TẠP CHÍ KHOA HỌC ĐẠI HỌC TÂN TRÀO
ISSN: 2354 - 1431
http://tckh.daihoctantrao.edu.vn/

RESEARCH ON SPECIES COMPOSITION AND DISTRIBUTION OF BENTHIC ANIMALS IN THE COASTAL ECOSYSTEM OF KIEN LUONG, KIEN GIANG PROVINCE (VIETNAM)

Nguyen Thanh Binh[1], Do Cong Ba[2]*
[1]Vietnam Institure of Seas and Island, Viet Nam
[2]Tan Trao University, Viet Nam
Email address: nguyenthanhbinh.visi.96@gmail.com
DOI: https://doi.org/10.51453/2354-1431/2022/900

Article info

Received:15/10/2022
Revised: 16/11/2022
Accepted: 10/12/2022

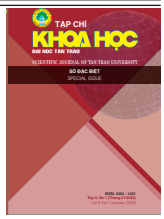
Keywords:

Kien Luong, Kien Giang, Gastropoda, Crustacea, Bivalvia.

Abstract:

Research results have identified 173 species of coastal benthic Kien Luong, belonging to 122 genera, 75 families and 7 representative groups. Among the discovered species, Gastropod Molluscs have the highest number of species with 70 species, followed by bivalve molluscs with 51 species, crustaceans with 40 species. Other groups account for a lower proportion: Polychaeta has 9 species, Scaphopoda has 2 species, Cephalopoda and Chelicerata all have 1 species. Distribution: The species composition of mangroves has 27 species, the average species weight is 15.8 g/m2, the average species density is 26.33 inds/m2, with a high biodiversity index of 3.57; The species composition of benthic organisms in the intertidal zone has 48 species, the average species weight is 42.71 g/m2, the average species density is 510.42 inds/m2, the relative biodiversity index is 2.83.

TẠP CHÍ KHOA HỌC ĐẠI HỌC TÂN TRÀO
ISSN: 2354 - 1431
http://tckh.daihoctantrao.edu.vn/



NGHIÊN CỨU THÀNH PHẦN LOÀI VÀ PHÂN BỐ CỦA ĐỘNG VẬT ĐÁY TRONG HỆ SINH THÁI VEN BIỂN KIÊN LƯƠNG, TỈNH KIÊN GIANG (VIỆT NAM)

Nguyễn Thanh Bình[1], Đỗ Công Ba[2]*

[1]Viện Nghiên cứu biển và hải đảo, Việt Nam

[2]Trường Đại học Tân Trào, Việt Nam

Địa chỉ Email: nguyenthanhbinh.visi.96@gmail.com

DOI: https://doi.org/10.51453/2354-1431/2022/900

Thông tin bài viết

Ngày nhận bài: 15/10/2022

Ngày sửa bài: 16/11/2022

Ngày duyệt đăng: 10/12/2022

Từ khóa:

Kiên Lương, Kiên Giang, Gastropoda, Crustacea, Bivalvia

Tóm tắt

Kết quả nghiên cứu đã xác định được 173 loài động vật đáy vùng ven biển Kiên Lương, thuộc 122 giống, 75 họ và 7 nhóm đại diện. Trong số các loài đã phát hiện, Thân mềm Chân bụng là nhóm có số loài nhiều nhất có 70 loài, tiếp theo là Thân mềm Hai mảnh vỏ có 51 loài, giáp xác có 40 loài. Các nhóm khác chiếm tỷ lệ thấp hơn: Polychaeta có 9 loài, Scaphopoda có 2 loài, Cephalopoda và Chelicerata đều có 1 loài. Phân bố: Thành phần loài động vật đáy rừng ngập mặn có 27 loài, khối lượng trung bình của các loài là 15,8 g/m2, mật độ trung bình của các loài là 26,33 cá thể/m2, có chỉ số đa dạng sinh học cao là 3,57; Thành phần loài động vật đáy ở bãi ngập triều có 47 loài, khối lượng trung bình của các loài là 42,71 g/m2, mật độ trung bình của các loài là 510,42 con/m2, có chỉ số đa dạng sinh học khá cao với 2,83.

1. Introduction

Kien Luong district is located in the northwest of Kien Giang province, with a long coastline, white sand, famous for ecological and spiritual tourism. As for coastal benthic animals, they mainly rely on the bottom layer, corals and mangroves to function, reproduce and develop. The mangrove ecosystem plays a very important role, as a habitat and a large food source for benthic animals. Benthopods are organisms that decompose plant waste, dig burrows to help aerate and release gases in the soil, most plants have provided a lot of food for animals living in the bottom. In particular, in the intertidal zone with sand, gravel and coral bottoms, it is a hiding place, protecting and providing food for many animals in the flooded area [1], [2].

Coastal and offshore benthic animals also have certain economic significance, many groups have been identified as having an important role in the daily life of people living in the sea and export value. That will create resources for economic development, and at the same time be a premise for important studies on biodiversity and ecology to find out how to raise livestock for large and small scale farming. The coastal intertidal zone of Kien Luong is also one of the areas with many aquatic plants and corals, in many places due to overexploitation by humans, causing the benthic fauna in the area to gradually decrease in number

of individuals as well as species composition. This study obtains a list of coastal benthic species in Kien Luong (Kien Giang), in order to assess the level of biodiversity, the difference in distribution in mangroves and intertidal areas, contributing to the study of marine biological resources along the coast of our country.

2. Research time and methods

2.1. Time and place

The location is Kien Luong coastal area with a rich and diverse ecosystem including mangroves and tidal flats, where the distribution of animal species both in number and species composition..Sample collection time March 2019 (Figure 1).

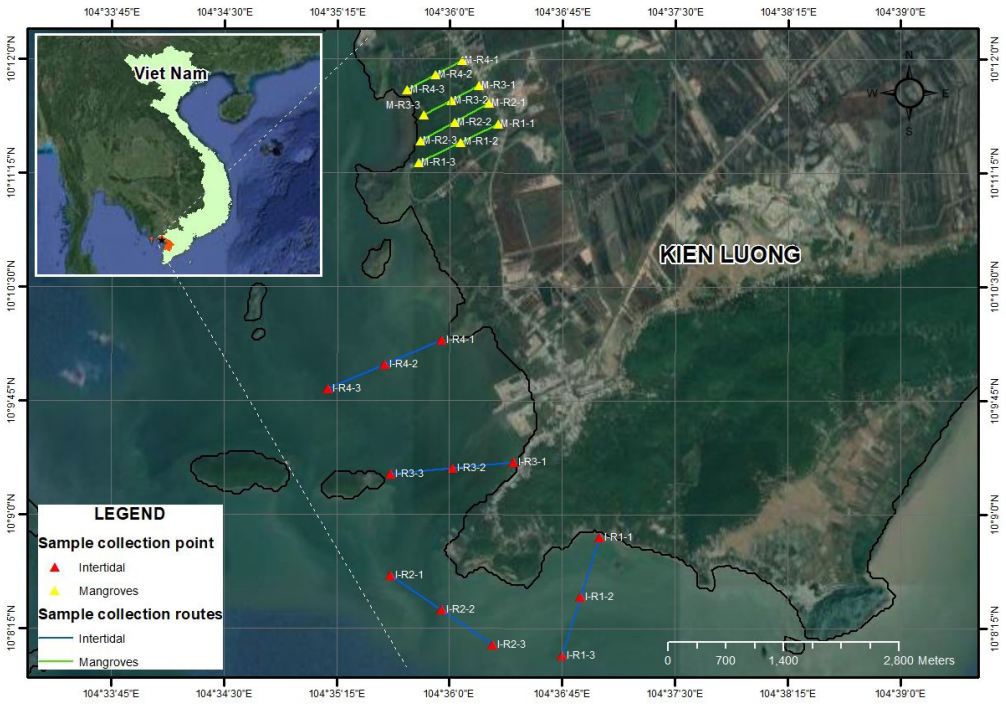


Figure 1. Map of the location to collect benthic samples in Kien Luong

2.2. Methods

***Quantitative sampling method*:** The research team established four sampling routes in mangroves and four in intertidal areas, including both qualitative and quantitative samples. Each route takes 3 samples, the sampling points are determined with coordinates, positions, ordinal numbers and recorded characteristics. Quantitative samples were collected in the mangrove forest with an area of $1m^2$ (1m x 1m), collected vertically at the bottom and 0,05 – 0,1m deep at the bottom until all benthic animals were gone. Triangular rake net (0,25 x 0,25m) used to collect benthic animals in the intertidal zone has an area of $1m^2$ (0,25 x 4m). Quantitative samples (24 samples) are recorded according to the ordinal number corresponding to the position and coordinates of each sampling route. Samples were collected from all benthic groups (Crustaceans, Gastropods, Bivalve Molluscs, Polychaetes, ...) until no longer found. The entire bottom sludge with an area of $1m^2$ is treated by 1-1,5mm mesh sieve to remove soil and collect benthic animals. Collected samples are placed in plastic bags or plastic containers with lids and labeled. Right on the same day, the sample was washed off the mud, fixed in 70^o alcohol to save the sample before analysis.

***Qualitative sampling method*:** Qualitative samples were extended the sampling range in the study area to supplement the quantitative samples and avoid missing species composition. The locations of the sampling points are determined by coordinates.

***Methods of specimen identification and specimen preservation*:** Samples after washing are fixed in alcohol 70^o, the samples are distinguished from each other by numbered labels and marked quantitative or qualitative on it. Determining the scientific name of the species for the specimens based on the external morphological features and the following documents:Dai Ai-Yun và

Yang Si-Liang,1994 [8]; Jocelyn Crane, 1975 [10]; Kent E. Carpenter và Volker H. Niem, 1998 [11]; Han Raven, Jap Jan Vermeulen, 2006 [9]; Blakmore, 2007 [7].

All samples after analysing were counted and weighed by electronic balance, error 0.01g. After that, they is stored in the laboratory of the Institute of Sea and Island Research.

***Methods to determine biological indicators*:**

- Density of individual in the study plot: m^2

In where: V - Number of individuals /m^2; Σn - Total number of individuals in the study plots (ind.); ΣS - Total area of study plots (m^2).

- Species richness (P%):

- Biodiversity Index or Shannon Index (H'):

In where: n_i - Number of individuals of species i^{th} in the study plot.

- Biomass calculated according to the formula: g/m^2

In where: W - Average mass of species; N - Total number of individuals; ∑m - Total mass from sample 1 to sample n.

3. Results and discussions

3.1. Diversity of benthic animals

The species composition of benthic animals on coastal intertidal area in Kien Luong had been recorded 173 species belonging to 122 genera, 75 families, 30 orders and 7 representative groups (Bivalvia, Gastropoda, Crustacea, Polychaeta, Cephalopoda, Chelicerata và Scaphopoda). Among the discovered species, Gastropod Molluscs are the group with the largest number of species (9 orders, 25 families, 45 genera, 70 species, accounting for 39.33%). Next is Bivalve Molluscs (11 orders, 20 families, 38 genera, 51 species accounting for 28.65%), Crustaceans (3 orders, 20 families, 27 genera and 40 species accounting for 22.47%). Other groups account for a lower proportion such as: Polychaeta has 8 species, Scaphopoda has 2 species, Cephalopoda and Chelicerata have 1 species (table 1 and 2).

Table 1. Species composition and distribution of coastal benthic animals in Kien Luong

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m^2	P%	v	g/m^2
	ANNELIDA						
	POLYCHAETA						
	Amphinomidae						
1	*Chloeia parva* Baird, 1868				0,07	0,33	0,57
	Eunicidae						
2	*Amphinome indica* Schmarda, 1861	1,90	0,5	0,28			
3	*Eunicide indica* Kinberg, 1865				0,08	0,42	0,06
4	*Onuphis holobranchiata* Marenzeller, 1879				0,03	0,17	0,07
	Glyceridae						
5	*Glycera alba* (O.F. Müller, 1776)				0,02	0,08	0,08
	Nereidae						
6	*Ceratonereis burmensis* Monro, 1937						
	Nereididae						
7	*Neanthes glandicincta* (Southern, 1921)						
	Sternaspidae						
8	*Sternaspis scutata* (Ranzani, 1817)				0,33	1,67	0,12
	ARTHROPODA						
	CHELICERATA						
	Limulidae						
9	*Limulus polyphemus* (Linnaeus, 1758)						
	CRUSTACEA						
	Alpheidae						
10	*Alpheus euphrosyne* De Man, 1897	1,58	0,41	0,40			

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
11	*Alpheus malabaricus* (Fabricius, 1775)						
	Camptandriidae						
12	*Paratylodiplax blephariskios* (Stebbing, 1924)				0,02	0,08	0,13
	Diogenidae						
13	*Clibanarius longitarsus* (De Haan, 1849)						
14	*Diogenes lophochir* Morgan, 1989						
	Dotillidae						
15	*Ilyoplax pusillus* (De Haan, 1835)	1,58	0,41	0,13			
	Grapsidae						
16	*Episesarma singaporense* (Tweedie, 1936)						
17	*Metopograpsus quadridentatus* (Stimpson, 1858)	1,58	0,41	0,15			
18	*Metopograpsus latifons* (White, 1847)						
19	*Metopograpsus thukuhar* (Owen, 1839)	0,32	0,08	0,13			
	Hymenosomatidae						
20	*Hymenosoma projectum* Dawson & Griffiths, 2012						
	Leucosiidae						
21	*Philyra globulosa* Ortmann, 1892						
22	*Phylira heterograna* Ortmann,1892				0,02	0,08	0,04
	Matutidae						
23	*Matuta planipes* Fabricius, 1798						
	Ocypodidae						
24	*Anomalifons lightana* Rathbun, 1929				0,02	0,08	0,08
	Pandalidae						
25	*Plesionika edwardsii* (Brandt, 1851)	9,18	2,42	0,47			
	Palaemonidae						
26	*Exopalaemon carinicauda* Holthuis, 1950	7,91	2,08	0,33			
27	*Palaemon gravieri* (Yu, 1930)				4,90	25,00	0,61
28	*Macrobrachium rosenbergii* de Man, 1879	0,32	0,08	0,03			
29	*Macrobrachium ohione* (Smith, 1874)						
	Penaeidae						
30	*Metapenaeus ensis* (de Haan, 1844)						
31	*Metapenaeus monoceros* (Fabricius, 1798)				3,92	20,00	0,09
32	*Parapenaeopsis hardwicklii* (Miers, 1878)						
33	*Parapenaeopsis sculptilis* (Heller, 1862)				0,05	0,25	1,04
	Pilumnidae						
34	*Pilumnus monilifera* Haswell, 1882	0,32	0,08	0,17			
	Portunidae						
35	*Charybdis anisodon* (de Haan, 1850)				0,02	0,08	0,03
36	*Charybdis callianassa* (Herbst, 1789)				0,03	0,17	0,07
37	*Portunus trituberculatus* Rathbun, 1902						
38	*Portunus spiniferus* Stephenson & Rees, 1967				0,02	0,08	0,04
39	*Portunus sanguinolentus* (Herbst, 1783)						
40	*Scylla serrata* (Forskål, 1775)						
	Sergestidae						
41	*Acetes japonicus* Kishinouye, 1905						
42	*Acetes sibogae sibogae* Hansen, 1919				14,08	71,92	0,67
	Sesarmidae						

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
43	*Parasesarma leptosoma* (Hilgendorf, 1869)	0,63	0,17	0,03			
44	*Perisesarma eumolpe* (de Man, 1895)						
	Varunidae						
45	*Metaplax elegans* de Man, 1888	6,33	1,67	0,50			
46	*Metaplax longipes* Stimpson, 1858	7,91	2,08	0,47			
	Xanthidae						
47	*Leptodius sanguineus* (H. Milne Edwards, 1834)	0,32	0,08	0,03			
	Squillidae						
48	*Oratosquilla oratoria* (de Haan, 1844)				0,29	1,50	1,01
	Balanidae						
49	*Amphibalanus amphitrite* Darwin, 1854				5,35	27,33	12,20
	MOLLUSCA						
	SCAPHOPODA						
	Dentaliidae						
50	*Antalis vulgaris* (da Costa, 1778)						
	Giống - *Dentalium*						
51	*Dentalium sexangulum* (Gmelin, 1790)				0,05	0,25	0,02
	CEPHALOPODA						
	Loliginidae						
52	*Loligo vulgaris* Lamarck, 1798				1,88	9,58	0,60
	BIVALVIA						
	Pharidae						
53	*Cultellus attenuatus* Dunker, 1862						
54	*Neosiliqua winteriana* (Dunker,1853)				0,54	2,75	1,32
55	*Siliqua radiata* (Linnaeus, 1758)						
	Solenidae						
56	*Solen corneus* Lamarck, 1818						
57	*Solen grandis* Dunker, 1862						
	Arcidae						
58	*Anadara antiquata* Linneaus, 1758				0,46	2,33	0,91
59	*Anadara ferruginea* (Reeve, 1844)						
60	*Anadara gubernaculum* (Reeve, 1844)				0,11	0,58	1,05
61	*Anadara granosa* (Linnaeus, 1758)						
62	*Barbatia trapezina* (Lamarck, 1819)				0,60	3,08	1,97
	Semelidae						
63	*Abra prismatica* (Montagu, 1808)						
64	*Abra* - sp						
65	*Theora lubrica* (Gould, 1861)						
	Tellinidae						
66	*Angulus vestalis* (Hanley, 1844)						
67	*Limecola balthica* (Linnaeus, 1758)				0,08	0,42	0,18
68	*Tellina fabula* Gmelin, 1791				0,10	0,50	0,11
69	*Tellina modesta* (Carpenter, 1864)						
70	*Tellina natalensis* Philippi, 1846						
71	*Tellina serrata* Brocchi, 1814)						
72	*Tellina timorensis* (Lamarck, 1818)	1,90	0,50	0,21			
	Solecurtidae						

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
73	*Azorinus chamasolen* (da Costa, 1778)						
74	*Sinonovacula constricta* (Lamarck, 1818)						
	Aloididae						
75	*Aloides laevis* Hinds, 1843						
	Corbulidae						
76	*Caryocorbula swiftiana* (C. B. Adams, 1852)						
77	*Lentidium mediterraneum* (O.G. Costa, 1829)				3,67	18,75	2,20
	Pholadidae						
78	*Barnea candida* (Linnaeus, 1758)						
	Mytilidae						
79	*Musculista senhousia* (Benson, 1842)				0,83	4,25	0,84
	Nuculanidae						
80	*Saccella mauritiana* (G. B. Sowerby I, 1833)						
	Ostreidae						
81	*Ostrea rivularis* Gould, 1861						
82	*Saccostrea cucullata* (Born, 1778)				0,10	0,50	0,30
83	*Saccostrea glomerata* (Gould, 1850)						
	Anomiidae						
84	*Enigmonia aenigmatica* (Holten, 1802)						
	Pectinidae						
85	*Amusium japonicum* (Gmelin, 1791)						
86	*Mimachlamys nobilis* (Reeve, 1852)						
87	*Volachlamys singaporina* (Sowerby, 1842)						
	Placunidae						
88	*Placuna placenta* Linnaeus, 1758				0,08	0,42	0,07
	Cyrenidae						
89	*Geloina coaxans* (Gmelin, 1791)						
	Ungulinidae						
90	*Phlyctiderma semiasperum* (Philippi, 1836)						
	Donacidae						
91	*Donax striatus* Linnaeus, 1767						
	Lucinidae						
92	*Anodontia fragilis* (Philippi, 1836)						
	Mactridae						
93	*Mactra lilacea* (Lamarck, 1818)						
94	*Mactra queenslandica* E. A. Smith, 1914						
	Veneridae						
95	*Anomalocardia squamosa* Linne, 1758						
96	*Bassina calophylla* (Philippi,1836)						
97	*Cuspidaria obesa* (Lovén, 1846)				0,13	0,67	0,07
98	*Dosinia discus* (Reeve, 1850)						
99	*Meretrix meretrix* (Linnaeus,1758)						
100	*Meretrix lyrata* (Sowerby, 1851)						
101	*Paphia gallus* (Gmelin, 1791)						
102	*Paphia textile* (Gmelin,1791)				0,70	3,58	0,77
103	*Pitar nipponicum* Kuroda et Habe, 1971				43,91	224,25	8,79
	GASTROPODA						

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
	Borsoniidae						
104	*Borsonella callicesta* W. H. Dall, 1902						
105	*Borsonella bartschi* R. Arnold, 1903						
106	*Microdrillia trina* Mansfield, 1925						
107	*Phenatoma rosea* (Quoy & Gaimard, 1833)						
	Clathurellidae						
108	*Corinnaeturris leucomata* (Dall, 1881)						
	Potamididae						
109	*Cerithidea cingulata* (Gmelin, 1791)						
110	*Cerithidea djadjariensis* (K. Martin, 1899)						
111	*Cerithidea quadrata* Adams, A., 1855	1,27	0,33	0,81			
112	*Cerithideopsis largillierti* (Philippi, 1848)	0,95	0,25	0,16			
113	*Pirenella alata* (Philippi, 1849)						
	Turritellidae						
114	*Colpospira smithiana* (Donald, 1900)						
115	*Gemmula diomedea* (Powell, 1964)						
116	*Turritella communis* Risso, 1826						
	Cylichnidae						
117	*Acteocina bidentata* (d'Orbigny, 1841)				0,47	2,42	0,06
118	*Cylichna cylindracea* (Pennant, 1777)				0,07	0,33	0,02
119	*Cylichna ordinaria* E.A. Smith, 1891				0,08	0,42	0,03
120	*Truncacteocina oryzaella* (Habe, 1956)				0,13	0,67	0,02
	Haminoeidae						
121	*Haminoea tenella* (Adams, 1850)	0,32	0,08	0,05	0,02	0,08	0,04
	Tornatinidae						
122	*Acteocina bidentata* (d'Orbigny, 1841)						
	Ellobiidae						
123	*Cassidula aurisfelis* (Bruguière, 1789)	23,42	6,17	6,42			
124	*Cassidula doliolum* (Petit de la Saussaye, 1842)						
125	*Cassidula nucleus* (Gmelin, 1791)						
126	*Cassidula mustelina* (Deshayes, 1830)	0,32	0,08	0,10			
127	*Melampus pulchellus* (Petit de la Saussaye, 1843)	1,27	0,33	0,07			
128	*Laemodonta punctatostriata* (H. Adams & A. Adams, 1854)	2,22	0,58	0,08			
129	*Laemodonta punctigera* (H. Adams & A. Adams, 1854)	0,63	0,17	0,03			
	Assimineidae						
130	*Assiminea brevicula* (Pfeiffer,1854)	20,89	5,50	0,62			
	Bursidae						
131	*Buforaria rana* (Linnaeus, 1758)						
	Eulimidae						
132	*Eulima bifascialis* (A. Adams,1864)						
133	*Melanella algoensis* (E. A. Smith, 1901)						
134	*Melanella cumingii* (A. Adams, 1854)						
	Littorinidae						
135	*Littoraria intermedia* (Philippi, 1846)						
136	*Littorina melanostosma* (Gray, 1839)	0,32	0,08	0,02			
137	*Littorina scabra* (Linnaeus, 1758)	2,22	0,58	0,33			

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
	Naticidae						
138	*Natica vitellus* (Linnaeus, 1758)						
139	*Notocochlis tigrina* (Roding, 1798)						
140	*Polinices didyma* (Röding, 1798)						
	Stenthyridae						
141	*Stenothyra divalis* (Gould, 1859)				1,96	10,00	0,07
142	*Stenothyra messageri* Bavay & Dautzenberg, 1900				0,03	0,17	0,01
	Clavatulidae						
143	*Clavatula interrupta* (Brocchi, 1814)				0,02	0,08	0,09
144	*Clavatula lelieuri* (Récluz, 1851)						
	Columbellidae						
145	*Anachis pygmaea* (Sowerby, 1832)						
146	*Anachis obesa* (C. B. Adams, 1845)				0,02	0,08	0,004
147	*Astyris lunata* (Say, 1826)						
	Conidae						
148	*Asperdaphne subzonata* (Smith E. A., 1879)						
	Buccinidae						
149	*Busycon carica* (Gmelin, 1791)				0,02	0,08	1,06
	Muricidae						
150	*Chicoreus capucinus* (Lamarck, 1822)	4,11	1,08	3,14			
151	*Coralliophila squamosissima* (Smith, 1876)						
152	*Murex trapa* Röding, 1798						
153	*Thais langi* Clench & Turner, 1948				0,05	0,25	0,02
154	*Thais malayensis* Tan & Sigurdsson, 1996						
	Nassariidae						
155	*Nassarius dorsatus* (Röding, 1798)				0,02	0,08	0,19
156	*Nassarius foveolatus* (Dunker, 1847)						
157	*Nassarius livescens* (Philippi, 1849)						
158	*Nassarius reticulatus* (Linnaeus, 1758)				0,02	0,08	0,04
159	*Nassarius pyrrhus* (Menke, 1843)						
160	*Nassarius siquijorensis* (A.Adams, 1852)				0,07	0,33	0,51
161	*Nassarius stolatus* (Gmelin, 1791)				0,07	0,33	0,43
162	*Tomlinia frausseni* Thach, N.N., 2014						
	Olividae						
163	*Oliva* – sp.						
164	*Oliva affinis* Marrat, 1871						
165	*Olivella dealbata* (Reeve, 1850)						
166	*Olivella fulgurata* (Adams & Reeve, 1850)						
	Terebridae						
	Terebra luctuosa Hinds, 1844						
167	*Terebra nitida* Hinds, 1844						
168	*Terebra pertusa* (Born, 1778)						
169	*Terebra succincta* (Gmelin, 1791)						
	Ringiculidae						
170	*Ringicula buccinea* Sowerby 1823						

No	Taxon	Distribution					
		Mangroves			Tidal beach		
		P%	v	g/m²	P%	v	g/m²
	Onchidiidae						
171	*Platevindex* sp.	0,32	0,08	0,21			
	Trochidae						
172	*Gibbula tumida* (Montagu, 1803)				14,47	73,83	4,05
173	*Umbonium vestiarium* (Linnaeus, 1758)						
Tổng			**V = 26,28**	**W = 15,37**		**V = 510,38**	**W = 42,75**

***Some comments from the study results*:** In the study area, there are 3 dominant benthic groups (Gastropoda, Bivalvia and Crustaceans), including 161 species (accounting for 90.45% of total species). Most of the benthic species in this area are species widely distributed in the coastal areas of Vietnam such as Gastropod Molluscs (*Nassarius*, *Natica*), Bivalve Molluscs (*Anadara, Placuna*), typical Crustaceans are ha (*Amphibalanus amphitrite*). In particular, *Tomlinia frausseni* is endemic to the southern region of Vietnam. Species on the list of protected, endangered, rare, medium and large sizes were not found in the study area.

Table 2. Structure of the taxonomy of benthic groups

No	Taxons	Families	Genera	**Species**	**Ratio (%) number of species**
1	Cephalopoda	1	1	1	0,58
2	Chelicerata	1	1	1	0,58
3	Scaphopoda	2	2	2	1,16
4	Polychaeta	6	8	8	4,62
5	Crustacea	20	27	40	23,12
6	Bivalvia	20	38	51	29,48
7	Gastropoda	25	45	70	40,46
Total		75	122	173	100 %

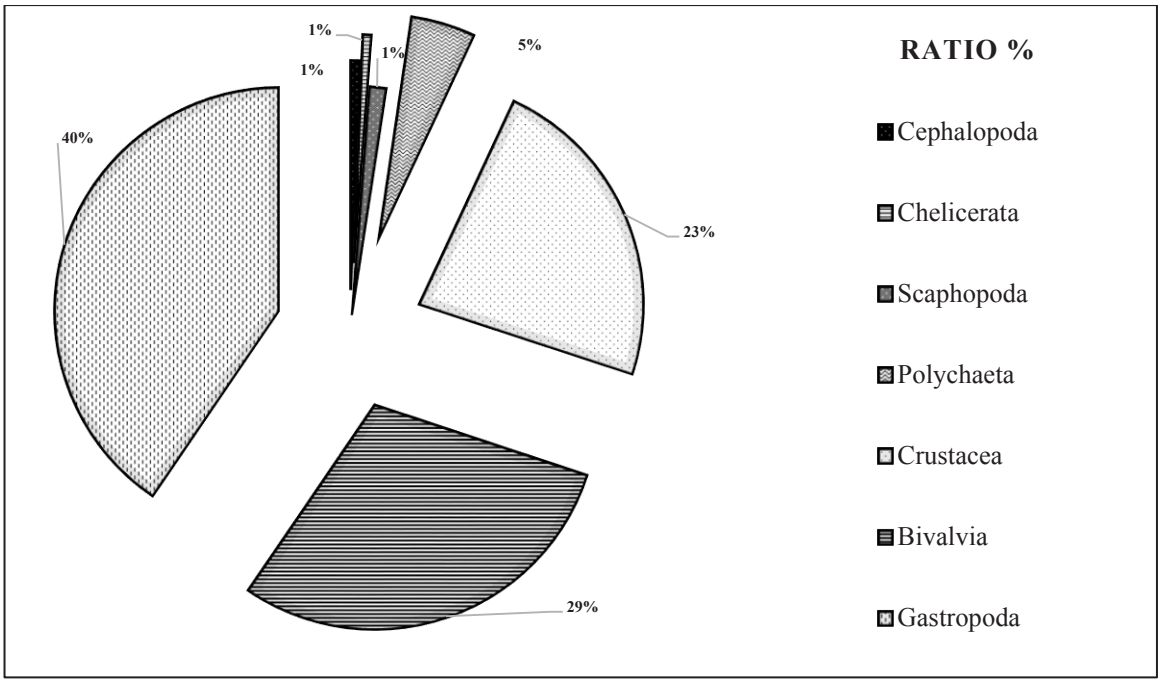


Figure 2. Percentage (%) of total benthic species

3.2. Distribution of benthic species in mangroves and intertidal zones

***Composition of benthic species in mangroves*:**

Species richness (P%): Through the research and analysis of quantitative samples, it has been determined that benthic animals distributed in mangrove forests have 27 species (accounting for 15.61% total species). Regarding the abundance of benthic animals distributed in mangroves, the species with the highest abundance was *Cassidula aurisfelis* with 23.42%, followed by *Assiminea brevicula* with 20.89% abundance. Other species have richness (P% ≤ 10%).

Total biomass of species (w): The mass of benthic species distributed in mangroves, the largest species was *Cassidula aurisfelis* with 6,42 g/m^2, followed by*Chicoreus capucinus* with 3,14 g/m^2, the lowest was *Littorina melanostosma* with 0,02 g/m^2. Average weight of all species W = 15,37 g/m^2.

Density (v): Density of benthic animals is distributed in mangroves, the species with the highest density is *Cassidula aurisfelis* with 6,17 inds/m^2, followed by *Assiminea brevicula* with 5,5 inds/m^2. Other species have density (v ≤ 5 inds/m^2). The average density of all species is V = 26,28 inds/m^2.

Biodiversity Index: Benthic animals distributed in mangroves have a high biodiversity index (H' = 3,57).

Composition of benthic fauna in the intertidal zone:

Species richness (P%): Through the research and analysis of quantitative samples, it has been determined that benthic animals distributed in the intertidal zone have 47 species, accounting for 27.17% of the total species. Regarding the abundance of benthic species distributed in the intertidal zone, the species with the highest abundance was *Pitar nipponicum* with 43,91%, followed by *Gibbula tumida* with 14,47%, *Acetes sibogae sibogae* with 14,08%. Other species have richness (P% ≤ 6%).

Total biomass of species (w): The mass of benthic species distributed in the intertidal zone, the largest species was *Amphibalanus amphitrite* with 12,20 g/m^2, followed by *Pitar nipponicum* with 8,79 g/m^2, the lowest was *Stenothyra messageri* with 0,01 g/m^2. Average weight of all species W = 42,75 g/m^2.

Density (v): The density of benthic animals is distributed in the intertidal zone, the species with the highest density is *Pitar nipponicum* with 224,25 inds/m^2, followed by *Gibbula tumida* with density of 73,83 inds/m^2, *Acetes sibogae sibogae* with density of 71,92 inds/m^2, *Metapenaeus monoceros* with density of 20 inds/m^2. Other species have density (v ≤ 20 with density of). The average density of all species is V = 510,38 inds/m^2.

Biodiversity Index: Benthic animals are distributed in the intertidal zone with an index close to the level of diversity (H' = 2,83).

Table 3. Density and biomass of benthic animals in Kien Luong compared to other regions

No	Area	g/m^2	inds/m^2	References
1	Northern Gulf	7,995	103,00	Ministry of Fisheries (1996) [10]
2	Coastal Hai Phong - Cat Ba	940,227	1.170	Binh N. T., Khac H. N. (2021) [1]
3	Coastal Thai Binh - Nam Dinh	82,985	584,125	Thinh P. V., Binh N. T., Ha V. H. (2021) [11]
4	Coastal Ninh Binh	15,3	172,17	Binh N. T., Van N. C. (2021) [2]
5	Kien Luong coastal area	29,26	268,36	Research area

Table 3 analyzes the average weight (g) and number of benthic animals (individuals) in the Northern region (calculated in 1m^2 of bottom): From this table, it can be seen that the number and biomass of benthic fauna in the study area is larger than that of Ninh Binh and the Gulf of Tonkin, less than that of Thai Binh - Nam Dinh and Hai Phong - Cat Ba. The results compare the density of benthic animals in the northern coastal area much higher than in the study area. Due to the difference in climatic and environmental conditions between the two regions, the species composition is lower (Kien Luong Beach Gulf of Thailand).

***Comment*:** The species composition and distribution of benthic groups in the coastal ecosystem of crabs and Molluscs depend on the nature, environment and depth of sea level with the bottom layer. At the bottom of the continuously flooded intertidal zone, the species

composition is different from that of mangroves due to the diurnal or semi-diurnal tidal regime.

4. Conclusions

The composition of Kien Luong seabed fauna has discovered 173 species belonging to 122 genera, 75 families, 30 orders and 7 representative groups (Bivalves, Gastropod Molluscs, Crustaceans, Polychaetes, Cephalopoda, Chelicerata and Scaphopoda). Among the discovered species, Gastropod Molluscs have the largest number of species (70 species, accounting for 39.33%), followed by Bivalve Molluscs (51 species, accounting for 28.65%), Crustaceans (40 species, accounting for 22.47%). Other groups account for a lower proportion (Polychaeta has 8 species, Scaphopoda has 2 species, Cephalopoda and Chelicerata have 1 species).

Distribution of benthic species in mangroves and intertidal zones: The species composition of mangroves through quantitative samples has determined the richness of 27 species, the average species weight is 15,37 g/m^2, the average species density is 26,28 inds/m^2, with a high biodiversity index of 3,57; The species composition of the intertidal benthic fauna through quantitative samples determined the richness of 47 species, the average weight of species was 42,75 g/m^2, the average species density is 510,38 inds/m^2, with an index close to the level of biodiversity 2,83.

Acknowledgements: The author would like to thank the support of the Ministry-level Science and Technology Project "Research on building models of exploitation, protection and sustainable development of intertidal ecosystems from Vung Tau to Kien Giang" and associates. people in the study area, provided with necessary information.

REFERENCES

[1]. Binh N. T., Khac H. N. 2021. Preliminary study on species composition of zoobenthos on coastal intertidal area in Hai Phong and Cat Ba. *Science Journal of Tan Trao University*. 24: 6-13.

[2]. Binh N. T., Van N. C. 2021. Research on species composition and distribution of benthic fauna in the coastal area of Ninh Binh province, *Science Journal of Tan Trao University*. 22: 128-141.

[3]. Arthur Anker and Ivan N. Martin 2000. *New records and species of Alpheidae (Crustacea: Decapoda) from Vietnam. Part I. Genus Salmoneus Holthuis,1955*. Atlantic. 54: 295-319.

[4]. Blakemore R. J. 2007. Origin and means of disperal of cosmopolitan Pontodrilus litralis (Oligochaeta: Megascolecidae). *European journal of Soil Biology*. 43, 3-8.

[5]. Dai Ai-yun and Yang Si Liang 1991. Crabs of the China seas. *China Ocean Press Beijing*. 118-558.

[6]. Han Raven, Jaap Jan Vermeulen 2006. Notes on molluscs from NW Borneo and Singapore. 2. A synopsis of the Ellobiidae (Gastropoda, Pulmonata). *Vita Malacologica.* 4: 29-62.

[7]. Jocelyn Crane 1975. Fiddler crabs of the World. 15-327.

[8]. Kent E. Carpenter and Volker H. Niem 1998. *The living marine resources of the Western Central Pacific. FAO.* Rome. 1: 124-646.

[9]. Nora F. Y. Tam and Y. S. Wong 2000. *Hong Kong mangroves*. City University of Hong Kong press. 148.

[10]. Ministry of Fisheries 1996. *Vietnam Fisheries Resources*. Agricultural Publishing House, 22-161.

[11]. Thinh P. V., Binh N. T., Ha V. H. 2021. Research on species composition and distribution of benthic fauna in the waters of Nam Dinh - Thai Binh, *Science Journal of Tan Trao University*. 22: 150-163.