal shape, external surface with 30 to 35 radial ribs, slightly arched and narrow taxodon hinge, prosogyrous umbos. The size of the valves varies between 3.8 cm in length and 2.5 cm in width. White color, thick brown or greenish-brown periostracum (figure 22). The species occurs from the sublittoral to 35 m depth, on sand, rock or coral bottoms. It is distributed along the entire coast of Brazil. Popular name “arca-blood”.

3. Olivancillaria auricularia (Lamarck, 1810)

Oval shell shape, short spiral, with strong posterior callosity. Solid, thick and heavy shell. Long last lap, wide and elongated opening. Columella facing left, with folds. Medium shell approximately 4.3 cm long and 3 cm wide. Blue-gray external color, fasciolar band with yellowish-brown color (figure 16). It occurs on sandy bottoms, in shallow waters, in the midlittoral zone. Gregarious species.

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Predator of other molluscs and crustaceans. Edible species. In Brazil, it occurs in Santa Catarina and Rio Grande do Sul. It may appear as a subspecies of O. vesica. Popular name “lingarudo”.

4. Donax hanleyanus Philippi, 1842

Trigonal valves, inequilateral with elongated anterior region. Ventral edges of the valves with crenulations. Dorsal surface of the valves with concentric radial striations. Hinge with two cardinal teeth and two lateral teeth on each valve. Left valve with recess for fitting the posterior tooth of the opposite valve (figure 28). Approximate size 2.8 cm long and 1.5 cm wide. Variable coloring; They are generally white with brown radial bands, yellowish periostracum. They occur in shallow waters, buried in the sublittoral zone; are used as food. On the coast of Brazil, they range from Espírito Santo to Rio Grande do Sul. Popular name “mozambique”. The species Fissurella clenchi Farfante, 1943, is confused with Lucapina aegis (REEVE, 1850). as well as the many similarities between Olivancillaria auricularia, and the presence of Pitar rostratus (KOCH, 1844), it was constant on some days, being a solid shell, equivalents, valves with a trigonal to quadrangular shape. Umbos protruding, strongly facing the anterior region, prosogyrous. External surface with fine, concentric growth lines. Cordiform lunula, thickened external ligament, smooth ventral border. Approximate size 5.6 cm long and 4.7 cm high (figure 31). External coloration generally whitish, varying from beige to cream, yellowish periostracum, white internal coloration. They occur in sandy bottoms, with gravel or fragmented shells, at depths of 10 to 100 m. Edible species. In Brazil, it occurs from Rio de Janeiro to Rio Grande do Sul.

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N	Species	Photos
01	Amiantis purpurata (Lamarck, 1818)	
02	Pitar rostrata (Koch, 1844)	
03	Brazilian Anadora (Lamarck, 1819)	

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04	Anadora ovalis (Bruguiére, 1789)	
05	Barbatia candida	
05	Olivancillaria vesica auricularia (Lamarck, 1810)	

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06	Olivancillaria carcellesi klappenbach (1965)	
07	Olivancillaria vesica, vesica (Gmelin, 1791)	
08	Lucapinella henseli (Martens, 1900)	
11	Donax hanleyanus (Philippi, 1842)	

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14	Diodora dysoni (Reeve, 1850)	
	Lottia subrugosa (d'Orbigny, 1846)	
		
	Lucapina aegis (Reeve, 1850)	

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	Tegula	

Source: Authors, 2020.

Through the images above we can see the diversity of mollusk species, with different colors and shapes, which demonstrates the rich marine biodiversity in the region.

5 CONCLUSION

It is observed that there is a lot of lighting coming from the Port of Imbituba at night, and this artificial lighting may have interfered with marine life, and in this region there is little presence of shells, as it reflects the light and illuminates the sand, possibly It may be causing interference in the ecosystem, as speaking with native surfers, they also noticed the decrease in some representatives of the mollusca phylum, such as Busela. The study developed was able to show the great biodiversity of mollusks on the beach under study, thus contributing to the understanding of the life forms of coastal habitation in this region.

The identified data suggest that, among molluscs, the taxon of the species *Donax hanleyanus* (PHILIPPI, 1842), Anadora Brasiliana (LAMARCK, 1819) and *leg leg* (LINNAEUS, 1758), Amiantis purpuratus (LAMARCK, 1818), and Olivancillaria auricularia (LAMARCK, 1810) the most frequently found resource. The study also brings new contributions to the knowledge of current and local malacofauna, contributing to future research in the region.

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