Records of the Zoological Survey of India

Studies on faunal diversity and Coral Reef Ecosystems of Palk Bay

K. VENKATARAMAN
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RECORDS
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ZOOLOGICAL SURVEY OF INDIA

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Kolkata
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INTRODUCTION

Conservation and sustained development of natural living resources and environmental protection have been the focus of extensive, scholarly attention in this century. The diverse use of coastal and oceanic habitats for fishing, oil and gas, energy, tourism, education and research has naturally generated significant capital returns. This has resulted in increased competition over ocean and coastal resources. Irrational exploitation of natural resources has crossed the sustainable levels and even leads to extermination of a number of species of plants and animals. If this state of over exploitation is allowed to continue, our country may lose more species in the immediate future. Hence, the present survey was undertaken to inventorise the fauna present in the region, Palk Bay. The outcome of the study may help management in a long-term basis.

Of an estimated 30 million species on earth, our knowledge of their diversity is limited to a catalogued 1.4 million with only 20% in the oceans. Although a wealth of data is available on the terrestrial biodiversity, the marine biodiversity is sill imperfectly known and catalogued. Marine conservation strategies compared to that of terrestrial ecosystem suffer from lack of attention and paucity of information on bioresources. Therefore, if the country is to effectively protect its marine biodiversity while fully enjoying the ecological benefits provided by these organisms, data on the faunal diversity is required to evaluate all these important resources. It is hoped that the present study may cater to the need to some extent.

1974; James and Badrudeen, 1975; James, 1966; Chacko and Rahim, 1968; Bensam, 1973; Devaraj, 1986, 1987; James et al., 1985; James, 1986; Kasinathan, 1988; Krishna Pillai and Kasinatan, 1995; Jayasankar, 1991, 1997; Ramadoss, 2002; Rekha Nair, 2005), sea turtles (Jones and Bastin Fernando, 1973; Agastheesapillai and Thiagarajan, 1979) and porpoise, whales and sea cow (Lal Mohan, 1976; Nammalwar et al., 1994; Kasinathan et al., 2002) are some of the important studies conducted till today.

Fig. 1 : Map showing the survey locations of Palk Bay
THE PHYSIOGRAPHY OF THE PALK BAY

The Gulf of Mannar and Palk Bay along the Eastern coast of India are well known for their faunistic richness and variety. The Palk Bay region lies between 9°17' N and 10°18' N Latitudes (Fig. 1). The mean rainfall varies from 820 to 1650 mm and relative humidity remains between 80 ± 10% throughout the year. Palk Bay is practically calm except at the onset of northeast monsoon when turbulent condition prevails. The wind speed fluctuates between 3 to 21 knots and the maximum of 12 to 15 knots between May and July. The monthly average temperature of Palk Bay waters is ranging between 24.6-29.1°C. Tides on the Palk Bay Coast are irregular, semi-daily or mixed type. The maximum tidal range is about 1.0 m (spring tide) and during neap tides vary often slight changes occur in the water levels with a rise or fall of 2 to 5 cm. From the field observation it is observed that the rise and fall of the tides on the Palk Bay is greatly influenced by the force and direction of the winds, which regulates the duration of submergence and emergence at successive levels. As mentioned by Jayaraman (1954) in the case of inshore waters of this area there has been a fall in salinity in the period December-January. The salinity of the water decreases gradually along an axis in the southwest direction running from the Palk Strait. High saline water is pocketed in the southwest corner of the bay. This may be due to the incursion of Gulf of Mannar water through Pamban pass. The density of the water also decreases along an axis in the southwest direction from the strait. Northeast wind’s strength in Nagapattinam is about 8-10 knots (North of Palk Bay) and at Pamban the wind strength is only 2-4 knots. Temperature, salinity, density and dissolved oxygen of the surface waters of the Palk Bay indicates that the Bay of Bengal waters entering the Palk Strait have major influence on the hydrographic condition of Palk Bay. The Gulf water influences the hydrological parameters to a minor extent only (Murthy and Udayavarma, 1964). The inshore waters of Palk Bay during monsoon become muddy due to the presence of suspended sand and silt stirred up from the sandy shore by wave action.

Cyclonic winds with high velocity are capable of generating enough mechanical damage to corals of this area during the monsoon seasons. Huge quantity of silt settlement has a remarkable effect on the distribution and diversity of the coral reef associated plants and animals. This appears to have a greater influence on the inshore regions of Palk Bay especially during the north-east monsoon. The bottom sediments of Mandapam consist of silt and clay, clayey silt and sand, fine to medium sand, coarse sand, and coarse sand with gravel. Distribution of various size classes indicates that the offshore sediment in this areas is usually unimodel with the primary mode around 1.5 – 2 (medium sand), a secondary mode is sometimes present around 3.5. Beach samples have prominent mode around 2.25, 1.75, 2.75 and 3.25 suggesting the polymodal nature of the sediment (Mallick, 1983).

Palk Bay comes under three different districts in Tamil Nadu. Under Ramanathapuram district there are about 46 fish landing centres starting from Rameshwaram, Verkotil to S.P. Pattinam, out of which 5 of them are mechanized fish landing centres. Each fish
landing centre has an average of 50-100 non-mechanised fishing vessels and the mechanized landing centres have 350-500 vessels for fishing. Likewise Pudukottai district has 14 landing centres out of which Kottapattinam and Jagadappatinam are mechanized fish landing centres. In the Thanjavur district, out of 66 fish landing centres have 552 mechanised fishing crafts for fishing. Likewise, Pudukottai district has 86 fish landing centres of which 9 are mechanized landing centres and the rest are non-mechanized ones.

The following are the fishing gears operated by the local fishermen for the fish catch in the Palk Bay coasts: Trawl nets, Drift/gill net, Boat scene, Fixed bag net, Hooks and lines, Shore scienê, Traps and Scoop nets (Table 1).

Table 1. Fishing Craft and Gear used in Palk Bay

<table>
<thead>
<tr>
<th>Items</th>
<th>Thanjavoor district</th>
<th>Pudukottai district</th>
<th>Ramanathapuram district</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Fishing crafts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanised</td>
<td>552</td>
<td>36</td>
<td>98</td>
<td>1569</td>
</tr>
<tr>
<td>Trawlers</td>
<td>5</td>
<td>?</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Gillnetters</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>?</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>2. Non-mechanised dug-out Canoes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plank-built</td>
<td>284</td>
<td>9</td>
<td>626</td>
<td>919</td>
</tr>
<tr>
<td>boats</td>
<td>1176</td>
<td>908</td>
<td>4074</td>
<td>6158</td>
</tr>
<tr>
<td>Catamarans</td>
<td>1043</td>
<td>128</td>
<td>370</td>
<td>5541</td>
</tr>
<tr>
<td>Others</td>
<td>495</td>
<td>?</td>
<td>44</td>
<td>239</td>
</tr>
<tr>
<td><strong>3. Fishing gear</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trawl nets</td>
<td>1496</td>
<td>82</td>
<td>3029</td>
<td>4607</td>
</tr>
<tr>
<td>Drift/gill nets</td>
<td>22337</td>
<td>14479</td>
<td>35048</td>
<td>71864</td>
</tr>
<tr>
<td>Boat scene</td>
<td>2262</td>
<td>579</td>
<td>24</td>
<td>2805</td>
</tr>
<tr>
<td>Fixed bag net</td>
<td>168</td>
<td>32</td>
<td>732</td>
<td>932</td>
</tr>
<tr>
<td>Hooks and line</td>
<td>4140</td>
<td>2756</td>
<td>5362</td>
<td>12258</td>
</tr>
<tr>
<td>Shore scienê</td>
<td>1637</td>
<td>57</td>
<td>1523</td>
<td>3217</td>
</tr>
<tr>
<td>Traps</td>
<td>166</td>
<td>4067</td>
<td>3312</td>
<td>7545</td>
</tr>
<tr>
<td>Scoop nets</td>
<td>698</td>
<td>?</td>
<td>22</td>
<td>720</td>
</tr>
<tr>
<td>Others</td>
<td>1571</td>
<td>31</td>
<td>1168</td>
<td>2770</td>
</tr>
</tbody>
</table>
Other than the above-mentioned fishing gears the following are the local-made gears used viz. Disco Thoondi, Shore scene, Kilangavela, Serayavela, Thangoost vala, Olavala, Velamin vala, Suda vala, Kumala vala, Kannikka vala, Disco vala, Chinna thoondi, Periya Thoondi, Nandu vala, Thalluvala, Eral Vala, diving, Koodu, Sheela vala Marrukku, Gutta vala, Chinn Ma rukkuppam, Paru vala, Sunni vala and Kurrukkuvetta vala. All the above-mentioned fishing gears are used on Mechanised fishing crafts such as Trawlers and Gillnetters or on non-mechanised. Crafts such as Dug-out Canoes, Plank-building boats and Catamarans or individually by venturing into the shore without using fishing crafts. In Palk Bay, there is one public sector Boat-building yard at Nagapattinam and there are about 2-3 private sector yards. In Pudukottai district there is a private sector yard available and there are many hand-fabricating units under cottage industry.

Table 2. Fauna collected during May 1997 Survey (number of examples).

<table>
<thead>
<tr>
<th>Stations</th>
<th>Porifera</th>
<th>Coelenterata</th>
<th>Crustacea</th>
<th>Mollusca</th>
<th>Echino-dermata</th>
<th>Fishes</th>
<th>Seaweed and Seagrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thankacchimadam</td>
<td>-</td>
<td>2</td>
<td>19</td>
<td>31</td>
<td>3</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Pamban bridge</td>
<td>1</td>
<td>-</td>
<td>32</td>
<td>11</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Devipattinam</td>
<td>10</td>
<td>6</td>
<td>36</td>
<td>31</td>
<td>6</td>
<td>24</td>
<td>-</td>
</tr>
<tr>
<td>Rameshwaram</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Thondi</td>
<td>2</td>
<td>-</td>
<td>17</td>
<td>23</td>
<td>9</td>
<td>74</td>
<td>-</td>
</tr>
<tr>
<td>S.P.Pattinam</td>
<td>4</td>
<td>3</td>
<td>42</td>
<td>42</td>
<td>12</td>
<td>51</td>
<td>1</td>
</tr>
<tr>
<td>Pudukudi coast</td>
<td>1</td>
<td>-</td>
<td>17</td>
<td>3</td>
<td>2</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Mallipattinam</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>15</td>
<td>2</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Adirampattinam</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Kodiakarai</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>11</td>
<td>171</td>
<td>172</td>
<td>46</td>
<td>244</td>
<td>13</td>
</tr>
</tbody>
</table>

Grand Total: 678 exs.

AREA SURVEYED AND THE METHODOLOGY OF COLLECTION

Materials for the present study were collected through three extensive surveys conducted by the Marine Biological Station between 1997 and 1999. The important fish landing centers between Dhanushkodi and Kodiakarai were surveyed and the samples were collected. During the low tide period samples were handpicked from the inter-tidal region. Other samples were collected by engaging catamarans, country boats and mechanised boats and also from the refuse of the non-mechanised and mechanised boat catches.
Three surveys were conducted to study the Ecology and Biodiversity of Palk Bay as per the annual programme of Marine Biological Station, Zoological survey of India in three different seasons to record the faunal components (K. Venkataraman - May 1997; M. Srinivasan - July 1998; P. Krishnamoorthy - Nov 1999). The results are presented in Table 2-4. The present report is a consolidation of the above surveys as well as the list of fauna identified in the study area. Some of major studies referred for the identification and compilation of list fauna mentioned below (Rama Rao, 1954; 1972; Srinivasan, 1977; Thomas, 1971; 1976; Thomas, 1969, 1973, Pillai, 1973; 1996).

Table 3. Fauna collected during July 1998 Palk Bay survey (number of examples)

<table>
<thead>
<tr>
<th>Stations</th>
<th>Porifera</th>
<th>Coelenterata</th>
<th>Crustacea</th>
<th>Mollusca</th>
<th>Echino-dermata</th>
<th>Fishes</th>
<th>Sea weed and Seagrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhanushkodi</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>29</td>
<td>41</td>
<td>14</td>
<td>34</td>
</tr>
<tr>
<td>Thankacchimadam</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rameshwaram</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>55</td>
<td>30</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>Uchipuli</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>29</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pamban bridge</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>18</td>
<td>6</td>
<td>49</td>
</tr>
<tr>
<td>Devipattinam</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>13</td>
<td>33</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Thondi</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Jagathahapattinam</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>80</td>
<td>22</td>
<td>-</td>
<td>84</td>
</tr>
<tr>
<td>Kottaipattinam</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>20</td>
<td>19</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>Mallipattinam</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Kattumavadi</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>23</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Adirampattinam</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Muthupettai</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Kodiakarai</td>
<td>1</td>
<td>4</td>
<td>-</td>
<td>12</td>
<td>21</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>13</td>
<td>3</td>
<td>257</td>
<td>282</td>
<td>55</td>
<td>338</td>
</tr>
</tbody>
</table>

Grand Total: 956 exs.
Table 4. Classified list of samples collected from Palk Bay during the November 1999 survey (number of examples)

<table>
<thead>
<tr>
<th>Stations</th>
<th>Porifera</th>
<th>Coelenterata</th>
<th>Crustacea</th>
<th>Mollusca</th>
<th>Echino-dermata</th>
<th>Fishes</th>
<th>Sea weed and Seagrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pamban bridge</td>
<td>43</td>
<td>1</td>
<td>82</td>
<td>27</td>
<td>3</td>
<td>-</td>
<td>69</td>
</tr>
<tr>
<td>Uchipuli</td>
<td></td>
<td>1</td>
<td>-</td>
<td>3</td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Thondi</td>
<td>5</td>
<td></td>
<td>64</td>
<td></td>
<td>12</td>
<td>-</td>
<td>54</td>
</tr>
<tr>
<td>Devipatnam</td>
<td>6</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td>-</td>
<td>62</td>
</tr>
<tr>
<td>Soliakudi</td>
<td>20</td>
<td></td>
<td></td>
<td>5</td>
<td>10</td>
<td>-</td>
<td>88</td>
</tr>
<tr>
<td>Adhiramapatnam</td>
<td>5</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>-</td>
<td>80</td>
</tr>
<tr>
<td>Mallipattinam</td>
<td>15</td>
<td>37</td>
<td></td>
<td>9</td>
<td></td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>Kodiakarai</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>71</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>39</td>
<td>251</td>
<td>41</td>
<td>28</td>
<td>10</td>
<td>544</td>
</tr>
</tbody>
</table>

Grand Total: 1012 exs.

LIST OF FAUNAL GROUPS OF PALK BAY IDENTIFIED DURING THE STUDY PERIOD

ARROW WORMS
Phylum Chaetognatha

Genus *Sagitta* Quoy and Gaimard, 1827

1. *Sagitta bedoti* Beraneck, 1895
2. *Sagitta enflata* Grassi, 1881
3. *Sagitta ferox* Doncaster, 1903
4. *Sagitta hexoptera* Orbigny, 1834
5. *Sagitta neglecta* Aida, 1897
6. *Sagitta pulchra* Doncaster, 1903
7. *Sagitta robusta* Doncaster, 1903
8. *Sagitta regularis* Aida, 1897

Genus *Krohnitta* Ritter Zahoons, 1909

9. *Krohnitta pacifera* (Aida, 1897)
10. *Krohnitta subtilis* (Grassi, 1881)
SPONGES

Phylum Porifera

Class Demospongiae Sollas

Order KERATOSIDA Grant

Family SPONGIDAE Gray

Genus Heteronema Keller

1. Heteronema erecta Keller, 1968

Genus Hyatella Lendenfeld

2. Hyatella cribiformes (Hyatt, 1875)

Genus Ircinia Nardo

3. Ircinia fusca (Carter, 1880)

Genus Fasciospongia Burton

4. Fasciospongia cavernosa (Schmidt, 1862)

Family DYSIDEIDAE Gray

Genus Dysidea Johnston

5. Dysidea herbacea (Keller, 1889)

Genus Dendrilla Lendenfeld

6. Dendrilla nigra (Dendy, 1889)

Genus Psammaplysilla Keller

7. Psammaplysilla purpurea (Carter, 1880)

Order HAPLOSCLERIDA TOPSENT

Family HALICLONIDAE De Laubenfels

Genus Haliclona Grant

8. Haliclona exigua (Kirkpatrick, 1900)

Family DESMACIDONIDAE Gray

Genus Iotrochota Ridley

9. Iotrochota baculifera Ridley, 1884
10. *Sigmadocia fibulata* (Schmidt, 1862)
11. *Sigmadocia pumila* (Lendenfeld, 1887)

Genus *Taxadocia* de Laubenfels

12. *Taxadocia toxius* (Topsent, 1897)

Genus *Orina* Gray

13. *Orina sagittaria* (Sollas, 1888) (=*Oceanapia sagittaria*)

Genus *Damiria* Keller

14. *Damiria simplex* (Keller, 1891)

Genus *Damirina* Burton

15. *Petrosia testudinaria* (Lamarck, 1815) (*Xestospongia testudinaria*)

Family CALLYSPONGIIDAE De Laubenfels

Genus *Callyspongia* Duch and Mich

16. *Callyspongia diffusa* (Ridley, 1884)
17. *Callyspongia fibrosa* (Ridley and Dendy, 1905)

Order POECILOSCLERIDA TOPSENT

Family PHORBASIDAE De Laubenfels

Subfamily PHORBASINAE de Laubenfels

Genus *Echinodictyum* Ridley

17a. *Echinodictyum gorgonoides* Dendy, 1916

Genus *Demiriana* de Laubenfels

19. *Demiriana schmidtii* (Ridley, 1884) (=*Waldoschmittia schmidtii* Ridley, 1884)

Family COELOSPHAERIDAE Henstschel

Genus *Siderodermella* Dendy

20. *Siderodermella navicelligera* (Ridley and Dendy, 1905)

Family TEDANIIDAE Ridley and Dendy

21. *Tedania (tedania) anhelans* (Lieberkuhn, 1859)
Family RASPAILIIDAE Hentschel

Genus *Aulospongus* Norman

22. *Aulospongus tubulatus* (Bowerbank, 1873)

Genus *Rhabderemia* Topsent


Genus *Endectyon* Topsent

24. *Endectyon fruticosa*, 1905

25. *Endectyon thurstoni* Dendy, 1937


Family OPHLITASPONGIDAE De Laubenfels

Genus *Clathria* Schmidt

27. *Clathria (Thalysias) vulpina* (Lamarck, 1814).

28. *Clathria (Thalysias) procera* var. *tessellata* (Dendy, 1905)

29. *Clathria (Clathria) indica* Dendy, 1905

Genus *Mycale* Gray

30. *Mycale (Mycale) grandis* (Gray, 1867)

31. *Mycale (Mycale) tenuispiculata* (Dendy, 1905)

32. *Mycale (Carmia) monachorata* (Burton and Rao, 1932)

Family AMPHILECTIDAE de Laubenfels

Genus *Toxemna* Hallman

33. *Toxemna tubulata* (Dendy, 1905)

Genus *Biemna* Gray

34. *Biemna fortis* (Topsent, 1897)

Order HALICHONDRIDAE, VOSMAER

Family AXINELLIDAE Ridley and Dendy, 1905

35. *Axinella tenuidigitata* Dendy, 1905

36. *Axinella agariciformis* Dendy, 1905
Genus *Higginsia* Higin

37. *Higginsia higgini* Dendy, 1889

Genus *Myrmekioderma* Ehlers

38. *Myrmekioderma granulata* (Esper, 1830)

Family HALICHONDRIIDAE

Genus *Trachyopsis* Dendy

39. *Trachyopsis halichondroides* Dendy, 1905

Order HADROMERIDA, TOPSENT

Family SPIRASTRELLIDAE (Ridley and Dendy, 1905)

Genus *Spirastrella* Schmidt

40. *Spirastrella coccinea* (Duch and Mich, 1864)

41. *Spirastrella cuspidifera* (Lamarck, 1814)

42. *Spirastrella inconstans* (Dendy, 1887)

43. *Spirastrella aurivilli* Lindgren, 1898

Genus *Timea* Gray

44. *Timea stellata* (Bowerbank, 1866)

45. *Timea stelligera* (Carter, 1880)

Family SUBERITIDAE Schmidt

Genus *Suberites* Nardo

46. *Suberites carnosus* (Johnston, 1842)

Genus *Laxosuberites* Topsent

47. *Laxosuberites cruciatus* (Dendy, 1905)

Genus *Pseudosuberites* Topsent

48. *Pseudosuberites andrewsi* Kirkpatrick, 1900

Genus *Aaptos* Gray

49. *Aaptos aaptos* (Schmidt, 1864)
Family PLACOSPONDIIDAE Gray
Genus *Placospongia* Gray

50. *Placospongia carinata* (Bowerbank, 1858)

Family CLIONIDAE Gray
Genus *Amorphinopsis* Carter

51. *Amorphinopsis excavans* Carter, 1886
Genus *Cliona* Grant

52. *Cliona celata* Grant, 1826
53. *Cliona vastifica* Hancock, 1849
54. *Cliona marginalis* Dendy, 1905

Order EPIPOLASIDA, SOLLAS
Family JASPIDAE de Laubenfels
Subfamily RHAPHIDISTIINAE de Laubenfels
Genus *Prostylyssa* Topsent

55. *Amorphinopsis foetida* Dendy, 1889
56. *Amorphinopsis oculata* Kieschnick, 1869
Genus *Stelletinopsis* Carter

57. *Asteropus simplex* Carter, 1879

Family COPPATIIDAE Topsent, 1898
Subfamily JASPINAE de Laubenfels
Genus *Zaplethea* de Laubenfels

58. *Zaplethea digonoxea ssp. diastrea* Vacelet and Vasseur, 1965

Family HALICHONDRIIDAL Vosmaer, 1887
Genus *Epipolasis* de Laubenfels, 1936

59. *Epipolasis topsenti* (Dendy, 1905)

Family TETHYIDAE GRAY
Genus *Tethya* Lamarck

60. *Tethya robusta* Bowerbank, 1873
61. *Tethya diploderma* Schmidt, 1870
62. *Tethya japonica* Sollas, 1888

Order CHORISTIDA SOLLAS
Family ANCORINIDAE Schmidt, 1870
Subfamily ANCORINIDAE de Laubenfels
Genus *Ecionemia* Bowerbank, 1863

63. *Ecionemia acervus* Bowerbank, 1863

Subfamily STELLETTINAE SOLLAS
Genus *Myriastva* Sollas, 1886

64. *Myriastra purpurea* (Ridley, 1884)

Genus *Rhabdastrella* Thiele, 1903

65. *Rhabdastrella globostellata* (Carter, 1883)

Family GEODIIDAE Gray
Genus *Goedia* Lamarck

67. *Geodia perarmata* Bowerbank, 1873
68. *Geodia lindgreni* (Lendenfeld, 1903)

Family TETILLIDAE Sollas, 1886
Genus *Cinachyra* Sollas, 1886

69. *Cinachyra cavernosa* (Lamarck, 1814)

Genus *Paratetilla* Dendy

70. *Paratetilla bacca* (Selenka, 1867)

Family DESMANTHIDAE Topsent, 1893
Genus *Lophocanthus* hentrechel

71. *Lophocantus rhabdophorus* Hentschel, 1914

Order CARNOSIDA CARTER
Family PACHASTREUIDAE Carter, 1875
Genus *Pachamphilla* Lendenfeld, 1907

72. *Pachamphilla dendyi* Hentschel, 1912
Subfamily CORTICIINAE vosmaer

Genus *Corticum* Schmidt

73. *Corticum acanthastrum* Thomas, 1968

Genus *Plakina* Schulze

74. *Platina monolopha* Schulze, 1889
75. *Plakina acantholopha* Thomas, 1970

Family CHONDRILLIDAE Gray

Genus *Chondrilla* Schmidt

76. *Chondrilla saccifomis* Carter, 1873

**STONY CORALS**

Phylum *Coelenterata*

Class *Anthozoa*

Subclass Zoantharia

Order SCLERACTINIA

Family POCILLOPORIDAE

Genus *Pocillopora*


Family ACROPORIDAE

Genus *Acropora*

2. *Acropora humilis* (Dana, 1876)
3. *Acropora digitifera* (Dana, 1846)
4. *Acropora formosa* (Dana, 1846)
5. *Acropora cytherea* (Dana, 1846)
6. *Acropora hyacinthus* (Dana, 1846)
7. *Acropora indica* (Brook, 1893)

Genus *Montipora*

8. *Montipora spumosa* (Lamarck, 1816)
9. *Montipora digitata* (Dana, 1846)
10. *Montipora hispida* (Dada, 1846)
11. Montipora foliosa (Pallas, 1746)
12. Montipora exesa Quelch, 1886
13. Montipora monasteriata (Forskal, 1775)

   Genus Astreopora

14. Astreopora myriophthalma (Lamarck, 1860)

   Family AGARCIIDAE

   Genus Pavona

15. Pavona varians Venill, 1864

   Family SIDERASTREIDAE

   Genus Psammocora

16. Psammocora contigua (Esper, 1797)

   Genus Pseudosiderastrea

35. Pseudosiderastrea tayami Yabe Sugiyama, 1935

   Family PORITIDAE Gray, 1842

   Genus Porites

36. Porites solida (Forskal, 1775)
37. Porites lutea Milne Edwards Heime, 1860
38. Porites lichen Dana, 1846
39. Goniopora stokesi Milne Edwards and Heime, 1851
40. Goniopora planulata (Ehrenberg, 1834)
41. Goniopora nigra Pillai, 1967

   Family FAVIIDAE

   Genus Favia

42. Favia favus (Forskal, 1775)
43. Favia pallida (Dana, 1846)

   Genus Favites

44. Favites abdita (Ellis and Solander, 1876)
45. Favites complanata (Ehrenberg, 1834)
Genus *Goniasrea*

46. *Goniastrea retiformis* (Lamarck, 1816)
47. *Goniastrea pectinata* (Ehrenberg, 1834)

Genus *Platygyra*

48. *Platygra daedalea* (Ellis and Solander, 1786)

Genus *Leptastrea*

49. *Leptastrea purpurea* (Dana, 1846)
50. *Leptastrea transversa* Klunzinger, 1879

Genus *Cyphastrea*

51. *Cyphastrea serailia* (Forskal, 1775)
52. *Cyphastrea microphthalmalma* (Lamarck, 1816)

Genus *Echinopora*

53. *Echinopora lamellosa* (Esper, 1795)

Family *OCULINIDAE*

Genus *Galaxea*

54. *Galaxea fascicularis* (Linnaeus, 1767)

Family *MERULINIDAE*

Genus *Merulina*

55. *Merulina ampliata* (Ellis and Solander, 1876)

Genus *Hydnophora*

56. *Hydnophora exesa* (Pallas, 1866)
57. *Hydnophora microconos* (Lamarck, 1816)

Family *MUSSIDAE*

Genus *Symphyllia*

58. *Symphyllia recta* (Dana, 1846)

Family *CARYOPHYLLIDAE* (not collected in the present study)

Genus *Paracyathus*

59. *Paracyathus profundus* Duncan, 1889
60. *Polycyathus verilli* Duncan, 1889
Genus *Heterocyathus*

61. *Heterocyathus aequicostatus* Milne Edwards and Haime, 1848

**CRABS**

**BRACHYURA**

Family *Dromidae*

1. *Dromia rumphii* Henderson, 1893

Family *Calappidae*

2. *Calappa philargius* (Linnaeus, 1758)
3. *Matuta planipes* Fabricius, 1798

Family *Leucosiidae*


Family *Maiaidae*

7. *Oethra scruposa* (Linnaeus, 1893)

Family *Portunidae*

8. *Portunus hastotoides* Fabricius, 1894
9. *Portunus pelagicus* (Linnaeus, 1758)
10. *Thalamita parvidens* Rathbun, 1907

Family *Grapsidae*

11. *Metapograpsus frontalis* Miers
12. *Pachygrapsus pusillus* Heller
14. *Sesarma (chiromantes) bidens* (de Haan, 1899)

Family *Ocyopodidae*

15. *Ocypoda macrocera* H.Milne Edwards, 1897

Family *Xanthidae*

16. *Actaea granulata* (Audoin, 1893)
17. *Carpilius maculatus* (Linnaeus, 1894)
18. *Menippe rumphii* (Fabricius, 1893)  
19. *Pilumnus vespertilio* (Fabricius, 1793)  

Family GONOPLACIDAE  

20. *Eucrate crenata dentata* De Haan, 1835  

**PRAWNS**  
Phylum *Arthropoda*  
Class *Crustacea*  
Order DECAPODA  
Suborder NATANTIA  
Infraorder *Penaeidea*  
Super family PENAEOIDEA  
Family SOLENOCERIDAE  

1. *Solenocera crassicornis* (H. Milne - Edwards, 1837)  

Family PENAEIDAE  

2. *Metapenaeopsis hilarula* (De Man, 1911)  
5. *Metapenaeus brevicornis* (H. Milne Edwards, 1837)  
6. *Metapenaeus dobsoni* (Miers, 1878)  
7. *Metapenaeus burkenroadi* Kubo, 1854  
8. *Metapenaeus monoceros* Fabricius, 1798  
10. *Parapenaeopsis cornuta* (Kishinonye, 1900)  
11. *Parapenaeopsis maxillipedo* Alcock, 1905  
13. *Parapenaeopsis tenella* (Bate, 1888)  
15. *Penaeus japonicus* Bate, 1888  
16. *Penaeus merguiensis* De Man, 1888  
17. *Penaeus monodon* Fabricius, 1798  
18. *Penaeus semisulcatus* De Haan, 1844
19. *Trachypenaeus pescadorensis* Schmitt, 1931

Infra order CARIDEA
Super family ALPHEOIDEA
Family ALPHEOIDEA

22. *Alpheus crossimanus* Heller, 1865
23. *Hippolyte ventricosa* H.Milne Edwards, 1837
24. *Latreutes mucronatus* (Stimpson, 1860)

**LOBSTERS**

Infra order PALINURIDEA
Super family PALUNUROIDEA
Family PALINURIDAE

1. *Panulirus homarus* (Linnaeus, 1758)
2. *Panulirus ornatus* (Fabricius, 1798)

Family SCYLLARIDAE
Subfamily SCYLLARIDAE

3. *Scyllarus sordidus* (Stimpson, 1860)

Subfamily THENINAE

4. *Thenus orientalis* (Lund, 1793)

**MOLLUSCA**

Class *Gastropoda*
Subclass *Prosobranchia*

Order ARCHAEOGASTROPODA
Superfamily PATELLIACEA (True limpets)
Family PATELLIACEA (Limpets)

1. *Cellana radiata* (Born, 1778)

Family TURBINIDAE (Turban shells)

2. *Turbo intercostalis* (Menke)
Order CAENOGASTROPODA

Superfamily CERITHIACEA

Family TURRITELLIDAE (Screw shells)

3. *Turritella duplicata* (Lamarck, 1799)

Family STROMBIDAE (Wing shells)

4. *Strombus rubbosa* (Selandr)

Superfamily NATICACEAE (Moon shells)

Family NATICIDAE

5. *Natica albula* (Roeding, 1791)

6. *Polinices mamilla* (Linnaeus) (= *Polinices tumides* Swainson, 1840)

Superfamily TONNACEA

Family CASSIDAE (Helmet Shells)

7. *Phalium areola* (Linnaeus, 1768)

8. *Phalium canaliculatum* (Brugiere, 1792)

Family FICIDAE (Fig shells)

9. *Ficus ficus* (Linnaeus, 1758)

Family TONNIDAE (Tun shells)

10. *Tonna dolium* (Linnaeus, 1758)

Family BURSIDAE (Frog shells)

11. *Bursa rubeta* (Linnaeus, 1758)

Order NEOGASTROPODA

Superfamily MURICIDAE

Family MURICIDAE

12. *Murex trapa* (Roeding, 1798)

13. *Murex tribulus* (Linnaeus, 1758)

Family THAIDIDAE (Rock shells)

14. *Thias carnifera* (Links)
Superfamily BUCCINICEA
Family BUCCINIDAE (Whelks)

15. *Babylonia spirata* (Linnaeus, 1758)
16. *Babylonia zeylanica* (Bruguiere)

Superfamily VOLUTACEA
Family OLIVIDAE (Olives)

17. *Olivancillana gibbosa* (Born, 1778)

Family TURBINELLIDAE (Chanks)

18. *Turbinella pyrum* (Linnaeus, 1758)

Superfamily CONACFA
Family CONIDAE (Cones)

19. *Conus amadis* (Gentlin, 1791)

Super family BULLACEA
Family BULLIDAE

20. *Bulla ampulla* (Linnaeus, 1758)

**Bivalves**

Family ARCIDAE

21. *Arca fusa* Bruguiere 1789

Family MYTILIDAE

22. *Modiolus metacalfei* (Hanley, 1843)
23. *Perna viridis* Linnaeus, 1758

Family PECTINIDAE

24. *Pecten tranquebaricus* (Gemlin, 1790)

Family ANOMIIDAE

25. *Placenta placenta* (Linnaeus, 1758)

Family OSTERIDAE

26. *Crassostrea cucullata*, 1780
Family CARDITIDAE

27. *Cardita biocolor* Lamarck, 1819

Family CARDIIDAE

28. *Cardium flavum* Linnaeus, 1758

Family VENERIDAE

29. *Circe scripta* (Linnaeus, 1758)
30. *Meretrix casta* (Chemnitz, 1782)
31. *Paphia textile* (Gemlin, 1790)
32. *Papia malabarica* (Chemnitz, 1782)

Family MACTRIDAE

33. *Mactra cuneata* Chemnitz, 1782

Family DONACIDAE

34. *Donax cuneatus* Linnaeus, 1758
35. *Donax laba* Gemlin, 1790

Family SEPIIDAE

36. *Sepia aculeata* Orbigny, 1848
37. *Sepia pharaonis* Ehrenberg, 1831
38. *Sepia brevimana* Steenstrup, 1875
39. *Sepia prashadi* Winckworth, 1936
40. *Sepiella inermis* Orbigny, 1898

Family LOLIGINIDAE

41. *Loligo duvauceli* Orbigny, 1848
42. *Doryteuthis singhalensis* Ortmann, 1891
43. *Sepioteuthis lessoniana* Lesson, 1830
44. *Loliolus investigatoris* Goodrich, 1896

Family OCTOPODIDAE

45. *Octopus rugosus* Bose, 1792
46. *Octopus macropus* Risso, 1826
47. *Octopus fusiformis* Brock, 1887
48. *Cistopus indicus* Orbigny, 1840
ECHINODERMS

**Asteroids**

Family **GONEASTERIDAE**

**Genus Anthinea**

1. *Anthinea pentagonula* (Lamarck, 1816)

   **Genus Astropecten**

2. *Astropecten hemprichii* Muller and Treschel, 1843

   **Genus Goniodiscus**

3. *Goniodiscus grunuliferus* Sladen, 1889

   Family **PENTACEROSTEREDAE**

   **Genus Pentaceroster**

4. *Pentaceroster multispinus* Doderlein 1936

   Family **OREASTEREIDAE**

   **Genus Oreaster**

5. *Oreaster thurstoni* Bell, 1888

   Family **ASTRINIDAE**

   **Genus Asterina**

6. *Asterina cepheus* (Muller Troschel, 1842)

7. *Asterina coronata* Von Martens, 1866

   **Genus Anseropoda**

8. *Palmipes sarasini* Gravely, 1927

**Ophiuroids**

Family **OPHIOTRICHDAE**

**Genus Ophiothrix**

9. *Ophiothrix korena* Duncan, 1878

10. *Ophiothrix galathea* Luthen, 1872
Family PECTINURADAE
   Genus *Pectinura*

11. *Pectinura intermedia* Bell, 1888

Family OPHIACTIDAE
   Genus *Ophiactis*

12. *Ophiactis savignyi* Muller and Troschel, 1842

Family AMPHURIDAE
   Genus *Amphioplus*

13. *Amphioplus gravelyi* James, 1970

Family OPHEOTHRICIDAE
   Genus *Opheothrix*

14. *Ophiothrix hirsuta* Muller and Troschel, 1842

Echinoids

Family STOMOPNEUSTIDAE
   Genus *Stomopneustes*

15. *Stomopneustes variolaris* (Lamarck)

Family TEMPNOPLEURIDAE
   Genus *Tempnopleures*

16. *Temnopleures toreumaticus* (Leske) 1880

   Genus *Salmacis*

17. *Salmacis virgulata* L. Agassiz

Family CLYPEASTERIDAE
   Genus *Clypeaster*

18. *Clypeaster humilis* (Leske, 1788)

   Genus *Lovenia*

19. *Lovenia elongata* (Grey, 1845)
Family LAGANIDAE
Genus \textit{Laganum}

20. \textit{Laganum depressum} Lesson, 1841

21. \textit{Echinolampus ovata} (Leske, 1778)

Family ECHINIDAE
Genus \textit{Echinus}

22. \textit{Parachinus angulosus} (Leske, 1778)

Family ECHINOMETRIDAE
Genus \textit{Echinometra}

23. \textit{Echinometra mathoei} (de Blainville, 1825)

Family ECHNKOLAMPADIDAE
Genus \textit{Echinolampus}

24. \textit{Echinolampus ovata} (Leske, 1778)

Family SCUTELLIDAE
Genus \textit{Echinodiscus}

25. \textit{Echinodiscus auritus} Leske, 1778.

Holothuroids

Family HOLOTHUROIDEA
Genus \textit{Bohadschia}

26. \textit{Bohadschia marmorata} Jaeger, 1833

Family CUCUMARIIDAE
Genus \textit{Stoles}

27. \textit{Stolus buccalis} (Stemson, 1966)

Family CUCUMARIIDAE
Genus \textit{Thyone}

28. \textit{Thyone mirubelis} Gravely, 1927
Family CUCUMARIIDAE
Genus *Actinocucumis*

29. *Actinocucumis typicus* Gravely, 1927

Family PSOLUS COMPLANATA Semper, 1868
Genus *Phylloporus*

31. *Phylloporus (urodemella) brocki* Ludwig, 1833

Family HOLOTHURIDOEAE
Genus *Holothuria*

32. *Holothuria (Halodeima) atra* Jager, 1833
33. *Holothuria (Metriatyla) scabra* Jager, 1833

Family STICHOPODIDAE
Genus *Stichopus*

34. *Stichopus chloronotus* Brandt, 1835

Family SYNAPTIDAE
Genus *Synapta*

35. *Synapta recta* Semper, 1868

Family CUCUMARIIDAE
Genus *Cucumaria*

36. *Cucumaria cunjungens* Semper, 1868
37. *Cucumaria frauenfeldi* Semper, 1868

**FISHES**

Phylum *Chordata*
Grade *Pisces*
Class *Choridrichthyes*
Subclass *Elasmobranchii*
Order *LAMNIFORMES*
Suborder *LAMNOIDEI*
Family RHINODONTIDAE

1. *Rhinodon typus* Smith, 1828
Family ORECTOLOBIDAE

2. *Chiloscyllium griseum* Muller and Henle, 1841
3. *Chiloscyllium indicus* (Gmelin, 1789)

Family STEGOSTOMATIDAE

4. *Stegostoma fasciatum* (Hermann, 1783)

Family CARCHARINIDAE

5. *Carcharinus dussumieri* (Muller and Henle, 1841)
6. *Carcharinus hemiodon* (Valenciennes, 1841)
7. *Carcharinus sorrah* (Muller and Henle, 1841)
8. *Scoliodon laficaudus* (Muller and Henle, 1841)

Family RHINOBATIDAE

9. *Rhinobatos grannulatus* Cuvier, 1829
10. *Rhina ancylostoma* (Schneider, 1801)

Family DASYATIDAE

11. *Dasyatis imbricata* (Schneider, 1801)

Family MOBULIDAE

12. *Mobule diabolus* (Shaw, 1804)

Class Psteichthyes
Subclass Actinopterygii
Order CLUPEIFORMES
Suborder CLUPEIDEI
Family CLUPEIDAE

13. *Dussumieria acuta* Valenciennes, 1847
14. *Escualosa thoracata* (Valenciennes, 1847)
15. *Sardinilla dayi* Regan, 1917
16. *Sardinella longiceps* Valenciennes, 1847
17. *Ilisha filigera* Misra, 1976
18. *Ilisha megaloptera* (Swainson, 1838)
19. *Ilisha melastoma* (Schneider, 1801)
20. *Ilisha sirishai* Seshagiri Rao, 1975
21. *Opisthopterus tardoore* (Cuvier, 1829)
22. *Pellona ditchela* Valenciennes, 1847
23. *Hilsa kelee* (Cuvier, 1829)
24. *Hilsa toli* (Valenciennes, 1847)

Family ENGRAULIDAE

25. *Setipinna taty* (Valenciennes, 1848)

Family CHIROCENTRIDAE

26. *Chirocentrus nudus* Swainson, 1839

Family CONGRIDAE

27. *Congresox talabon* (Cuvier, 1829)

Family ARRIDAE

28. *Arius arius* (Hamilton-Buchanan, 1822)
29. *Arius jella*, Day, 1877

Family PLOTOSIDAE

30. *Plotosus lineatus* (Thunberg, 1791)

Family HARPADONTIDAE

31. *Harpadon nehereus* (Hamilton-Buchanan, 1822)

Family EXOCOETIDAE

32. *Hirundichthys coromandelensis* (Homell, 1923)
33. *Parexocoetetus mentao* (Cuvier, 1846)
34. *Hyporhamphus limbatus* (Valenciennes, 1976)
35. *Rhynchoramphus malabaricus* Collette, 1976

Family BELONIDAE

36. *Strongylura strongylura* (Van hasselt, 1823)

Family PIATYCEPHALIDAE

38. *Platycephalus tuberculatus* Cuvier, 1829
Order PERCIFORMES
Family AMBASSIDAE
39. Ambassis commersoni Cuvier, 1828
40. Ambassis gymnocephalus (Lacepede, 1802)

Family SERRANIDAE
41. Cephalopholis leopardus (Lacepede, 1802)
42. Cephalopholis sonnerati (Valenciennes, 1828)
43. Epinephelus diacanthus (Valenciennes, 1828)
44. Epinephelus latifasciatus (Temminck and Schlegel, 1842)
45. Epinephelus maculatus Block, 1790
46. Epinephelus malabaricus (Schneider, 1801)
47. Epinephelus tauvina (Forsskal, 1775)

Family TERAPONIDAE
48. Pelates quadrilineatus (Bloch, 1790)
49. Terapon jarbua (Forsskal, 1775)
50. Terapon theraps Cuvier, 1828

Family APOGONIDAE
51. Apogon taeniatus (Cuvier, 1828)

Family SILLAGINIDAE
52. Sillago sihama (Forsskal, 1775)

Family LACTARIIDAE
53. Lactarius lactarius (Schneider, 1801)

Family CARANGIDAE
54. Alectis ciliaris (Bloch, 1788)
55. Alectis indicus (Ruppell, 1828)
56. Alepes djedaba (Forsskal, 1775)
57. Alepes vari (Cuvier, 1833)
58. Atropus atropus (Bloch, 1801)
59. Atule mate (Cuvier, 1833)
60. Carangoides tala (Cuvier, 1831)
Family MENIDAE

61. *Mene maculata* (Bloch, 1801)

Family LEIOGNATHIDAE

62. *Gazza minuta* (Bloch, 1797)
63. *Leiognathus bindus* (Valenciennes, 1835)
64. *Leiognathus daura* (Cuvier, 1829)
65. *Leiognathus dussumieri* (Valenciennes, 1835)
66. *Leiognathus jonesi* James, 1971
67. *Secutor insidiator* (Bloch, 1787)
68. *Leiognathus brevirostris* (Valenciennes, 1835)

Family LUTJANIDAE

69. *Lutjanus argentimaculatus* (Forsskal, 1775)
70. *Lutjanus biguttatus* (Valenciennes, 1830)
71. *Lutjanus johni* (Bloch, 1972)
72. *Lutjanus kasmira* (Forsskal, 1775)
73. *Lutjanus lineolatus* (Ruppell, 1828)
74. *Lutjanus lutjanus* Bloch, 1790
75. *Lutjanus lunulatus* (Mungopark, 1797)
76. *Lutjanus malabaricus* (Bloch and Schneider, 1801)
77. *Lutjanus monostigma* (Cuvier, 1828)
78. *Lutjanus rivulatus* (Cuvier, 1828)

Family NEMIPTERIDAE

79. *Nemipterus bleekeri* (Day, 1875)
80. *Nemipterus luteus* (Schneider, 1801)
81. *Nemiperus toilu* (Valenciennes, 1830)

Family GERRIDAE

82. *Gerres filamentosus* Cuvier, 1854
83. *Gerres macracanthus* Bleeker, 1854

Family LETHRINIDAE

84. *Lethrinus cinereus* Valenciennes, 1830
85. *Lethrinus lantjan* (Lacepede, 1854)
86. *Lethrinus microdon* Valenciennes, 1830
Family SCIADIDAE

87. Daysciaena albida (Cuvier, 1830)  
88. Dendrophysa russelii (Cuvier, 1830)  
89. Johnius carutta Bloch, 1793  
90. Johnius belangerii (Cuvier, 1830)  
91. Johnius macropterus (Bleeker, 1853)  
92. Paranibea semiluctuosa (Cuvier, 1830)

Family MULLIDAE

93. Mulloidies falvolineatus (Lacepede, 1802)  
94. Parupeneus indicus (Shaw, 1803)  
95. Upeneus (Pennon) tragula Richardson, 1846  
96. Upeneus (Upeneus) vittatus (Lacepede, 1801)

Family MONODACTYLIIDAE

97. Monodactylus argenteus (Linnaeus, 1758)

Family CHAETODONTIDAE

98. Chaetodon decussatus Cuvier, 1831  
99. Heniochus acuminatus (Linnaeus, 1758)

Family MUGLIDAE

100. Mugil cephalus (Linnaeus, 1758)

Family TRICHIURIDAE

101. Trichiurus lepturus Linnaeus, 1758

Family SCOMBRIDAE

102. Rastrellilger brachysoma (Bleeker, 1851)  
103. Rastrellilger kanagurta (Cuvier, 1817)

Family BOTHIDAE

104. Pseudorhombus arsius (Hamilton-Buchanan, 1822)  
105. Pseudorhombus elevatus (Ogilby, 1912)

Family SOLEIDAE

106. Aesopia cornuta Kaup, 18584  
107. Zeptias quagga (Kaup, 1858)
Family CYNOGLOSSIDAE

108. Cynoglossus arel (Schneider, 1801)
109. Cynoglossus bilineatus (Lacepede, 1802)
110. Cynoglossus punticeps (Richardson, 1846)

Family TRIACANTHIDAE

111. Triacanthus biculeatus (Bloch, 1782)
112. Triacanthus indicus ma Bura, 1982
113. Triacanthus brevirostris Schlegel, 1844
114. Pseudotriacanthus strigilifer (Cantor, 1949)

Family BALISTIDAE

115. Abalistes stellaris (Lacepede, 1798)
116. Aluterus scripta (Osbek, 1771)
117. Balistes vetula Linnaeus, 1758

Family MONOCANTHIDAE

118. Monocanthus choirocephalus Bleeker, 1822
119. Psilocephalus barbatus Gray, 1831

Family OSTRACIIDAE

120. Ostracion nasus Bloch, 1785
121. Tetrasomus gibbosus (Linnaeus, 1758)

Family TETRADONTIDAE

122. Chelonodon pataca (Hamilton, 1822)
123. Lagocephalus lunaris (Bloch and Schneider, 1801)
124. Lagocephalus spadicius (Richardson, 1844)
125. Takifugu oblongus (Bloch, 1786)
126. Arothron immaculatus (Bloch & Schneider, 1801)
127. Arothron hispidius (Linnaeus, 1802)
128. Arothron leopardus (Day, 1818)
129. Arothron nigropunctatus (Bloch and Schneider, 1801)
130. Arothron reticularis (Bloch, 1801)
REPTILES

1. *Enhydrina schistoea* (Daudin)
2. *Hydrophis cyanocinctus* (Daudin)

ECOLOGY OF CORAL REEFS OF PALK BAY

The coral reefs of Palk Bay are a small strip of fringing reefs present almost parallel to the shore in an east-westerly direction. The lagoon is small and shallow and can be waded through at low tides. The width of lagoon varies from 400 ± 200 meters in different regions. A channel 2-4 meters deep, almost at the mid length of the reef, through which fishing boats enter the lagoon, separates the reef into the eastern and western halves. The eastern half, which extends eastward up to Pamban Bridge, is called Kathuvallimunai reef, and the western half, which extends westward up to Tehdai village is called Vellapertumuni Reef. The Kathuvallimuni Reef is comparatively wider than the Vellaperutumuni Reef for most of its length. Because of their continuity and similarity in faunal assemblage, earlier workers had treated both these reefs as single biotype.

A general survey along the beach to the open bay is demarcated as sandy shore, lagoon, back reef, reef-crest, and the fore reef for the purpose of the present study. The shore throughout the coral reef area of the Palk Bay was purely sandy, except at the extreme eastern end near the Pamban Bridge where there were a few sandstone formations. The sandy beach harbored a variety of fauna. The burrowing crabs, *Dotilla myctiroides* and *Scopimera proxima* the bivalve, *Donax* spp. were common along the sandy shore. Oysters were also present in this rocky area. During the first survey (May 1997) the scyphomedusa, *Rhopilema hispidum* were found washed ashore in large numbers. The gastropods, *Umbonium vestoarium* and *Cerithidia jluviatalis* are common, the latter representing the commonest molluscan shell of this area, found on the shore. The starfish, *Pentaceraster australis* (Lutkin) was often found stranded on the shore by the receding tides.

The width of the lagoon ranged from 200 to 600 m, with a depth of 1.5 to 2 m at its central part during spring tides. Since the beach was of loose white sand, the waves, especially during the period of northeast monsoon, whipped up considerable quantities of beach sand and deposited it in the lagoon, gradually filling its bottom. Further the loose sand blown off by the southwest wind from land may also get deposited in the lagoon. The absence of living corals in the lagoon may probably be on account of the absence of solid substratum on which the planula larvae can settle. The bottom sand was found mixed with a good percentage of dead shells of *Cerithidia jluviatalis*. In the deeper parts of the lagoon variously coloured, branching sponges were fairly common. *Hércinia fusca* Carter, *Dysidea fragilis* (Montagu), *Spirastrella inconstans* Dendy, *Haliclona tenuiramosa* (Burton), *Callyspongia diffusa* (Riddley) and *C. fibrosa* (Ridley and Dendy) etc. were some of the common sponges encountered during transect studies in this area. The sea anemone *Stoichactes* sp. was not uncommon. The small tube dwelling polychaete
Spirobis sp. was found in abundance on the sea grass Cymodocea. At least three species of echinoderms viz. Pentaceraster australis (Lutkin), Holothuria atra (Jager) and H. scabra (Jager) were observed within the lagoon. The bottom of the lagoon was covered with sea weeds such as Cymodocea, Ulva reticulata, Amphiroa and the calcareous green alga Halimeda. Among the other major algae Turbinaria sp. and Padina spp. were also common.

The shoreward side of the reef was composed of massive dead reefs. They were widely spaced with their interspaces filled with loose sand similar to that of the shore. Majority of the corals occurring in this part of the reef were mostly massive. Individual colonies were small, generally ranging from 10 to 20 cm in greater diameters. Though the fauna was rich in regard to the number of species, none of the species were said to be abundant but Favia pallida and Leptastrea transversa out number the others. Other massive corals like Goniopora stokesi, Porites spp. Favia favus, Goniastrea retiformis, Platygrya lamellina, Hydnopora excesa, Symphyllia recta and Cyphastrea microphthalma occurred in numbers. Galaxea fascicularis and Pavona varians was also noticed during the investigation from this reef. Other fauna such as encrusting sponges and bryozonans were abundant on corals of this area. Soft corals such as Lobophyton sp. Sarcophyton sp. and polychaetes were numerous on corals, the parasitisation by some of them causing irregular nodular branches in certain colonies of corals. Both, Holothuria atra and H. scabra were found in the sandy interspaces of the rocks.

The reef crest of these reefs was often observed exposed at low tides. Corals were very rare at the reef crest, probably due to the influence of exposure to sunlight and waves. However, under the dead rocks occasionally Leptastrea sp. and Goniopora were seen. This part of the reef was comparatively less in live corals, probably due to the influence of intermittent exposure to sun during low tides. The non-calcareous algae Padina sp. and Caulerpa peltata were common in this region.

The reef slope composed of majority of the branching coral genera viz. Pocillopora sp. Acropora sp. as well as Montipora sp. They were comparatively diverse than the shoreward side. The seaweeds such as Turbinaria sp. Sargassum sp. Fading sp. Caulerpa sp. and rarely Cymodocea sp. Halimeda sp. and a few other encrusting calcareous algae were commonly found in this region. This part of the reef is composed of massive corals with a luxuriant growth of branching corals. Many of the encrusting and massive species occurring in the shoreward side could also be found in this part, but not in such greater abundance as they were in the shoreward side. Among the branching forms, Pocillopora damicornis and Acropora corymbosa are common in this region.

Many coral associates were found associated with the corals of this part of the reef. At least two species of Alpheus were recorded from Pocillopora damicornis and Acropora corymbosa. Trapezian crabs were found associated with almost all colonies of P. damicornis. The spider crab Tylocaroinus styx (Herbst) was recorded in plenty on Pocillopora damicornis and Acropora corymbosa. At least three species of coral reef,
fishes viz. Chaetopod octofasciatus, Pseudochromis tusens and Holocentrus diadema were found among Montipora foliosa.

A total of 61 species of algae was recorded among the three major groups viz, green algae (14 genera and 28 species), brown algae (8 genera and 13 species), red algae (17 genera and 2.0 species). Species of Caulerpa and Sargasam were the most common plants found in the reef. The physical conditions like the nature of the substratum and water level above the substratum influence the distribution of the flora of the coral reef area (Umamaheswara Rao, 1969). Boring sponges was the major group among the marine organisms causing considerable destruction to the reef system. The bores made by the sponges weaken the entire reef, making it more susceptible to the wear and tear caused by the waves. There are altogether 20 species of boring sponges now known from the Gulf of Mannar and Palk Bay, falling into 9 genera. The most conspicuous genus is Cliona both in number of species and in distribution (Thomas, 1969). Among the coral boring organisms bivalve mollusc found to cause considerable destruction to coral reefs of Palk Bay. They act as biological agents in the erosion of hard corals stones. In Palk Bay and Gulf of Mannar 17 boring bivalve species were recorded (under 10 genera of six families, Appukuttan, 1973). Asir Ramesh et al. (1996) recorded a total of 73 species of molluscs associated with corals in Palk Bay viz. 46 species of gastropods belonging to 17 families and 27 species of bivalves belonging to 13 families.

The dried sea horse (Hippocampus kuda) occurring in great numbers is in great demand in the south-east Asian countries especially in Singapore and China not only for extraction of soup which is a delicacy but also for its medicinal values. Along the Ramnad District coast, the dried sea horse is harvested in large quantities and is used as medicine to arrest whooping cough in children. For whooping cough, the dried sea horse is powdered and heated in the earthen pot. The fried powder mixed with honey is administered as medicine. In some places the fried powder is mixed with the coconut oil and pasted on the cut wounds and also used for curing asthma (Marichamy et al., 1993).

Dugongs are long living animals with a low reproductive rate, a long generation time and a large gap in between off springs. Fishing of dugong in Palk Bay region during 1960 was about 25, which were caught accidentally in the fishing gears. In Palk Bay Karangadu, Nambuthaalai, Morepani and Mullimunai are the minor fishing villages of Dugong. Valivalai (drift net) shore scens and Thirukkaivalai are being used to capture the dugong in the shallow regions. The explosives (country bombs and dynamites) are also used for capturing the dugong around the deep regions of Thiruppalaikudi and Devipatinam (major fish landing centers of Ramnad District).

THREATS TO THE PALK BAY ECOSYSTEM

Natural threats:

The major stresses on reefs are storms and waves, particularly tropical storms and cyclones. These cause major intermittent damage to reefs, particularly to those reefs that
rarely experience these storms. Cyclonic disturbances develop during certain months (October-November) along the Indian Sea coast and elsewhere in the tropical region.

These cyclones have sustained winds with speed ranging from 65 to 120 km per hour. High-speed winds cause extreme wave action that break corals into rubbles and sometimes-large amounts of sand and other materials may be dumped on to the coral reef. Due to 1969 cyclone, a large area of coral was buried under the sand in Rameswaram area of Gulf of Mannar and Palk Bay. Freshwater runoff damages reefs in semi-enclosed bays and lagoons by lowering salinity and depositing large amounts of sediments and nutrients. There is now considerable speculation that the incidence of both these stresses has been exacerbated by human activities.

**Human induced threats:**

Varied human activities which are a cause for concern includes runoff and sedimentation from developmental activities, eutrophication from sewage and agriculture, physical impact from maritime activities, dredging, collecting, and destructive fishing practices, pollution from industrial sources and oil refineries and the synergistic impacts of anthropogenic disturbance on top of natural disturbance.

Sedimentation, which is the most well studied impact, may affect corals in three different ways: photosynthetically, physically, and chemically. As most reef-building corals obtain the majority of their nutritional requirements through translocation of metabolites from their photosynthetic partners (Zooxanthellae), any reduction in the availability of light will affect coral nutrition, growth, reproduction and depth distribution.

Physically, sediments also interfere with coral nutrition by coating the feeding surfaces responsible for catching prey items needed to supplement the energy provided by zooxanthellae. While corals do have the ability to cleanse themselves using a combination of mucus secretion and ciliary action, chronic sedimentation may end up in a high energetic cost, adding to the overall impact on the colony. Sedimentation can alter species composition of reefs through photosynthetic and physical effects. Change in relative abundance of morphological types as well as individual species are an important reflection of how sedimentation as a disturbance affects community structure. The standing examples are the coral reefs of Gulf of Mannar islands and the reefs of Palk Bay. So far, the presence of sediment load in the coral reef areas has been confirmed in Gulf of Mannar and Palk Bay, however, quantitatively they are not reported.

Sedimentation can also physically interfere with recruitment of coral larvae, which require a solid substratum upon which to settle and metamorphose. Dredging projects have been particularly damaging the reefs, (Sethu Samudram project, Gulf of Mannar region) primarily through the initial physical disturbance, habitat alteration and the subsequent problems associated with sedimentation. Sand mining in Palk Bay and coral
quarrying in Gulf of Mannar (Tuticorin group of Islands) cause a lot of sedimentation and siltation on coral reefs.

A general rule for coastal zone: whatever is used on land today ends up in the aquifer or coastal zone tomorrow. Salinity changes alone have proven to affect corals, especially on shallow water reef flats, which are most likely to be affected by freshwater runoff. The amount of sediments and chemicals the runoff water carries to the sea has profound effects on fertilization of eggs of coral species and other associated fauna. Likewise, the quality of runoff water can affect the metamorphosis of the larvae of corals. Many areas in Palk Bay and Gulf of Mannar area have large quantities of sediment laden freshwater runoff impinged on coastal reefs, causing high levels of coral mortality, rapid growth of fleshy algae species, and large areas of reduced salinity/quality seawater. Local fishermen of Palk Bay have complained of decreased fisheries and reef vitality not only on these coastal reefs, but also on off shore islands and reefs not directly affected by contact with the sediment. Inspection of these reefs revealed (Zoological Survey of India, Chennai) live adult coral colonies, but less signs of larval recruits with increased levels of sedimentation.

Oil pollution is an extreme example of how chemicals, in these case hydrocarbons, can affect reefs. Research performed in many areas has documented coral mortality, decreased fecundity and recruitment failure in response to chronic oil pollution. The number of mechanised fishing boat may contribute a lot to this effect in Palk Bay especially in the coral reef and sea grass beds.

The overall impact of sewage on a coral reef community depends on sewage, level of treatment, presence of toxic materials and receiving water characteristics. The effects of sewage-related nutrient enrichment on coral reef communities have been documented and include alteration of competitive interactions, reduction of coral calcification rates from decreased light levels and increased phosphate concentrations and increased mortality from bacterial infection. Corals are adapted to live in nutrient poor environments and are relatively slow growing compared to algae, sponges, tunicates and other groups of sessile benthic organisms. Nutrients not only increase the bio-mass of phytoplankton, affecting light transmission and increasing the biological oxygen demand (BOD) which may have some impact on the corals, but also give a competitive advantage to faster growing benthic species. The green algae have formed large mats, covering and killing corals in Mandapam coast coral reefs in Palk Bay, due to sewage pollution from the town. The nutrient enrichment via sewage reduces the photosynthetic efficiency of corals, as algal cells increase in density to the point of becoming self-shading. Since the coral zooxanthellae symbiosis evolved under nutrient limited conditions, it is reasonable to assume that the relationship will become altered in response to changes in the level of nutrients available. Further studies of the physiological effects of such changes are needed to determine the sub lethal or long-term effects of sewage and nutrient enrichment on coral reefs of Palk Bay.
There has been unprecedented bleaching of hard and soft corals throughout the coral reefs of the world from mid-1997 to late-1998. Much of the bleaching coincided with a large El Nino event followed by a strong La Nina but bleaching in all the coral reefs are uncorrelated. During this event, bleaching and mortality were most pronounced in shallow water (less than 15 m) and particularly affected stag horn and plate Acropora and other fast growing corals. Many of the massive, slow-growing species bleached, but some corals have recovered with in one or two months. This bleaching event has resulted in poor coral cover (1999-2000 study by Zoological Survey of India, Chennai) (Venkataraman, 2000) and possibly fewer new coral recruits in Palk Bay for the next 10 years until recovery gains speed. In the short term, this may affect adversely the economy of India, particularly fisheries. There will be a shift in the composition of coral communities; some will have greater dominance of slow growing massive corals, whereas other reefs will lose century-old colonies. Nevertheless, such shifts have occurred in the past and are part of the normal variability of many coral reefs. If however, the recent bleaching event is linked to global climate change, the consequences would be serious for many coral reefs if sea temperatures show a continuing upward trend.

Four types of coral diseases have been "identified": white band disease, black band disease, bacterial infection, and shutdown reaction. While there is a degree of uncertainty over the causes responsible for each disease, they all appear to be stress-related. Synergism is believed to play an important role, as stressed coral seems to be the most susceptible to the above diseases. Sediment, sewage, pesticides, heavy metals, bleaching and other human impacts have tumors, bacterial attack and parasitic worms. White Band Disease has been reported from Andaman and Nicobar and Lakshadweep islands. In addition, a new disease called Pink Line disease is also reported from Lakshadweep.

The use of destructive fishing practices has been responsible for the destruction of coral reefs throughout the world. Destructive fishing practices have seriously damaged many of the Palk Bay and Gulf of Mannar's richest and most diverse coral reefs, necessitating an urgent warning that immediate and far-reaching action is warranted. The Gulf of Mannar and Palk Bay stands out as one of the hardest hit areas, with 60% of its reef in varying stages of deterioration. Because of the large size of the areas concerned and the general lack of resources for enforcement, education appears to be more successful than legislation in controlling these practices. Poverty reduces the alternatives for fishermen who must feed their families and rely on fishing as a source of protein and income. This same problem has led to another human induced impact on reefs: Over Fishing. The uses of fish traps made of long-lasting materials with small mesh sizes results in the capture of pre-reproductive juveniles, affecting future populations and the death of fish when traps become dislodged during storms, yet continue to capture fish, which eventually starve. Several types of net fishing have also been responsible for over-exploitation of reef. As with all biological communities in a coral reef, each species plays an important role in the dynamics of balance. The depletion of grazers, for example, may eventually lead to overgrowth of alga as in the case Palk Bay reefs.
Although it is now illegal, blast fishing has been a widespread and accepted fishing technique in some of the reef areas in Palk Bay and Gulf of Mannar. Schooling reef fishes are located visually, after which the capture boat moves within close range and a lighted bomb is thrown into the middle of the school. After the bomb is exploded, fishermen enter the water to collect the fish that have been killed or stunned by the resulting shock wave. Due to blasting, branching, tabulate and foliose of hard corals are shattered while massive and columnar corals are often fractured. Although this effect of blasting is quite localized, reefs subject to repeated blasting are often do little more than shifting rubble fields or puncture by the occasional massive coral head. In addition to damaging the reef framework, blast fishing results in side-kills of non-target and juvenile fish and invertebrates.

The use of bamboo mesh traps, locally known as koodu, is widespread throughout Palk Bay and Gulf of Mannar islands reef fisheries. In Ramanathapuram alone 3,312 (37% of the total trap in the Tamil Nadu State) traps are found. Although this gear is not intrinsically destructive, the process of setting and retrieving the trap is largely responsible for the destruction wrought on the reef. These traps set by simply lowering the trap from boat-side via a buoyed rope are responsible for the most reef damage. The traps are often heavily weighed with wooden runners or stones and can destroy entire stands of branching and foliose corals on the reef during their installation and especially removal (by pulling on the rope). If the current trend continues, Koodu trap activities will become an increasingly important cause of reef damage in Palk Bay and Gulf of Mannar.

Ola valai is a type of drive-in net fishing technique where by a line of fishermen in the water use scare-lines, lines with palm leaves tied off at regular intervals to drive fish down a bag net. The scare lines are rhythmically lifted and dropped into the shore areas, often breaking live corals while the fish are driven ahead. Next to this are the shore seines form the major gear of Gulf of Mannar. There are about 1523 numbers of shore seines found in Ramanathapuram district alone, forming about 33% of the total shore seines in the Tamil Nadu state. Although this gear is not intrinsically destructive, the process of shore seines is largely responsible for the destruction of new colonies emerging near lagoon.

While it is simple to prove how damaging destructive fishing practices are to the productivity of fisheries, the economic realities of day-to-day life in Gulf of Mannar and Palk Bay makes the solution difficult to obtain.

The villagers around Palk Bay harvest holothurians, seahorse and pipefishes. Other harvesting activities include chanks and milk fish fry. Turtles are being harvested up to 1000 annually; Dugongs are also illegally poached. The destruction of reefs and reef associated organisms in the Gulf of Mannar and Palk Bay is perhaps unparalleled in the history of environmental damage to nature and natural resources in the recent past (Pillai, 1996). The coral reefs on Palk Bay and Gulf of Mannar have been quarried for industrial purposes from early sixties from Mandapam to Tuticorin. The estimate of coral quarried
varies. At Tuticorin the estimate was 80,000 t per year. Pillai (1973) estimated the exploitation of corals from Mandapam area during sixties and early seventies to the tune of 250 m³ per day. It is found that some of the islands (Vilanguchalli in Tuticorin group and Poovarasanganpatti Island in Keelakarai group) are totally submerged below three to four meters under water and vanished may be because of quarrying. A recent status survey on the coral reefs of Gulf of Mannar has revealed that only 25% live coral survived after the recent bleaching event in 1998 (Venkataraman, 2000). The huge colonies of corals that occupied large areas in the lagoons of many islands are no more there due to bleaching, over exploitation of algae and shells by fishermen in an extensive scale. During collection of algae, fishermen brake most of the corals while negotiating their boats. The export of live crabs and lobsters from this area in the recent years is also causing damage to live corals because fish traps (Koodu) used to collect live crabs are causing a lot of destruction to coral reefs in these areas. Other than these disturbances, siltation, agricultural run off, sewage discharge as well as the faecal pollution is the major problems in these areas.

Due to increased urban development throughout coastal belt of Palk Bay as well as due to the development of getting East coast Road, most of the near shore areas are polluted. The sewage outlets and aquaculture ponds are increasing the suspended load, increasing turbidity, increasing nutrient of the coastal waters of Palk Bay. Wherever the fish processing industries are out letting the sewages, the coastal ecosystem is differing from the adjacent healthy areas. The indiscriminate cutting of the near shore forest in some areas of Palk Bay coast has led to coastal soil erosion with huge quantities of nutrients increasing the physical stresses on the coastal ecosystem of Palk Bay.

**SUMMARY**

Three different survey parties surveyed the Palk Bay region from Pamban to Kodiakarai during the period from 1997 to 1999. During these surveys a total number of 2625 specimens were collected, which include Fishes (1126), Crustaceans (817), Molluscs, Echinoderms (111), Sponges (24) and coelenterates. The present study reveals that the marine biodiversity of this region is qualitatively very rich and varied, and an extensive taxonomic study would reveal the occurrence of many more species in this region. The following are the list of species identified/recorded from Palk Bay: Chaetognatha 10, Sponges 77, Corals 61, Brachyura 20, Prawns 24, Lobsters 4, Mollusca 48, Echinoderms 36 and Fishes 130. An account of the coral reef ecosystem of Palk Bay has been attempted in this paper explaining the ecology and faunal assemblage of the following areas such as sandy shore, lagoon, back reef, reef-crest, and the fore reef. The natural threats such as storms and waves, particularly tropical storms and cyclones and the human induced threats such as pollution, over fishing, diseases, bleaching and destructive fishing practices in Palk Bay are explained.
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