

## Results:

### 5.1. Available marine molluscan fauna at Digha coast:

During the staggering 5 years study period from January - 2013 to July - 2017, the total number of 54 species of bivalves belonging to 8 orders, 18 families and 34 genera (Table – 2), 35 species of gastropods belonging to 4 orders, 18 families and 27 genera (Table – 3) & 4 species of cephalopods belonging to 3 orders, 3 families and 4 genera (Table – 4) have been identified at Digha coast of West Bengal. All of molluscs except cephalopods habitat (sandy bottom) can be found in the different ghats (spots) of Digha coast (Figure – 110). All available bivalves, gastropods and cephalopods are seen in Figure – 17 to 109.

**Table – 2: List of bivalvia available at Digha coast.**

Sl.No.	Family Name (18)	Genera (34)	Specimen (54)
1.	Arcidae	<i>Anadara</i>	<i>Anadara granosa</i> (Linnaeus, 1758)
			<i>Anadara inequivalvis</i> (Bruquiere, 1789)
			<i>Anadara antiquata</i> (Linnaeus, 1758).
		<i>Scapharca</i>	<i>Scapharca cornea</i> (Reeve, 1844).
2.	Astropectinidae	<i>Astropecten</i>	<i>Astropecten indicus</i> (Doederlein, 1872)
3.	Cardiidae	<i>Trachycardium</i>	<i>Trachycardium asiaticum</i> (Brugiera, 1794)
4.	Corbiculidae	<i>Polymesoda</i>	<i>Polymesoda bengalensis</i> (Lamarck, 1818)
5.	Donacidae	<i>Donax</i>	<i>Donax incarnates</i> (Gmelin, 1791)
			<i>Donax scortum</i> (Linnaeus, 1758)
6.	Glaucnomidae	<i>Glaucnome</i>	<i>Glaucnome sculpta</i> (Sowerby, 1844)
			<i>Glaucnome virens</i> (Linnaeus, 1767)
7.	Laternulidae	<i>Laternula</i>	<i>Laternula truncate</i> (Lamarck, 1818)

Sl.No.	Family Name (18)	Genera (34)	Specimen (54)
8.	Mactridae	<i>Mactra</i>	<i>Mactra mera</i> (Reeve, 1854)
			<i>Mactra luzonica</i> (Reeve, 1854)
			<i>Mactra violacea</i> (Gmelin, 1791)
			<i>Mactra plicataria</i> (Linnaeus, 1758)
			<i>Mactra dissimilis</i> (Reeve, 1854)
			<i>Mactra cuneata</i> (Gmelin, 1791)
		<i>Mactra stultrum</i> (Linnaeus, 1758)	
		<i>Roeta</i>	<i>Roeta pulchella</i> (Reeve, 1850)
<i>Roeta peliculla</i> (Reeve, 1854)			
9.	Mytilidae	<i>Perna</i>	<i>Perna viridis</i> (Linnaeus, 1758)
		<i>Modiolus</i>	<i>Modiolus undulates</i> (Dunker, 1856)
			<i>Modiolus striatulus</i> (Hanley, 1844)
10.	Ostreidae	<i>Saccostrea</i>	<i>Saccostrea cucullata</i> (Born, 1778)
		<i>Crassostrea</i>	<i>Crassostrea gryphoides</i> (Scholtheim, 1813)
11.	Pharidae	<i>Pharella</i>	<i>Pharella javanica</i> (Lamark, 1818)
		<i>Siliqua</i>	<i>Siliqua albida</i> (Dunker, 1865)
			<i>Siliqua radiata</i> (Linnaeus, 1758)
			<i>Siliqua winteriana</i> (Dunker, 1852)
12.	Pinnidae	<i>Pinna</i>	<i>Pinna bicolor</i> (Gmelin, 1791)
13.	Psammobiidae	<i>Apolymetis</i>	<i>Apolymetis edentula</i> (Spengler, 1782)
		<i>Sanguinolaria</i>	<i>Sanguinolaria acuminata</i> (Reeve, 1857)
14.	Pholadidae	<i>Barnea</i>	<i>Barnea candida</i> (Linnaeus, 1758)
		<i>Pholas</i>	<i>Pholas orientalis</i> (Gmelin, 1791)
15.	Solenidae	<i>Solen</i>	<i>Solen brevis</i> (Gray, 1842)
16.	Tellinidae	<i>Tellina</i>	<i>Tellina sinuata</i> (Spengler, 1782)
			<i>Tellina opalina</i> (Chemitz, 1788)
		<i>Strigilla</i>	<i>Strigilla splendida</i> (Anton, 1838)
		<i>Macoma</i>	<i>Macoma birmanica</i> (Philippi, 1849)
			<i>Macoma truncata</i> (Jonas, 1843)
			<i>Macoma blairensis</i> (Smith, 1906)

Sl.No.	Family Name (18)	Genera (34)	Specimen (54)
17.	Ungulinidae	<i>Diplodonta</i>	<i>Diplodonta bullata</i> (Dunker, 1865)
18.	Veneridae	<i>Timoclea</i>	<i>Timoclea imbricata</i> (Sowerby, 1844)
		<i>Meretrix</i>	<i>Meretrix meretrix</i> (Linnaeus, 1758)
			<i>Meretrix casta</i> (Gmelin, 1791)
		<i>Katelsia</i>	<i>Katelsia opima</i> (Gmelin, 1791)
		<i>Katelesiya</i>	<i>Katelesiya japonica</i> (Gmelin, 1791)
		<i>Pelecyrora</i>	<i>Pelecyrora trigona</i> (Reeve, 1850)
		<i>Paphia</i>	<i>Paphia textile</i> (Gmelin, 1791)
		<i>Dosinia</i>	<i>Paphia semirugata</i> (Philippi, 1847)
		<i>Sunetta</i>	<i>Dosinia prostata</i> (Linnaeus, 1758)
			<i>Sunetta scripta</i> (Linnaeus, 1758)
		<i>Sunetta meroi</i> (Linnaeus, 1758)	

Table - 3: List of gastropoda available at Digha coast

Sl.No.	Family Name (18)	Genera (27)	Specimen (35)
1.	Architectonidae	<i>Architectonica</i>	<i>Architectonica perspectiva</i> (Linnaeus, 1758)
			<i>Architectonica laevigata</i> (Lamarck, 1816)
2.	Bursidae	<i>Bursa</i>	<i>Bursa rana</i> (Linnaeus, 1758)
3.	Cassidae	<i>Phalium</i>	<i>Phalium bisulcatum</i> (Schubert & Wagner, 1829)
4.	Ellobidae	<i>Pythia</i>	<i>Pythia plicata</i> (Fe'russac, 1848)
5.	Epitoniidae	<i>Acrilla</i>	<i>Acrilla gracilis</i> (Sowerby, 1844)
		<i>Merex</i>	<i>Murex tribulus</i> (Linnaeus, 1758)
6.	Muricidae	<i>Seminricimula</i>	<i>Seminricinula konkanensis</i> (Melvill, 1893)
		<i>Thais</i>	<i>Thais lacera</i> (Born, 1778)
			<i>Thais blanfordi</i> (Melvill, 1893)
7.	Melongenidae	<i>Pugilina</i>	<i>Pugilina cochlidium</i> (Linnaeus, 1758)

Sl.No.	Family Name (18)	Genera (27)	Specimen (35)
8.	Nassaridae	<i>Nassarius</i>	<i>Nassarius faveolatus</i> (Reeve, 1849)
			<i>Nassarius stolatus</i> (Gmelin, 1791).
		<i>Nassaria</i>	<i>Nassaria nassaria.</i> (Roeding P F, 1798)
9.	Naticidae	<i>Natica.</i>	<i>Natica gualteriana</i> (Recluz, 1843)
			<i>Natica lineata</i> (Roeding, 1798)
			<i>Natica tigrina</i> (Roeding, 1798)
		<i>Sinum</i>	<i>Sinum neritoiderum</i> (Linnaeus, 1758)
		<i>Polinices</i>	<i>Polinices didyma</i> (Roeding, 1798)
			<i>Polinices tumidus</i> (Swainson, 1840)
10.	Neritidae	<i>Nerita</i>	<i>Nerita grayana</i> (Recluz, 1843)
11.	Olividae	<i>Olivancillaria</i>	<i>Olivancillaria gibbosa</i> (Born, 1778)
		<i>Oliva</i>	<i>Oliva olive</i> (Linnaeus, 1758)
		<i>Amalda.</i>	<i>Amalda ampla</i> (Gmelin, 1791)
		<i>Agaronia</i>	<i>Agaronia nebulosa</i> (Lamark, 1811)
12.	Potamididae	<i>Cerithidae</i>	<i>Cerithidea cingulate</i> (Gmelin, 1791)
			<i>Cerithidea obtusa</i> (Lamarck, 1758)
		<i>Telescopium</i>	<i>Telescopium telescopium</i> (Linnaeus, 1758)
13.	Renellidae	<i>Gyrinum</i>	<i>Gyrinum natator</i> (Roeding, 1798)
14.	Terebridae	<i>Terebra</i>	<i>Terebra tenera</i> (Hinds, 1844)
15.	Tonnidae	<i>Tonna</i>	<i>Tonna dolium</i> (Linnaeus, 1758)
			<i>Tonna sulcosa</i> (Swainson, 1840)
16.	Turritullidae	<i>Turritella</i>	<i>Turritella attenuata</i> (Reeve, 1849)
17.	Trochidae	<i>Umbonium</i>	<i>Umbonium vestiarius</i> (Linnaeus, 1758)
18.	Volutidae	<i>Melo</i>	<i>Melo melo</i> (Solander, 1786)

**Table - 4: List of cephalopoda available at Digha coast**

Sl. No.	Family Name (3)	Genera (4)	Specimen (4)
1.	Loliginidae	<i>Loligo</i>	<i>Loligo duvauceli</i> (d'Orbigny, 1848)
2.	Octopodidae	<i>Octopus</i>	<i>Octopus macropus</i> (Risso, 1826)
3.	Sepiidae	<i>Sepia</i>	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848)
		<i>Sepiella</i>	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848)

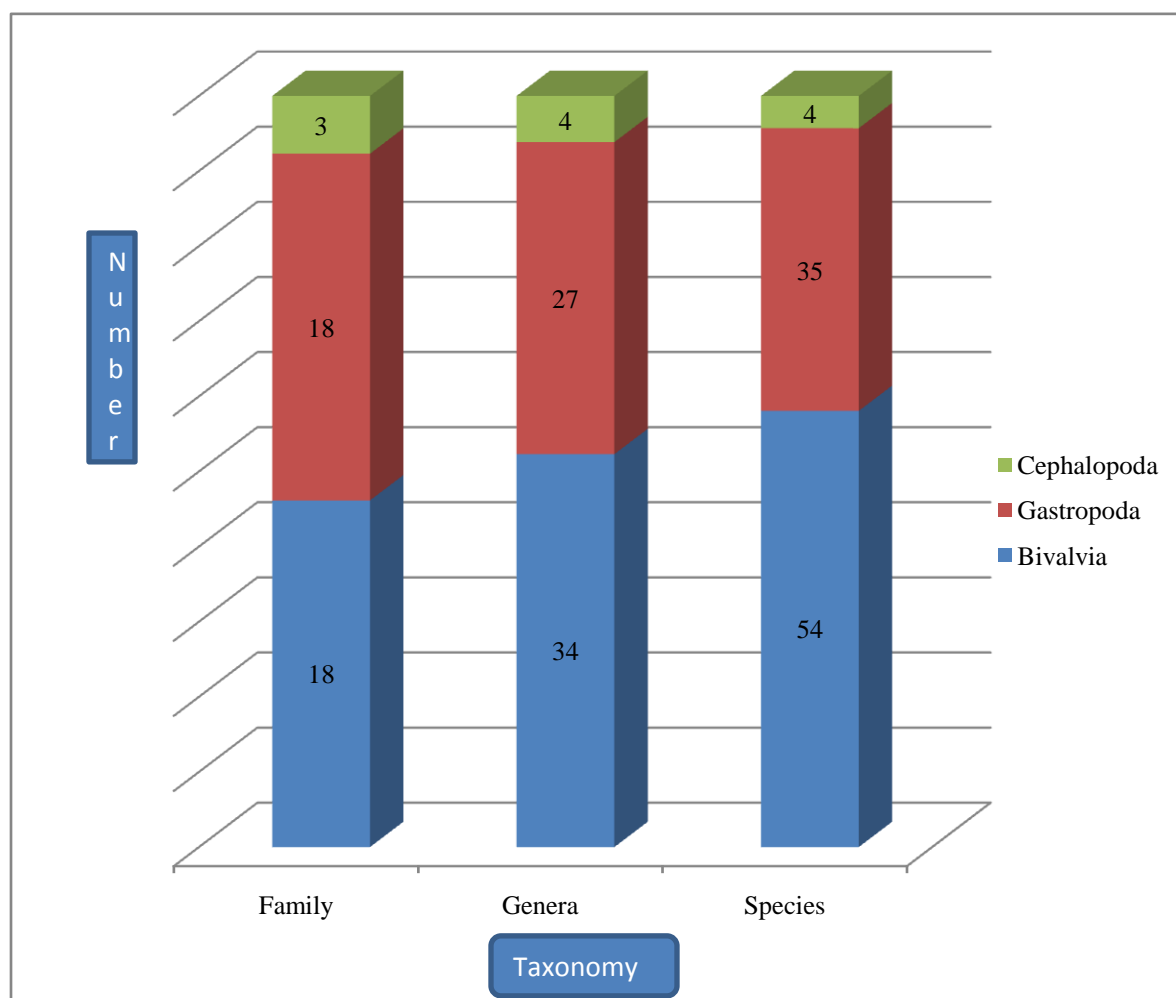


Diagram- 1: Taxonomic identification of molluscs species available at Digha coast

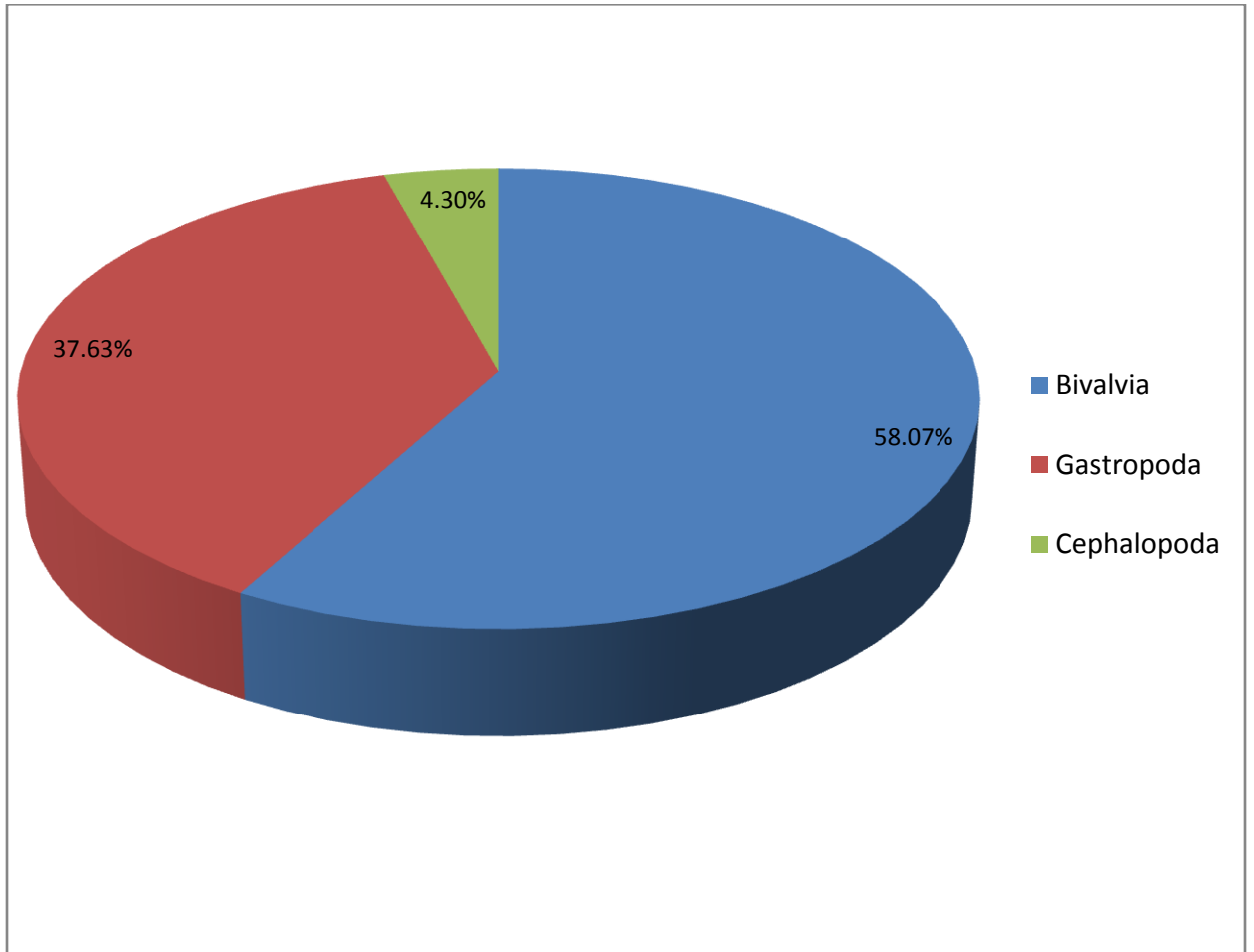
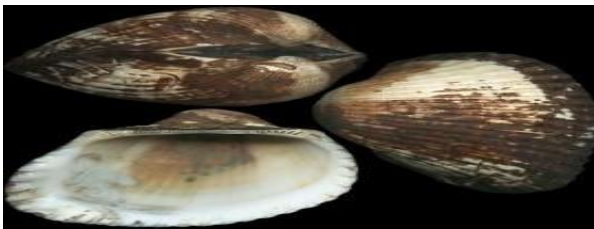
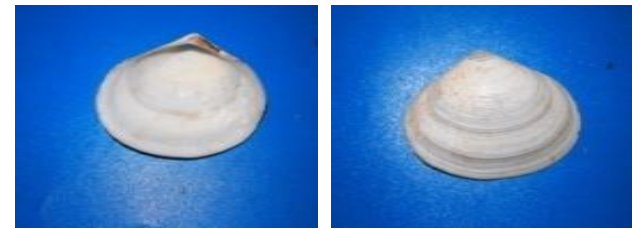
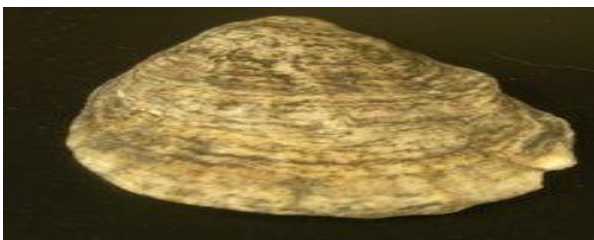
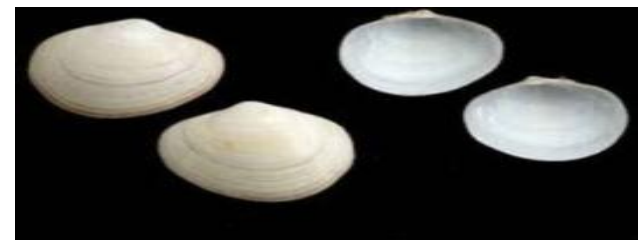


Diagram -2: Composition of marine molluscs groups at Digha coast

## Photographs of molluscan fauna available at Digha coast

Fig. – 17: *Anadara granosa*Fig. – 18: *Anadara inequalvis*Fig. – 19: *Anadara antiquata*Fig. – 20: *Apolymetis edentula*Fig. – 21: *Astropecten indicus*Fig. -22: *Barnea candida*Fig. – 23: *Crassostrea gryphoides*Fig. – 24: *Diplodonta bullata*Fig. – 25: *Donax incarnates*Fig. – 26: *Dosinia prostata*





Exterior view



Interior view

Fig. – 27: *Donax scortum*

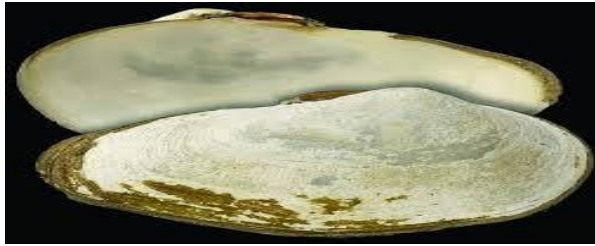


Fig. – 28: *Glauconome virens*

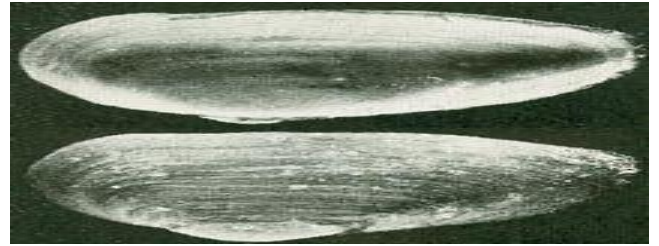


Fig. – 29: *Glauconome sculpta*



Fig. – 30: *Katelesiya japonica*



Fig. – 31: *Katelysia opima*



Fig. – 32: *Laternula truncate*



Fig. – 33: *Mactra mera*



Fig. – 34: *Mactra violacea*

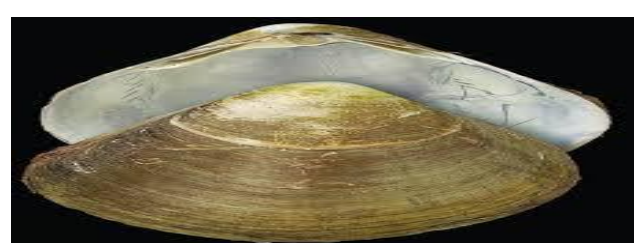


Fig. – 35: *Mactra plicataria*





Fig. – 36: *Mactra luzonica*



Fig. – 37: *Macoma truncata*



Fig. – 38: *Macoma birmanica*



Fig. – 39: *Meretrix meretrix*



Fig. – 40: *Macoma blairensis*



Fig. – 41: *Mactra dissimilis*



Fig. – 42: *Mactra cuneata*

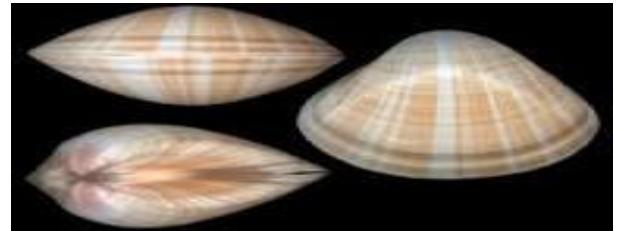


Fig. – 43: *Mactra stultum*

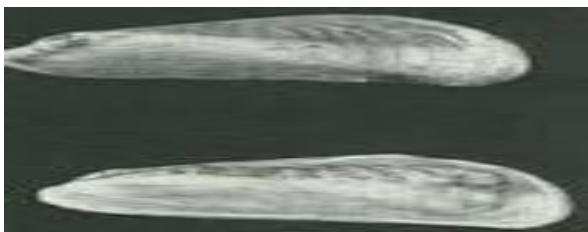


Fig. – 44: *Modiolus undulates*



Fig. – 45: *Modiolus striatulus*

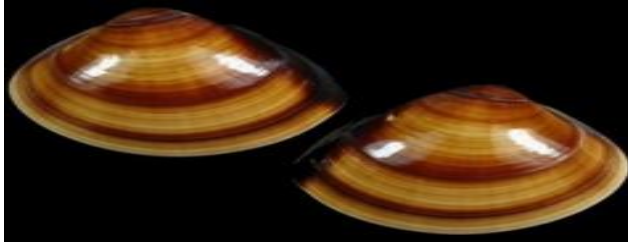


Fig. – 46: *Meretrix casta*



Fig. – 47: *Pholas orientalis*



Fig. – 48: *Polymesoda bengalensis*



Fig. – 49: *Perna viridis*



Fig. – 50: *Pharella javanica*



Fig. – 51: *Pinna bicolor*



Fig. – 52: *Pelecyrora trigona*



Fig. – 53: *Paphia textile*



Fig. – 54: *Paphia semirugata*



Fig. – 55: *Roeta peliculla*





Fig. – 56: *Roeta pulchella*

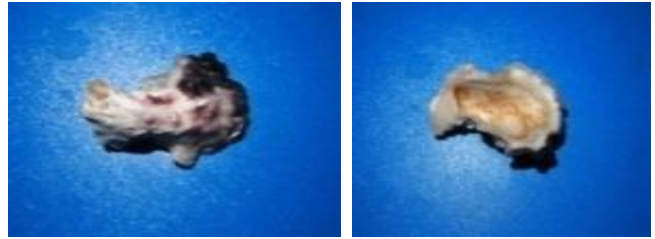


Fig. – 57: *Saccostrea cucullata*

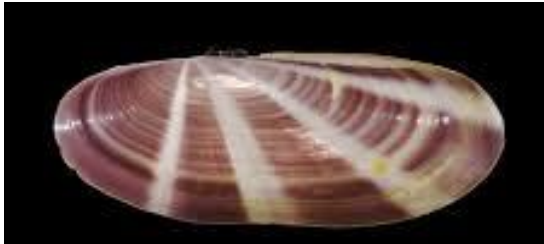


Fig. – 58: *Siliqua radiata*



Fig. – 59: *Siliqua albida*



Fig. – 60: *Solen brevis*



Fig. – 61: *Scapharca corne*

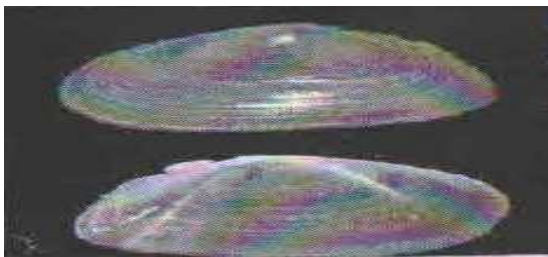


Fig. – 62: *Strigilla splendida*



Fig. – 63: *Siliqua winteriana*



Fig. – 64: *Sanguinolaria acuminata*



Fig. – 65: *Sunetta scripta*



Fig. – 66: *Sunetta meroi*



Fig. – 67: *Trachycardium asiaticum*



Fig. – 68: *Timoclea imbricata*



Fig. – 69: *Tellina sinuata*



Fig. – 70: *Tellina opalina*



Fig. – 71: *Architectonica perspectiva*



Fig. –72: *Architectonica laevigata*



Fig. – 73: *Agaronia nebulosa*



Fig. – 74: *Amalda ampla*

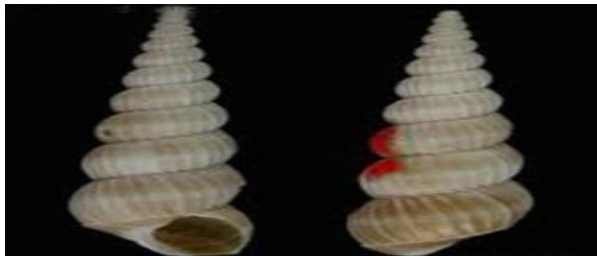


Fig. – 75: *Acrilla gracilis*



Fig. – 76: *Bufonaria rana*



Fig. – 77: *Cerithidea cingulate*



Fig. – 78: *Cerithidea obtusa*





Fig. – 79: *Gyrinum natator*



Fig. – 80: *Melo melo*



Fig. – 81: *Murex tribulus*



Fig. – 82: *Natica tigrina*



Fig. – 83: *Natica lineata*



Fig. – 84: *Nassarius stolatus*

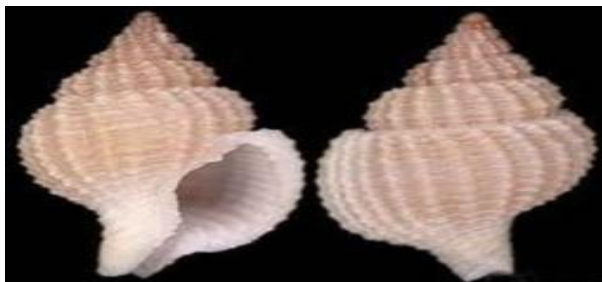


Fig. – 85: *Nassarius faveolatus*



Fig. – 86: *Natica gualteriana*



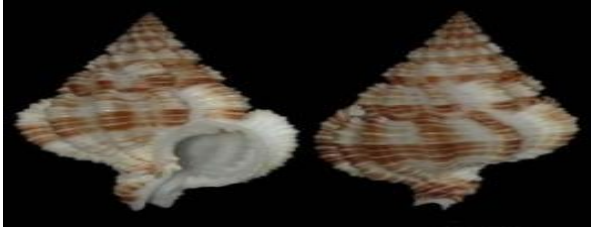


Fig. – 87: *Nassaria nassaria*



Fig. – 88: *Nerita grayana*



Fig. – 89: *Olivancillaria gibbosa*



Fig. – 90: *Oliva olive*



Fig. – 91: *Polinices didyma*



Fig. – 92: *Polinices tumidus*



Fig. – 93: *Phalium bisulcatum*



Fig. – 94: *Pythia plicata*



Fig. – 95: *Pugilina cochlidium*

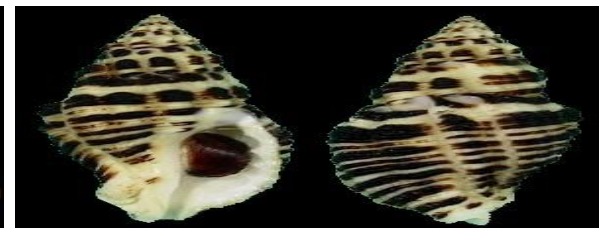


Fig. – 96: *Seminricinula konkanensis*

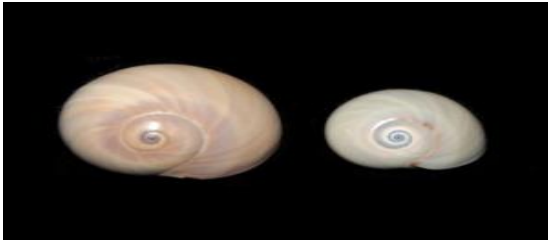


Fig. – 97: *Sinum neritoiderum*



Fig. – 98: *Telescopium telescopium*



Fig. – 99: *Tonna dolium*



Fig. – 100: *Tonna sulcosa*



Fig. – 101: *Turritella attenuata*



Fig. – 102: *Terebra tenera*



Fig. – 103: *Thais blanfordi*



Fig. – 104: *Thais lacera*



Fig. – 105: *Umboonium vestiarius*



Fig. – 106: *Loligo duvauceli*



Fig. – 107: *Octopus macropus*



Fig. – 108: *Sepia aculeata*



Fig. – 109: *Sepiella inermis*

## 5.2. Taxonomy of marine molluscan fauna at Digha coast:

Taxonomy is the ordering of animals into sets or groups on the basis of their relationship. The available 54 bivalve species falls under 8 orders, 18 families and 34 genera, 35 gastropod species falls under 4 orders, 18 families and 27 genera and 4 cephalopod species falls under 3 orders, 3 families and 4 genera. The systemic position in animal kingdom is mentioned in Table – 5 to 7.

### Taxonomy of available molluscan fauna at Digha coast:

Table – 5: Taxonomy of bivalves available at Digha coast.

Sl. No	Systematic Position	Sl. No	Systematic Position
1.	<i>Anadara granosa</i> (Linnaeus, 1758) Phylum – Mollusca Class – Bivalvia Order – Arcoida Family – Arcidae	2.	<i>Anadara inequivalvis</i> (Bruquiere, 1789) Phylum - Mollusca Class - Bivalvia Order - Arcoida Family - Arcidae
3.	<i>Anadara antiquata</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Arcoida Family - Arcidae	4.	<i>Apolymetis edentula</i> (Spengler, 1782) Phylum - Mollusca Class – Bivalvia Order - Veneroida Family - Psammobiidae
5.	<i>Astropecten indicus</i> . (Doederlein, 1872) Phylum - Mollusca Class – Bivalvia Order – Paxilloida Family – Astropectinidae	6.	<i>Barnea candida</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order – Myoida Family – Pholadidae
7.	<i>Crassostrea gryphoides</i> (Scholtheim, 1813) Phylum - Mollusca Class - Bivalvia Order - Osteroida Family – Ostreidae	8.	<i>Diplodonta bullata</i> (Dunker, 1865) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Ungulinidae



Sl. No	Systematic Position	Sl. No	Systematic Position
9.	<i>Donax incarnates</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Donacidae	10.	<i>Dosinia prostrata</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Veneridae
11.	<i>Donax scortum</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Donacidae	12.	<i>Glaucanome virens</i> (Linnaeus, 1767) Phylum - Mollusca Class - Bivalvia Order - Adapendota Family – Glauconomidae
13.	<i>Glaucanome sculpta</i> (Sowerby, 1844) Phylum - Mollusca Class - Bivalvia Order – Adapendota Family - Glauconomidae	14.	<i>Katelesiya japonica</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - veneridae
15.	<i>Katelsia opima</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Veneridae	16.	<i>Laternula truncate</i> (Lamarck, 1818) Phylum - Mollusca Class – Bivalvia Order - myoida Family – Laternulidae
17.	<i>Mactra mera</i> (Reeve, 1854) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Mactridae	18.	<i>Mactra violacea</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Mactridae
19.	<i>Mactra plicataria</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Mactridae	20.	<i>Mactra luzonica</i> (Reeve, 1854) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Mactridae

Sl. No	Systematic Position	Sl. No	Systematic Position
21.	<i>Macoma truncata</i> (Jonas, 1843) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Tellinidae	22.	<i>Macoma birmanica</i> (Philippi, 1949) Phylum- Mollusca Class - Bivalvia Order - Veneroida Family - Tellinidae
23.	<i>Meretrix meretrix</i> (Linnaeus, 1758) Phylum- Mollusca Class - Bivalvia Order - Veneroida Family - Veneridae	24.	<i>Macoma blairensis</i> (Smith, 1906) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Tellinidae

25.	<i>Macra dissimilis</i> (Reeve, 1854) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Mactridae	26.	<i>Macra cuneata</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Mactridae
27.	<i>Macra stultum</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Mactridae	28.	<i>Modiolus undulates</i> (Dunker, 1856) Phylum - Mollusca Class - Bivalvia Order - Mytiloida Family – Mytilidae
29.	<i>Modiolus striatulus</i> (Hanley, 1844) Phylum - Mollusca Class - Bivalvia Order - Mytiloida Family – Mytilidae	30.	<i>Meretrix casta</i> (Gmelin, 1791) Phylum- Mollusca Class - Bivalvia Order - Veneroida Family – Veneridae
31.	<i>Pholas orientalis</i> (Gmelin, 1791) Phylum - Mollusca Class - Bivalvia Order - Myoida Family – Pholadidae	32.	<i>Polymesoda bengalensis</i> (Lamarck, 1818) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Corbiculidae



Sl. No	Systematic Position	Sl. No	Systematic Position
33.	<i>Perna viridis</i> (Linnaeus, 1758) Or. <i>Mytilus viridis</i> (Hornell, 1921). Phylum - Mollusca Class - Bivalvia Order - Mytiloidea Family – Mytilidae	34.	<i>Pharella javanica</i> (Lamark, 1818)  Phylum - Mollusca Class - Bivalvia Order - Adapendota Family – Pharidae
35.	<i>Pinna bicolor</i> (Gmelin, 1791)  Phylum - Mollusca Class - Bivalvia Order - Pteriomorpha Family – Pinnidae	36.	<i>Pelecyrora trigona</i> (Reeve, 1850)  Phylum - Mollusca Class - Bivalvia Order - Veneroidea Family - Veneridae

37.	<i>Paphia textile</i> (Gmelin, 1791)  Phylum - Mollusca Class - Bivalvia Order - Veneroidea Family - Veneridae	38.	<i>Paphia semirugata</i> (Philippi, 1847)  Phylum - Mollusca Class - Bivalvia Order - Veneroidea Family - Veneridae
39.	<i>Roeta peliculla</i> (Reeve, 1854)  Phylum - Mollusca Class - Bivalvia Order - Veneroidea Family - Mactridae	40.	<i>Roeta pulchella</i> (Reeve, 1850)  Phylum - Mollusca Class - Bivalvia Order - Veneroidea Family - Mactridae
41.	<i>Saccostrea cucullata</i> (Born, 1778)  Phylum - Mollusca Class - Bivalvia Order - Osteroidea Family – Ostreidae	42.	<i>Siliqua radiata</i> (Linnaeus, 1758)  Phylum - Mollusca Class - Bivalvia Order - Adapendota Family – Pharidae
43.	<i>Siliqua albida</i> (Dunker, 1865)  Phylum - Mollusca Class - Bivalvia Order - Adapendota Family – Pharidae	44.	<i>Solen brevis</i> (Gray, 1844)  Phylum - Mollusca Class - Bivalvia Order – Adapendota Family – Solenidae

Sl. No	Systematic Position	Sl. No	Systematic Position
45.	<i>Scapharca cornea</i> (Reeve, 1844) Phylum - Mollusca Class - Bivalvia Order - Arcoida Family - Arcidae	46.	<i>Strigilla splendid</i> (Anton, 1838) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Tellinidae
47.	<i>Siliqua winteriana</i> (Dunker, 1852) Phylum - Mollusca Class - Bivalvia Order - Adapendota Family – Pharidae	48.	<i>Sanguinolaria acuminata</i> (Reeve, 1857) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Psammobiidae
49.	<i>Sunetta scripta</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family – Veneridae	50.	<i>Sunetta meroi</i> (Linnaeus, 1758) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Veneridae
51.	<i>Trachycardium asiaticum</i> (Brugierra, 1794) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Cardiidae	52.	<i>Timoclea imbricata</i> (Sowerby, 1844) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family - Veneridae
53.	<i>Tellina sinuata</i> (Spengler, 1782) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family-Tellinidae	54.	<i>Tellina opalina.</i> (Chemitz, 1788) Phylum - Mollusca Class - Bivalvia Order - Veneroida Family-Tellinidae

Table – 6: Taxonomy of gastropods available at Digha coast.

Sl. No	Systematic Position	Sl. No	Systematic Position
1.	<i>Architectonica perspective</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Archectonidae	2.	<i>Architectonica laevigata</i> (Lamarck, 1816) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Archectonidae
3.	<i>Agaronia nebulosa</i> (Lamark, 1811) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Olividae	4.	<i>Amalda ampla</i> (Gmelin, 1791) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Olividae
4.	<i>Acrilla gracilis</i> (Sowerby, 1844) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Epitoniidae	6.	<i>Bufonaria rana.</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Bursidae
7.	<i>Cerithidea cingulate</i> (Gmelin, 1791) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family – Potamididae	8.	<i>Cerithidea obtusa</i> (Lamarck, 1758) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Potamididae
9.	<i>Gyrinum natator</i> (Roeding, 1798) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Renellidae	10.	<i>Melo melo</i> (Solander, 1786) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Volutidae
11.	<i>Murex tribulus</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Muricidae	12.	<i>Natica tigrina</i> (Roeding, 1798) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae

Sl. No	Systematic Position	Sl. No	Systematic Position
13.	<i>Natica lineata</i> (Roeding, 1748) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae	14.	<i>Nassarius stolatus</i> (Gmelin, 1791) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Nassariidae
15.	<i>Nassarius faveolatus</i> (Reeve, 1849) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Nassariidae	16.	<i>Natica gualteriana</i> (Recluz, 1843) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae
17.	<i>Nassaria nassaria</i> (Roeding, P.F, 1798) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Nassariidae	18.	<i>Nerita grayana</i> (Recluz, 1843) Phylum - Mollusca Class - Gastropoda Order - Archaeogastropoda Family - Neritidae
19.	<i>Olivancillaria gibbosa</i> (Born, 1778) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Olividae	20.	<i>Oliva olive</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Olividae
21.	<i>Polinices didyma</i> (Roeding, 1798) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae	22.	<i>Polinices tumidus</i> (Swainson, 1840) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae
23.	<i>Phalium bisulcatum</i> (Schubert & Wagner, 1829) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Cassidae	24.	<i>Pythia plicata</i> (Fe'russac, 1848) Phylum - Mollusca Class - Gastropoda Order - Basomatophora Family - Ellobidae

Sl. No	Systematic Position	Sl. No	Systematic Position
25.	<i>Pugilina cochlidium</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Melongenidae	26.	<i>Seminricinula konkanensis</i> (Melvill, 1893) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Muricidae
27.	<i>Sinum neritoiderum</i> (Linnaeus, 1767) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Naticidae	28.	<i>Telescopium telescopium</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Potamididae
29.	<i>Tonna dolium</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Tonnidae	30.	<i>Tonna sulcosa</i> (Swainson, 1840) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Tonnidae
31.	<i>Turritella attenuata</i> (Reeve, 1849) Phylum - Mollusca Class - Gastropoda Order - Mesogastropoda Family - Turritellidae	32.	<i>Terebra tenera</i> (Hinds, 1844) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Terebridae
33.	<i>Thais blanfordi</i> (Melvill, 1893) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Muricidae	34.	<i>Thais lacera</i> (Born, 1778) Phylum - Mollusca Class - Gastropoda Order - Neogastropoda Family - Muricidae
35.	<i>Umbonium vestiarium</i> (Linnaeus, 1758) Phylum - Mollusca Class - Gastropoda Order - Archaeogastropoda Family - Trochidae		

Table – 7: Taxonomy of cephalopods available at Digha coast.

Sl. No	Systematic Position	Sl. No	Systematic Position
1.	<i>Loligo duvauceli</i> (d’Orbigny, 1848)  Phylum - Mollusca Class - Cephalopoda Order - Teuthoidea Family - Loliginidae	2.	<i>Octopus macropus</i> (Risso, 1826)  Phylum - Mollusca Class - Cephalopoda Order - Octopoda Family - Octopodidae
3.	<i>Sepia aculeata</i> (Ferussac and d’Orbigny, 1848)  Phylum - Mollusca Class - Cephalopoda Order - Sepioidea Family - Sepiidae	4.	<i>Sepiella inermis</i> (Ferussac and d’Orbigny, 1848)  Phylum - Mollusca Class - Cephalopoda Order - Sepioidea Family - Sepiidae

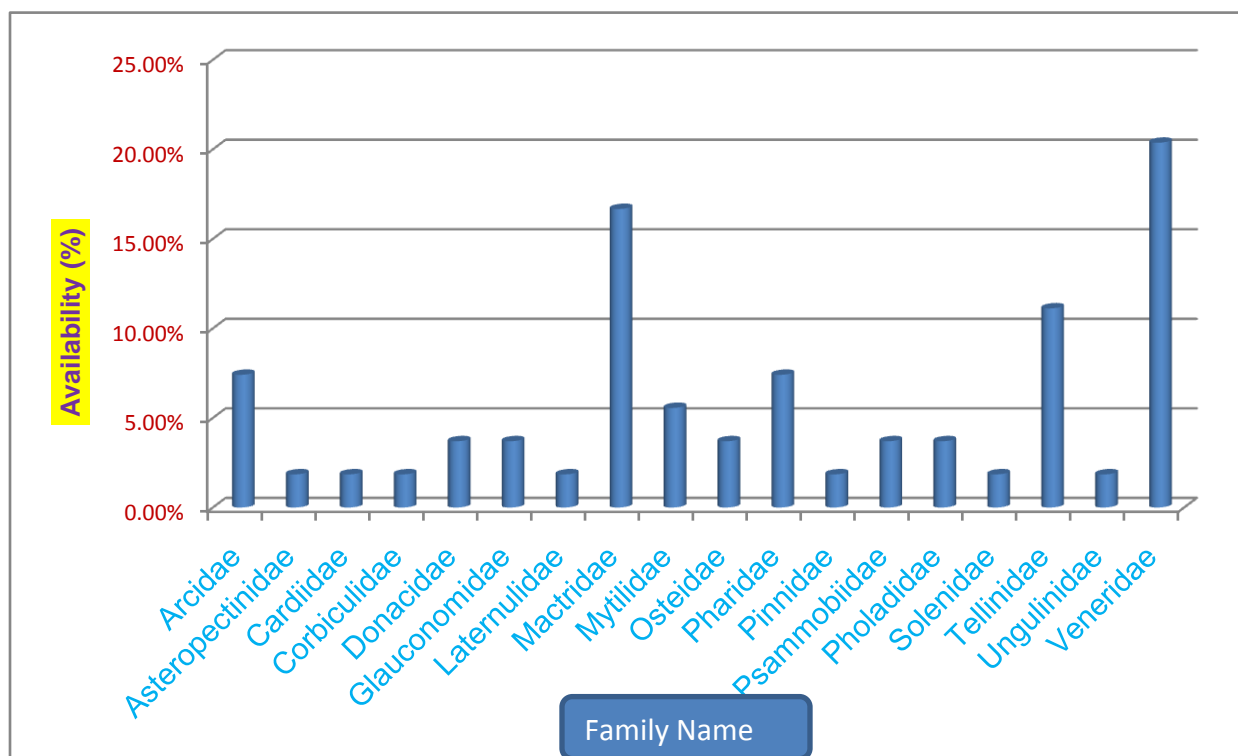


Diagram – 3: Showing distribution of **bivalves** in family-wise (%) from the study area



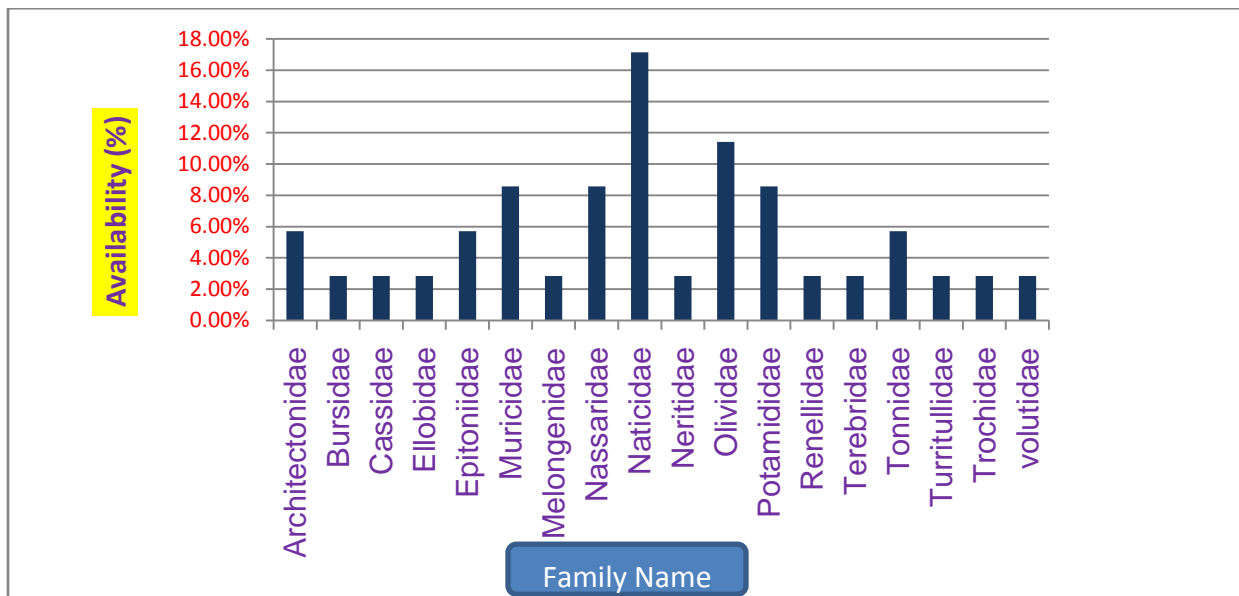


Diagram – 4: Showing distribution of **gastropods** in family-wise (%) from the study area

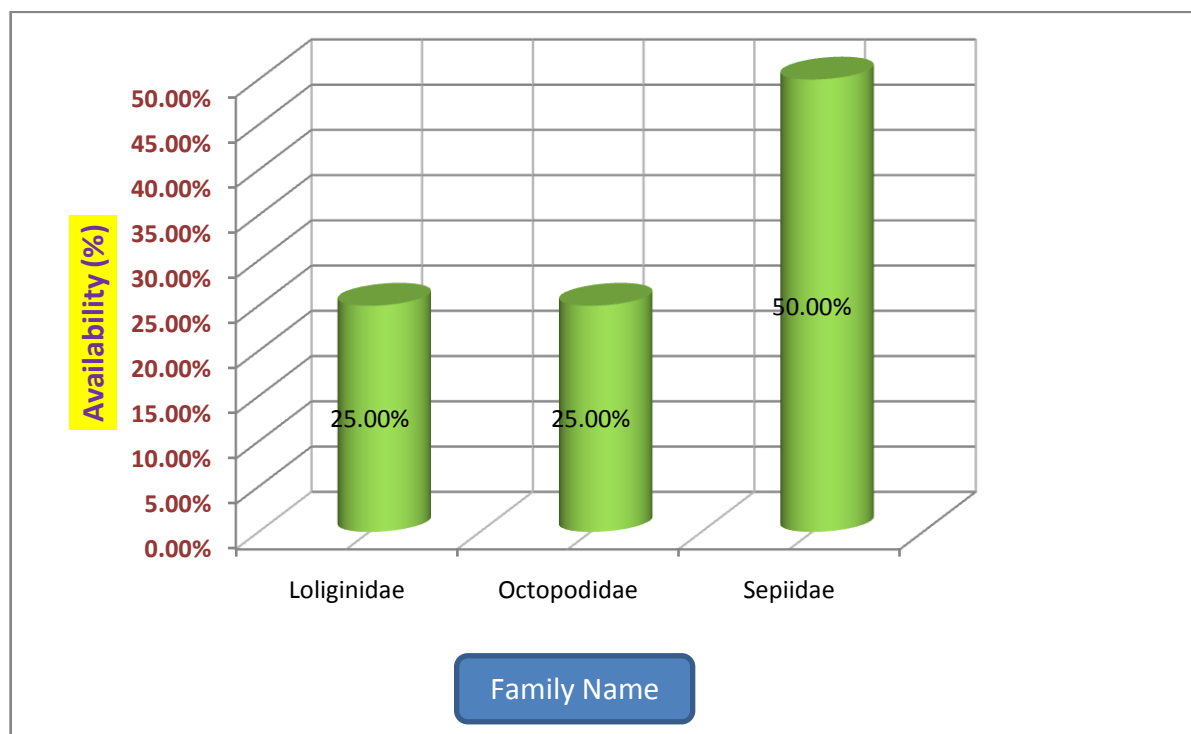


Diagram - 5: Showing distribution of **cephalopods** in family-wise (%) from study area.

### 5.3. Seasonal abundance of marine molluscan fauna at Digha coast:

Molluscs species are available at Digha coast more or less throughout the year. Highest population density is in post monsoon period from the months of September to February due to optimum water salinity and temperature. Availability goes down lowest in monsoon period mainly from the months of June to August due to lowest water salinity. Population density is optimum in pre monsoon season from March to May (Diagram - 6).

From the observation among the available 54 bivalves at Digha coast it is known that *Crassostrea gryphoides*, all available species of genus *Macra* and *Saccostrea cucullata* are found in every season of a year whereas other bivalves are seasonal. The details of availability of bivalves are shown in following Table – 8 and Diagram - 7.

**Table – 8: Seasonal availability of molluscs (bivalvia) species at Digha coast**

Sl.No	Specimen (Bivalvia)	J	F	M	A	M	J	J	A	S	O	N	D
1.	<i>Anadara granosa</i> (Linnaeus)	+	+	+	-	-	-	-	+	+	+	+	+
2.	<i>Anadara inequivalvis</i> (Bruquiere)	+	+	+	-	-	-	-	-	-	+	+	+
3.	<i>Anadara antiquata</i> (Linnaeus)	+	+	+	-	-	-	-	-	+	+	+	+
4.	<i>Apolymetis edentula</i> (Spengler)	+	+	+	+	-	-	-	-	-	+	+	+
5.	<i>Astropecten indicus</i> (Doederlein)	+	+	+	+	-	-	-	-	-	+	+	+
6.	<i>Barnea candida</i> (Linnaeus)	+	+	+	+	-	-	-	-	-	+	+	+
7.	<i>Crassostrea gryphoides</i>	+	+	+	+	+	+	+	+	+	+	+	+
8.	<i>Diplodonta bullata</i>	+	+	+	+	-	-	-	-	-	+	+	+
9.	<i>Donax incarnates</i>	+	+	+	+	+	+	-	-	-	+	+	+
10.	<i>Dosinia prostata</i>	+	+	+	-	-	-	-	-	-	+	+	+
11.	<i>Donax scortum</i>	+	+	+	+	+	+	-	-	-	+	+	+
12.	<i>Glaucanome sculpta</i>	+	+	+	-	-	-	-	-	-	+	+	+
13.	<i>Glaucanome virens</i>	+	+	+	+	-	-	-	-	-	+	+	+
14.	<i>Katelsia opima</i>	+	+	+	+	-	-	-	-	+	+	+	+
15.	<i>Katelesiya japonica</i>	+	+	+	+	-	-	-	-	-	+	+	+
16.	<i>Laternula truncate</i>	+	+	+	+	-	-	-	-	-	+	+	+
17.	<i>Macra mera</i>	+	+	+	+	+	+	+	+	+	+	+	+
18.	<i>Macra violacea</i>	+	+	+	+	+	+	+	+	+	+	+	+
19.	<i>Macra plicataria</i>	+	+	+	+	+	+	+	+	+	+	+	+
20.	<i>Macra luzonica</i>	+	+	+	+	+	+	+	+	+	+	+	+
21.	<i>Macra dissimilis</i>	+	+	+	+	+	+	+	+	+	+	+	+

Sl.No	Specimen (Bivalvia)	J	F	M	A	M	J	J	A	S	O	N	D
22.	<i>Mactra cuneata</i>	+	+	+	+	+	+	+	+	+	+	+	+
23.	<i>Mactra stultum</i>	+	+	+	+	+	+	+	+	+	+	+	+
24.	<i>Macoma blairensis</i>	+	+	+	+	-	-	-	-	-	+	+	+
25.	<i>Macoma truncata</i>	+	+	+	+	-	-	-	-	-	+	+	+
26.	<i>Macoma birmanica</i>	+	+	+	+	-	-	-	-	-	+	+	+
27.	<i>Meretrix meretrix</i>	+	+	+	-	-	-	-	-	-	+	+	+
28.	<i>Meretrix casta</i>	+	+	+	-	-	-	-	-	-	+	+	+
29.	<i>Modiolus striatulus</i>	+	+	+	-	-	-	-	-	-	+	+	+
30.	<i>Modiolus undulates</i>	+	+	+	-	-	-	-	-	-	+	+	+
31.	<i>Polymesoda bengalensis</i>	+	+	+	-	-	-	-	-	-	+	+	+
32.	<i>Perna viridis</i>	+	+	+	+	-	-	-	-	-	-	+	+
33.	<i>Pharella javanica</i>	+	+	+	+	-	-	-	-	-	+	+	+
34.	<i>Pinna bicolor</i>	+	+	+	+	-	-	-	-	-	+	+	+
35.	<i>Pelecyrora trigona</i>	+	+	+	-	-	-	-	-	-	+	+	+
36.	<i>Paphia textile</i>	+	+	+	+	-	-	-	-	+	+	+	+
37.	<i>Paphia semirugata</i>	+	+	+	+	-	-	-	-	+	+	+	+
38.	<i>Pholas orientalis</i>	+	+	+	+	-	-	-	-	-	+	+	+
39.	<i>Roeta peliculla</i>	+	+	+	-	-	-	-	-	-	+	+	+
40.	<i>Roeta pulchella</i>	+	+	+	-	-	-	-	-	-	+	+	+
41.	<i>Saccostrea cucullata</i>	+	+	+	+	+	+	+	+	+	+	+	+
42.	<i>Siliqua albida</i>	+	+	+	+	-	-	-	-	-	+	+	+
43.	<i>Siliqua radiata</i>	+	+	+	+	-	-	-	-	-	+	+	+
44.	<i>Siliqua winteriana</i>	+	+	+	+	-	-	-	-	-	+	+	+
45.	<i>Solen brevis</i>	+	+	+	+	-	-	-	-	-	+	+	+
46.	<i>Strigilla splendida</i>	+	+	+	+	-	-	-	-	-	+	+	+
47.	<i>Scapharca cornea</i>	+	+	+	-	-	-	-	-	-	+	+	+
48.	<i>Sunetta meroi</i>	+	+	+	+	-	-	-	-	-	+	+	+
49.	<i>Sunettac scripta</i>	+	+	+	+	-	-	-	-	-	+	+	+
50.	<i>Sanguinolaria acuminata</i>	+	+	+	+	-	-	-	-	-	+	+	+
51.	<i>Timoclea imbricata</i>	+	+	+	-	-	-	-	-	-	+	+	+
52.	<i>Tellina sinuata</i>	+	+	+	+	-	-	-	-	-	+	+	+
53.	<i>Tellina opalina</i>	+	+	+	+	-	-	-	-	-	+	+	+
54.	<i>Trachycardium asiaticum</i>	+	+	+	+	-	-	-	-	-	+	+	+

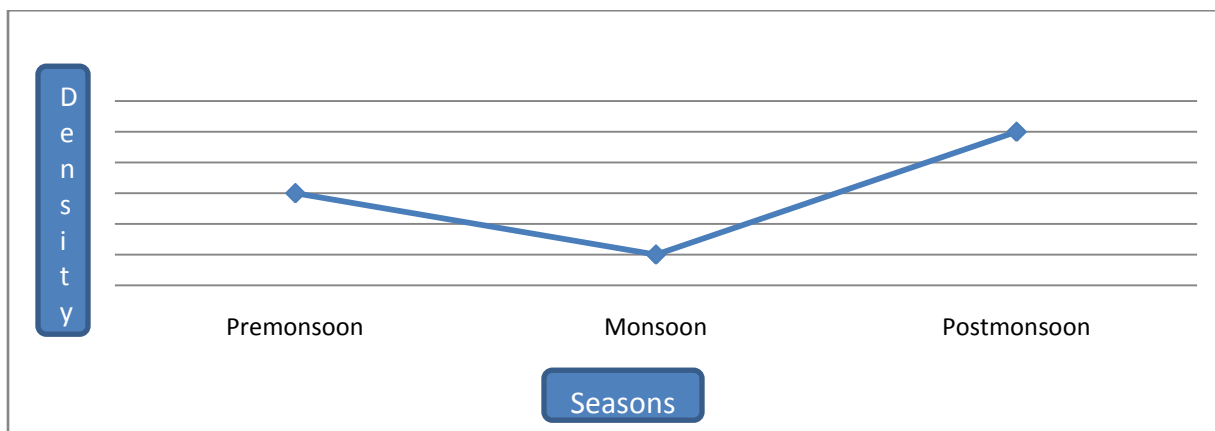


Diagram – 6: Seasonal abundance (season wise) of molluscan species at Digha coast

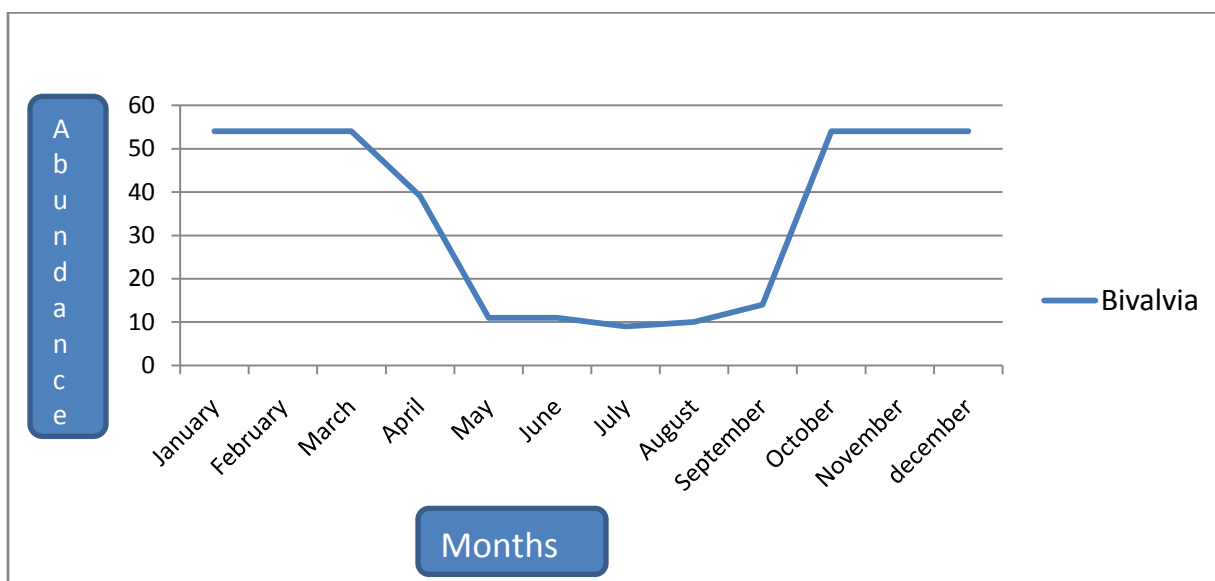


Diagram – 7: Seasonal abundance (month wise) of bivalvia species at Digha coast

Among the available 35 gastropods at Digha coast, *Acrilla gracilis*, *Cerithidea obtuse*, *Murex tribulus*, *Natica tigrina*, *Natica lineate*, *Natica gualteriana*, *Nerita grayana*, *Polinices didyma*, *Polinices tumidus*, *Tonna dolium*, *Tonna sulcosa* and *Umbonium vestiarius* are found throughout the year and other available gastropods are seasonal. The details of availability of gastropods are shown in Table – 9 and Diagram – 8.

**Table - 9: Seasonal availability of molluscs (gastropoda) species at Digha coast**

Sl.No	Specimen (Gastropoda)	J	F	M	A	M	J	J	A	S	O	N	D
1.	<i>Architectonica perspectiva</i>	+	+	+	-	-	-	-	-	-	+	+	+
2.	<i>Architectonica laevigata</i>	+	+	+	-	-	-	-	-	-	+	+	+
3.	<i>Agaronia nebulosa</i>	+	+	+	-	-	-	-	-	-	+	+	+
4.	<i>Amalda ampla</i>	+	+	+	+	-	-	-	-	+	+	+	+
5.	<i>Acrilla gracilis</i>	+	+	+	+	+	+	+	+	+	+	+	+
6.	<i>Bufo rana</i>	+	+	+	-	-	-	-	-	-	+	+	+
7.	<i>Cerithidea cingulate</i>	+	+	+	-	-	-	-	-	-	+	+	+
8.	<i>Cerithidea obtusa</i>	+	+	+	+	+	+	+	+	+	+	+	+
9.	<i>Gyrum natator</i>	+	+	+	-	-	-	-	-	-	+	+	+
10.	<i>Melo melo</i>	+	+	+	-	-	-	-	-	-	+	+	+
11.	<i>Murex tribulus</i>	+	+	+	+	+	+	+	+	+	+	+	+
12.	<i>Natica tigrina</i>	+	+	+	+	+	+	+	+	+	+	+	+
13.	<i>Natica lineata</i>	+	+	+	+	+	+	+	+	+	+	+	+
14.	<i>Nassarius stolatus</i>	+	+	+	+	-	-	-	-	-	+	+	+
15.	<i>Nassarius faveolatus</i>	+	+	+	+	-	-	-	-	-	+	+	+
16.	<i>Natica gualteriana</i>	+	+	+	+	+	+	+	+	+	+	+	+
17.	<i>Nassaria nassaria</i>	+	+	+	+	-	-	-	-	-	+	+	+
18.	<i>Nerita grayana</i>	+	+	+	+	+	+	+	+	+	+	+	+
19.	<i>Olivancillaria gibbosa</i>	+	+	+	-	-	-	-	-	-	+	+	+
20.	<i>Oliva olive</i>	+	+	+	-	-	-	-	-	+	+	+	+
21.	<i>Polinices didyma</i>	+	+	+	+	+	+	+	+	+	+	+	+
22.	<i>Polinices tumidus</i>	+	+	+	+	+	+	+	+	+	+	+	+
23.	<i>Phalium bisulcatum</i>	+	+	+	+	-	-	-	-	-	+	+	+
24.	<i>Pythia plicata</i>	+	+	+	-	-	-	-	-	-	+	+	+
25.	<i>Pugilina cochlidium</i>	+	+	+	+	-	-	-	-	-	+	+	+
26.	<i>Seminricinula konkanensis</i>	+	+	+	+	-	-	-	-	-	+	+	+
27.	<i>Sinum neritoiderum</i>	+	+	+	+	-	-	-	-	-	+	+	+
28.	<i>Telescopium telescopium</i>	+	+	+	-	-	-	-	-	-	+	+	+
29.	<i>Tonna dolium</i>	+	+	+	+	+	+	+	+	+	+	+	+
30.	<i>Tonna sulcosa</i>	+	+	+	+	+	+	+	+	+	+	+	+
31.	<i>Turritella attenuata</i>	+	+	+	-	-	-	-	-	-	+	+	+
32.	<i>Terebra tenera</i>	+	+	+	-	-	-	-	-	-	+	+	+
33.	<i>Thais blanfordi</i>	+	+	+	+	-	-	-	-	-	+	+	+
34.	<i>Thais lacera</i>	+	+	+	+	-	-	-	-	-	+	+	+
35.	<i>Umbonium vestiarium</i>	+	+	+	+	+	+	+	+	+	+	+	+

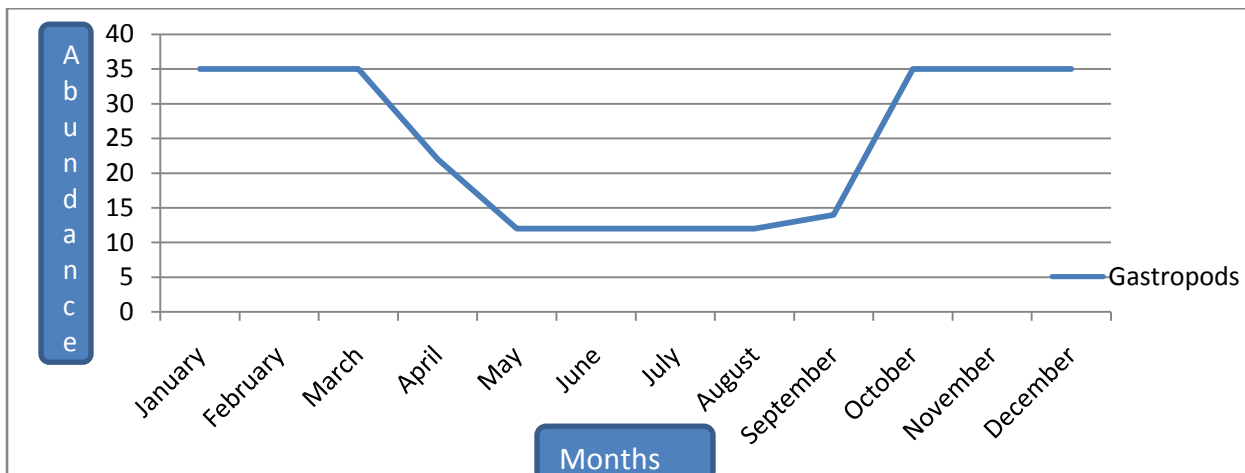


Diagram – 8: Seasonal abundance (month wise) of gastropods species at Digha coast

All available 4 species of cephalopods at Digha are seasonal, maximum amount founds during winter season. The details of availability of cephalopods are shown in Table - 10 and Diagram – 9.

**Table - 10: Seasonal availability of molluscs (cephalopoda) species at Digha coast**

Sl.No	Specimen (Cephalopodas)	J	F	M	A	M	J	J	A	S	O	N	D
1.	<i>Loligo duvauceli</i>	+	+	+	+	+	-	-	-	+	+	+	+
2.	<i>Octopus macropus</i>	+	+	+	-	-	-	-	-	-	-	-	+
3.	<i>Sepia aculeata</i>	+	+	+	+	+	-	-	-	+	+	+	+
4.	<i>Sepiella inermis</i>	+	+	+	+	+	-	-	-	+	+	+	+

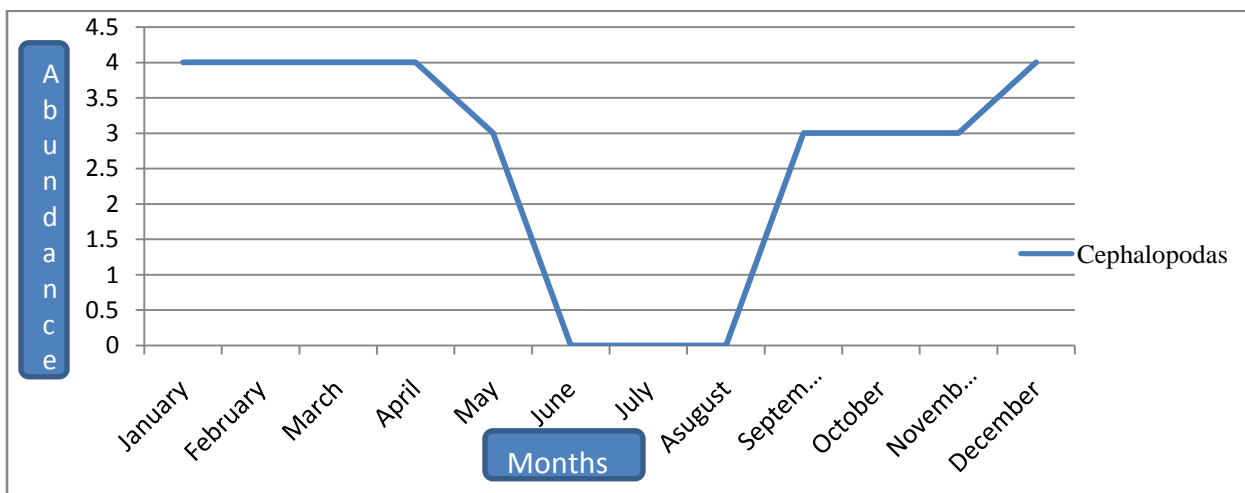


Diagram – 9: Seasonal abundance (month wise) of cephalopodas species at Digha coast



#### 5.4. Availability of marine molluscan fauna at various landing centers at Digha coast:

During study period there are eight (8) ghats (landing Centre) which are considered according to the local name of those areas viz., Paschim Gadadharpur, Udaypur, Ongaria Ghat, Jatranala Ghat, New Digha (Bat tala ghat), Hospital Ghat (Marine aquarium ghat), Sea Hawk Ghat and Digha Mohana (Figure – 110 and Table - 11).

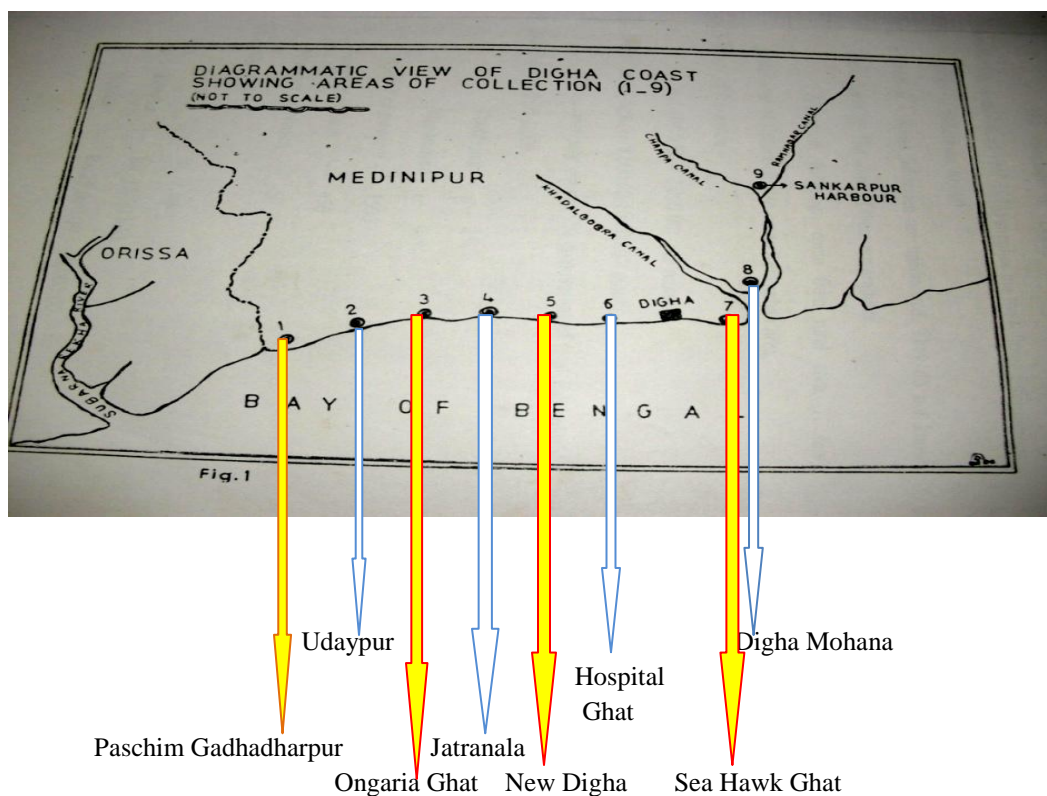


Fig. – 110: Diagrammatic view (b) of Digha coast showing areas of collection

**Table -11: Various fish landing centers (ghats/ spots) and its nature at Digha coast**

Ghats (spots)	Nature
Paschim Gadadharpur	Beach with sand and rocks.
Udaypur	Beach with sand and mud.
Ongaria Ghat	Beach with sand and rocks.
Jatranala Ghat	Beach with sand and gravels.
New Digha	Beach with sub- littoral rocky boulders.
Hospital Ghat	Beach with sand and rocks.
Sea Hawk Ghat	Beach with sand and rocks.
Digha Mohana	Estuary with sandy, muddy & rocky area.

It is conducted the studies on total number of 54 species of bivalves belonging to 8 orders, 18 families, 35 species of gastropods belonging to 4 orders, 18 families and 4 species of cephalopods belonging to 3 orders, 3 families have been identified at Digha coast of West Bengal. All of these except cephalopods habitat (Sandy bottom) can be found in the different ghats (spots) of Digha coast. Cephalopods are caught by drag net operation.

This study of natural population of molluscs at eight study localities reveals several points of interest with respect to sustainability of the species as well as impact of different levels of anthropogenic activities in the area. As a common tropical and sub tropical marine bivalves, high densities of these species occur in the zone of inter tidal and sub tidal regions of coastal water at Digha. Besides the dominance of marine molluscs species is maximum in inter tidal zone reported in these localities, can possibly be attributed to a higher tolerance level to environmental stress like atmospheric exposure, fluctuation of salinity due to influx of fresh water, pressure induced by pollution etc. and particularly in Mohana pollution effects like fishing boat discharge, sewage and land drain. In the present study, population density of marine molluscs (benthic groups of animal) is comparatively more at Digha mohana. It is observed that in estuarine environments where changes in salinity are very large, maximum abundance of many organisms occur at exceptionally low salinities. At Digha, though the edible oyster inhabits in sub tidal region thereby remain submerged even in low tide hours, the water is mostly turbid. Due to such environment there is positive effect on the number of gametes formed, released and survival of new recruits. Such situation may be attributed to enhance by pure, eutrophic, environmental conditions prevailing in monsoon from June to August, which gave great decrease in the population density in case of molluscs species at all the localities (Diagram – 6). The decrease of population was considerably less in the other location in respect to seasons, which reveals suitability of the habitats.

Udaypur ghat also shows maximum varieties of molluscs availability due to peaceful environment and less anthropogenic activities. The availability of marine molluscs at 8 ghats at Digha coast is given in details in Table – 12 to 14.

**Table – 12: Molluscs species (bivalves) available at various spots (ghats) at Digha coast**

Sl.No	Specimen	Digha Mohana	Sea Hawk Ghat	Hospital Ghat	New Digha	Jatranala Ghat	Ongaria Ghat	Udaypur Ghat	Paschim Gadadharpur
1.	<i>Anadara granosa</i>	√							
2.	<i>Anadara inequivalvis</i>				√			√	
3.	<i>Anadara antiquata</i>	√			√			√	√
4.	<i>Apolymetis edentula</i>	√			√			√	
5.	<i>Astropecten indicus</i>	√						√	
6.	<i>Barnea candida</i>	√			√			√	
7.	<i>Crassostrea gryphoides</i>	√			√				
8.	<i>Diplodonta bullata</i>	√							
9.	<i>Donax incarnates</i>	√			√			√	
10.	<i>Dosinia prostata</i>	√							
11.	<i>Donax scortum</i>	√			√			√	
12.	<i>Glaucanome sculpta</i>	√			√			√	
13.	<i>Glaucanome virens</i>	√							
14.	<i>Katelsia opima</i>	√			√			√	
15.	<i>Katelesiya japonica</i>							√	
16.	<i>Laternula truncate</i>							√	
17.	<i>Mactra mera</i>	√	√	√	√	√	√	√	√
18.	<i>Mactra violacea</i>	√			√			√	
19.	<i>Mactra plicataria</i>				√			√	
20.	<i>Mactra luzonica</i>	√		√	√			√	√
21.	<i>Macoma truncata</i>	√			√				√
22.	<i>Macoma birmanica</i>							√	
23.	<i>Meretrix meretrix</i>	√			√			√	
24.	<i>Macoma blairensis</i>	√			√			√	√
25.	<i>Mactra dissimilis</i>	√			√			√	
26.	<i>Mactra cuneata</i>	√			√			√	
27.	<i>Mactra stultrum.</i>							√	
28.	<i>Modiolus undulates</i>							√	
29.	<i>Modiolus striatulus</i>	√			√				
30.	<i>Meretrix casta</i>	√			√				
31.	<i>Polymesoda bengalensis</i>				√				
32.	<i>Perna viridis</i>	√			√			√	√
33.	<i>Pharella javanica</i>	√							
34.	<i>Pinna bicolor</i>							√	

Sl.No	Specimen	Digha Mohana	Sea Hawk Ghat	Hospital Ghat	New Digha	Jatranala Ghat	Ongaria Ghat	Udaypur Ghat	Paschim Gadadharpur
35.	<i>Pelecyrora trigona</i>			√					
36.	<i>Paphia textile</i>	√							
37.	<i>Paphia semirugata</i>	√			√				
38.	<i>Pholas orientalis</i>	√			√				
39.	<i>Roeta peliculla</i>				√			√	
40.	<i>Roeta pulchella</i>							√	
41.	<i>Saccostrea cucullata</i>	√		√	√			√	√
42.	<i>Siliqua radiata</i>							√	
43.	<i>Siliqua albida</i>							√	
44.	<i>Siliqua winteriana</i>				√			√	√
45.	<i>Strigilla splendida</i>	√							
46.	<i>Solen brevis</i>				√			√	√
47.	<i>Scapharca cornea</i>	√			√			√	
48.	<i>Sunetta meroi</i>							√	
49.	<i>Sunetta scripta</i>							√	
50.	<i>Sanguinolaria acuminata</i>				√			√	
51.	<i>Timoclea imbricata</i>	√							
52.	<i>Tellina sinuata</i>				√				
53.	<i>Tellina opalina</i>	√			√			√	√
54.	<i>Trachycardium asiaticum</i>							√	

**Table - 13:** Molluscs species (gastropods) available at various spots (ghats) at Digha coast.

Sl. No	Specimen	Digha Mohana	Seahawk Ghat	Hospital Ghat	New Digha	Jatranala Ghat	Ongaria Ghat	Udaypur Ghat	Paschim Gadadharpur
1.	<i>Architectonica perspectiva</i>	√							
2.	<i>Architectonica laevigata</i>	√							
3.	<i>Agaronia nebulosa</i>				√			√	
4.	<i>Amalda ampla</i>	√			√			√	√
5.	<i>Acrilla gracilis</i>	√			√			√	
6.	<i>Bufo rana.</i>				√				
7.	<i>Cerithidea cingulate</i>								√
8.	<i>Cerithidea obtusa</i>								√
9.	<i>Gyrum natator</i>				√				
10.	<i>Melo melo</i>							√	
11.	<i>Murex tribulus</i>							√	
12.	<i>Natica tigrina</i>							√	
13.	<i>Natica lineata</i>	√							
14.	<i>Nassarius stolatus</i>								√
15.	<i>Nassarius faveolatus</i>	√							
16.	<i>Natica gualteriana</i>	√							√
17.	<i>Nassaria nassaria</i>	√							
18.	<i>Nerita grayana.</i>							√	
19.	<i>Olivancillaria gibbosa</i>	√							
20.	<i>Oliva olive</i>			√					
21.	<i>Polinices didyma</i>	√			√			√	
22.	<i>Polinices tumidus</i>							√	√
23.	<i>Phalium bisulcatum</i>	√							
24.	<i>Pythia plicata</i>								√
25.	<i>Pugilina cochlidium</i>							√	
26.	<i>Seminricinula konkanensis.</i>	√							
27.	<i>Sinum neritoiderum.</i>							√	
28.	<i>Telescopium telescopium</i>	√						√	√
29.	<i>Tonna dolium</i>	√							
30.	<i>Tonna sulcosa</i>	√							
31.	<i>Turritella attenuata</i>				√			√	√
32.	<i>Terebra tenera</i>	√							
33.	<i>Thais blanfordi</i>	√			√			√	
34.	<i>Thais lacera</i>				√			√	√
35.	<i>Umbonium vestiarium</i>				√			√	

**Table - 14:** Molluscs species (cephalopods) available at various spots (ghats) at Digha coast.

Sl.No.	Specimen.	Digha mohana	Sea hawk ghat	Hospital Ghat	New Digha Ghat	Hospital Ghat	Jatranala Ghat	Udaypur Ghat	Paschim Gadadharpur
1.	<i>Loligo duvauceli</i>	√		√	√			√	
2.	<i>Octopus macropus</i>	√		√	√			√	
3.	<i>Sepia aculeata</i>	√		√	√			√	
4.	<i>Sepiella inermis</i>	√		√	√			√	

### Molluscs Specimen Collection Spots:



Fig. – 111: View of Udaypur ghat

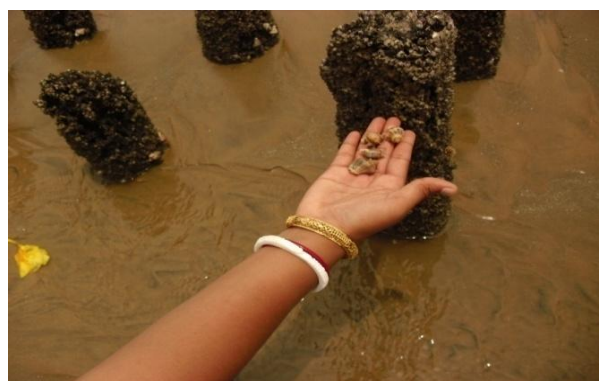


Fig. – 112: Specimen collection from reef area



Fig. – 113: Rocky beach at Hospital ghat



Fig. – 114: Reef for specimen collection at Hospital ghat





Fig. – 115: Clay beach at Digha mohana



Fig. – 116: Sandy beach at New Digha ghat

### Photographs of Molluscs Collection at Digha Coast:



Fig. – 117: A woman collects molluscs along the sea beach during low tide





Fig. – 118: Net used for molluscs collection

Fig. – 119: A molluscs collector with net

### 5.5. Physico-chemical parameters of water and soil at Digha coast:

The physico-chemical parameters of water and soil at Digha sea beach (selected three spots like Digha Mohana, New Digha and Udaypur) are studied at the time of high tide level, mean tide level and low tide level during pre monsoon (from the month of March to May), monsoon (from the month of June to August) and post monsoon period (from the month of September to February).

Is is collected water and soil sample from the monsoon period, June - 2014 to pre monsoon period, May - 2016. It is analysed the physico-chemical parameters of water and soil in laboratory.

According to the study it is seen that the water temperature is highest ( $32 \pm 0.5^{\circ}\text{C}$ ) during pre monsoon period, 2016 at Udaypur ghat and lowest temperature ( $13 \pm 0.4^{\circ}\text{C}$ ) is recorded during post monsoon period, 2014 - 15 at Udaypur ghat. The temperature fluctuation is  $19 \pm 0.1^{\circ}\text{C}$  during 2 years study period.

**Table - 15:** Seasonal (Mean) variations of **Temperature ( $^{\circ}\text{C}$ )** of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-I			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	$30 \pm 0.7$	$31 \pm 0.5$	$31 \pm 0.2$	$30 \pm 0.5$	$29 \pm 0.8$	$29 \pm 0.2$	$30 \pm 0.3$	$30 \pm 0.2$	$30 \pm 0.7$
POM, 14-15	$15 \pm 0.3$	$15 \pm 0.2$	$15 \pm 0.2$	$14 \pm 0.2$	$14 \pm 0.9$	$14 \pm 0.7$	$13 \pm 0.4$	$13 \pm 0.8$	$14 \pm 0.4$
PRM, 15	$30 \pm 0.5$	$30 \pm 0.7$	$31 \pm 0.1$	$30 \pm 0.2$	$29 \pm 0.4$	$29 \pm 0.5$	$31 \pm 0.2$	$31 \pm 0.3$	$31 \pm 0.3$
MON, 15	$30 \pm 0.3$	$30 \pm 0.2$	$30 \pm 0.2$	$29 \pm 0.4$	$30 \pm 0.1$	$30 \pm 0.8$	$30 \pm 0.8$	$30 \pm 0.8$	$30 \pm 0.9$
POM, 15-16	$15 \pm 0.5$	$15 \pm 0.3$	$15 \pm 0.5$	$15 \pm 0.3$	$13 \pm 0.5$	$15 \pm 0.5$	$14 \pm 0.2$	$13 \pm 0.3$	$14 \pm 0.5$
PRM, 16	$31 \pm 0.6$	$31 \pm 0.7$	$31 \pm 0.8$	$31 \pm 0.4$	$30 \pm 0.9$	$31 \pm 0.3$	$32 \pm 0.4$	$31 \pm 0.9$	$32 \pm 0.5$

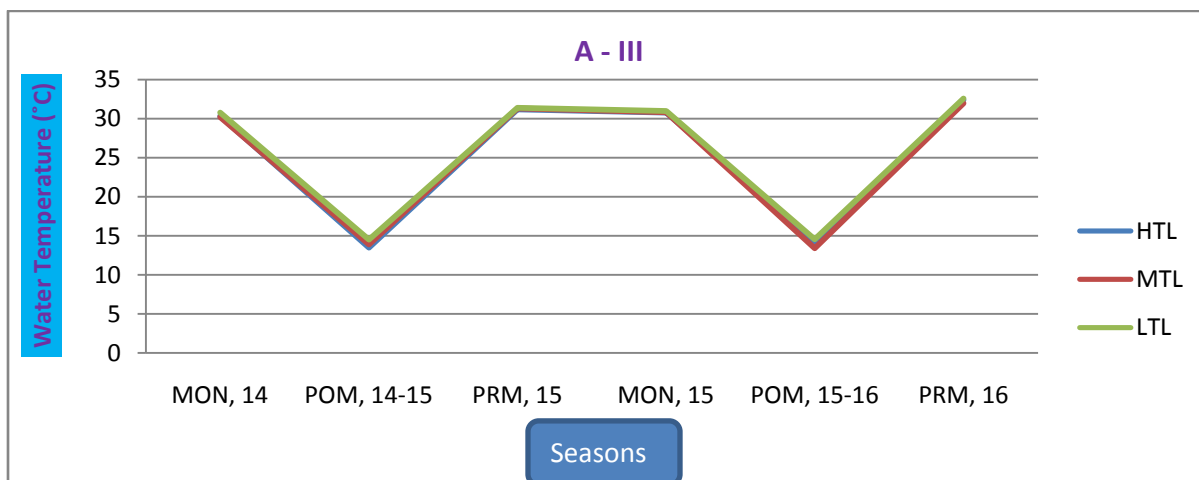
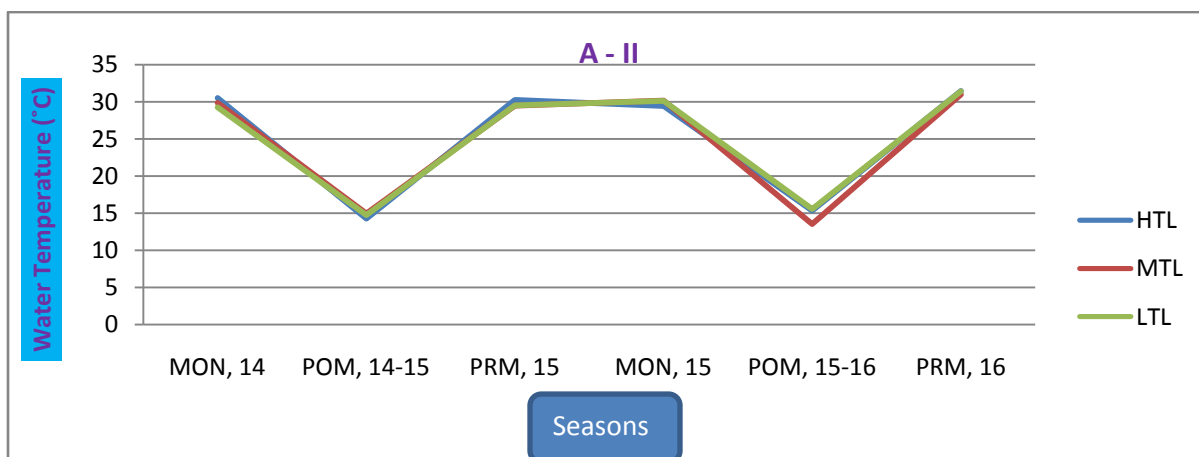
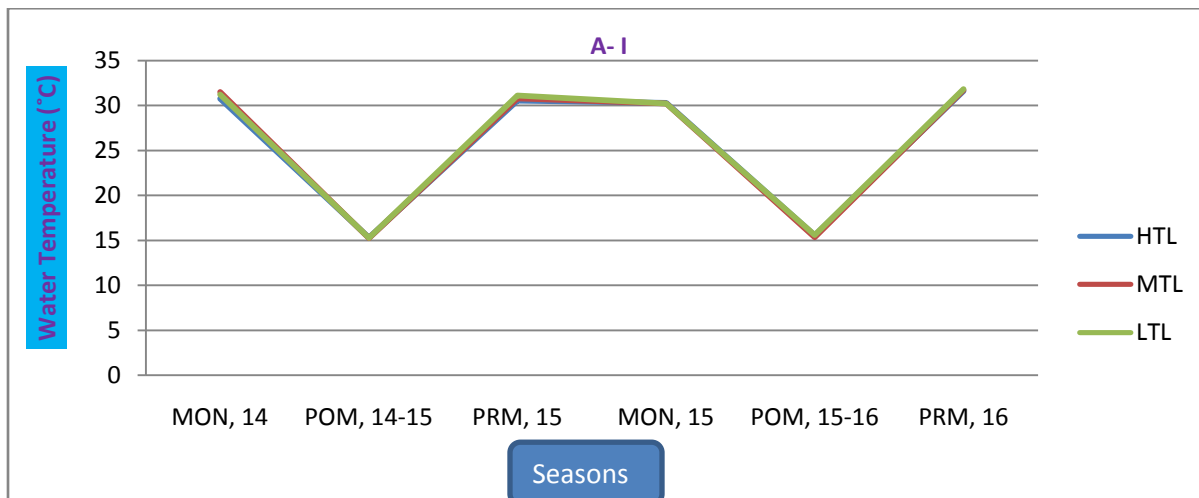
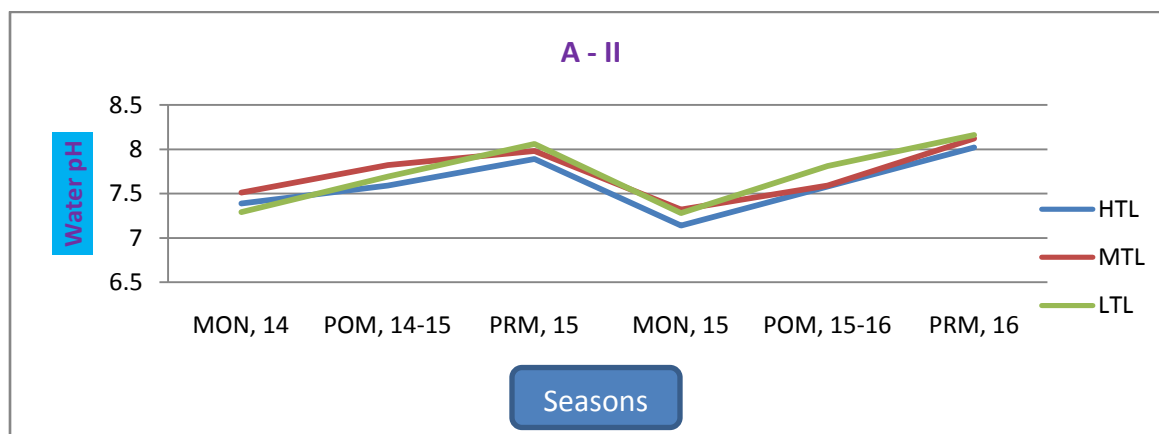
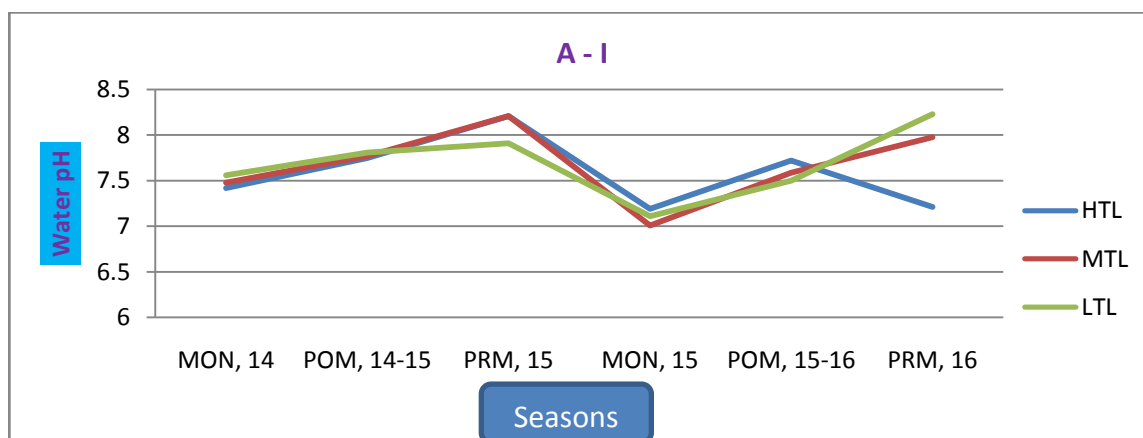


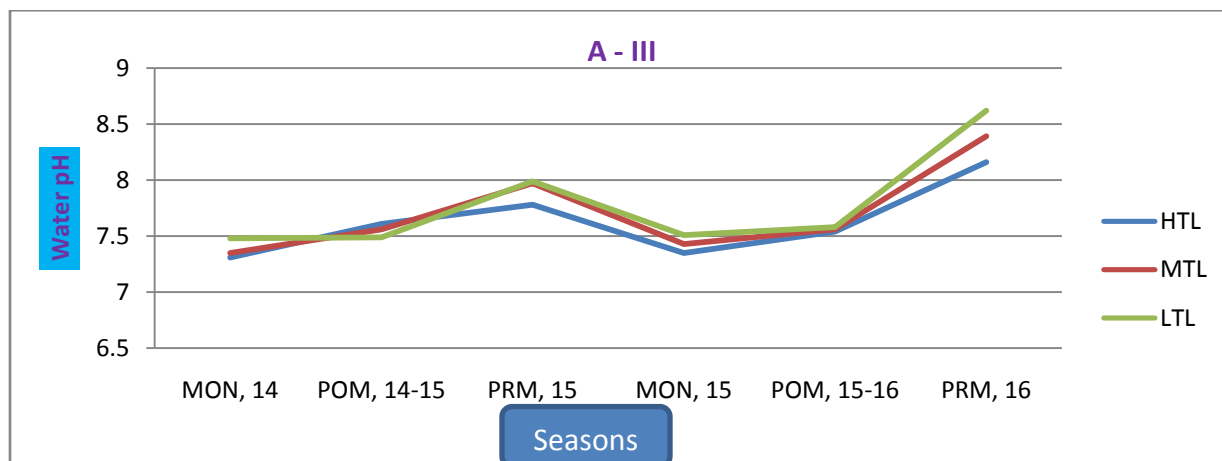
Diagram - 10: Seasonal (Mean) variations of Temperature (°C) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

In case of water pH, it is highest ( $8 \pm 0.6$ ) during pre monsoon period, 2016 at Udaypur ghat and lowest ( $7 \pm 0.1$ ) during monsoon period, 2015 at Digha mohana. pH fluctuation is  $1 \pm 0.5$  and it is little.

**Table - 16:** Seasonal (Mean) variations of pH of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-1			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	$7 \pm 0.4$	$7 \pm 0.4$	$7 \pm 0.5$	$7 \pm 0.3$	$7 \pm 0.5$	$7 \pm 0.2$	$7 \pm 0.3$	$7 \pm 0.3$	$7 \pm 0.4$
POM, 14-15	$7 \pm 0.7$	$7 \pm 0.7$	$7 \pm 0.8$	$7 \pm 0.5$	$7 \pm 0.8$	$7 \pm 0.6$	$7 \pm 0.4$	$7 \pm 0.5$	$7 \pm 0.4$
PRM, 15	$8 \pm 0.2$	$8 \pm 0.2$	$7 \pm 0.9$	$7 \pm 0.9$	$7 \pm 0.9$	$8 \pm 0.5$	$7 \pm 0.7$	$7 \pm 0.9$	$7 \pm 0.9$
MON, 15	$7 \pm 0.1$	$7 \pm 0.1$	$7 \pm 0.1$	$7 \pm 0.5$	$7 \pm 0.3$	$7 \pm 0.2$	$7 \pm 0.3$	$7 \pm 0.4$	$7 \pm 0.5$
POM, 15-16	$7 \pm 0.7$	$7 \pm 0.5$	$7 \pm 0.5$	$7 \pm 0.6$	$7 \pm 0.5$	$7 \pm 0.8$	$7 \pm 0.5$	$7 \pm 0.5$	$7 \pm 0.5$
PRM, 16	$7 \pm 0.2$	$7 \pm 0.9$	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.1$	$8 \pm 0.2$	$8 \pm 0.1$	$8 \pm 0.3$	$8 \pm 0.6$





**Diagram - 11:** Seasonal (Mean) variations of pH of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

It is also recorded the mean value of Dissolved Oxygen (DO) in water. The highest DO level is  $5 \pm 0.4$  ppm during monsoon, 2015 at Udaypur ghat and lowest level is  $3 \pm 0.3$  ppm during pre monsoon, 2016 at Digha mohana and Udaypur ghat also. Dissolved  $O_2$  level fluctuates  $2 \pm 0.1$  ppm in 2 years study period. Overall DO level is high throughout the year due to high speed airflow and tidal amplitude.

**Table - 17:** Seasonal (Mean) variations of Dissolved Oxygen (mg/l) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-1			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	$4 \pm 0.8$	$4 \pm 0.8$	$3 \pm 0.7$	$5 \pm 0.4$	$5 \pm 0.4$	$4 \pm 0.5$	$5 \pm 0.4$	$4 \pm 0.3$	$3 \pm 0.7$
POM, 14-15	$4 \pm 0.3$	$3 \pm 0.7$	$3 \pm 0.3$	$4 \pm 0.2$	$3 \pm 0.9$	$3 \pm 0.8$	$5 \pm 0.1$	$4 \pm 0.2$	$4 \pm 0.0$
PRM, 15	$4 \pm 0.2$	$3 \pm 0.7$	$3 \pm 0.5$	$4 \pm 0.2$	$3 \pm 0.9$	$3 \pm 0.5$	$4 \pm 0.9$	$4 \pm 0.6$	$3 \pm 0.5$
MON, 15	$4 \pm 0.9$	$4 \pm 0.4$	$3 \pm 0.8$	$4 \pm 0.6$	$4 \pm 0.9$	$4 \pm 0.6$	$5 \pm 0.4$	$4 \pm 0.7$	$4 \pm 0.2$
POM, 15-16	$4 \pm 0.5$	$3 \pm 0.8$	$3 \pm 0.3$	$4 \pm 0.2$	$4 \pm 0.1$	$4 \pm 0.2$	$4 \pm 0.9$	$4 \pm 0.4$	$3 \pm 0.6$
PRM, 16	$4 \pm 0.2$	$3 \pm 0.8$	$3 \pm 0.3$	$4 \pm 0.2$	$4 \pm 0.1$	$3 \pm 0.5$	$4 \pm 0.3$	$3 \pm 0.5$	$3 \pm 0.3$

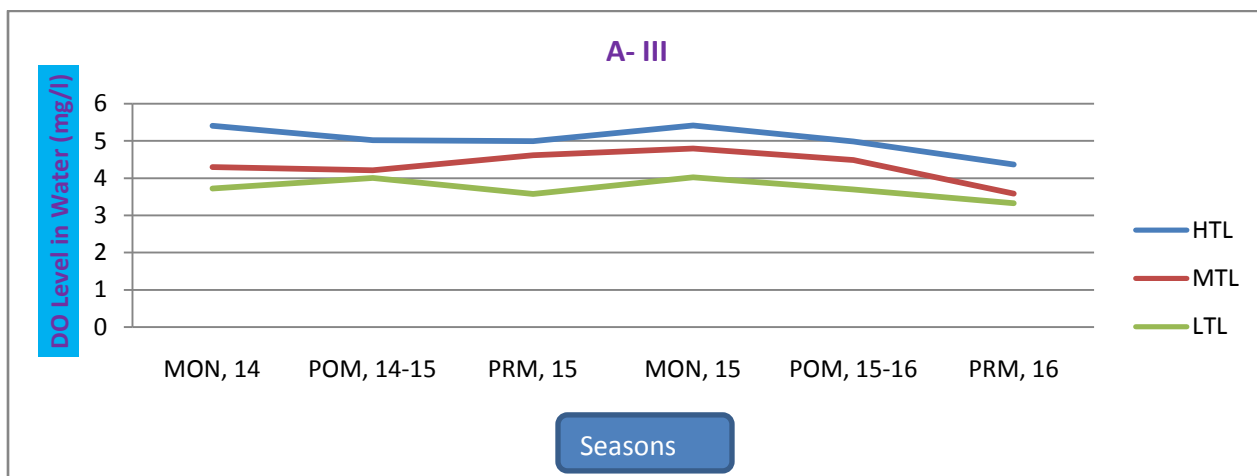
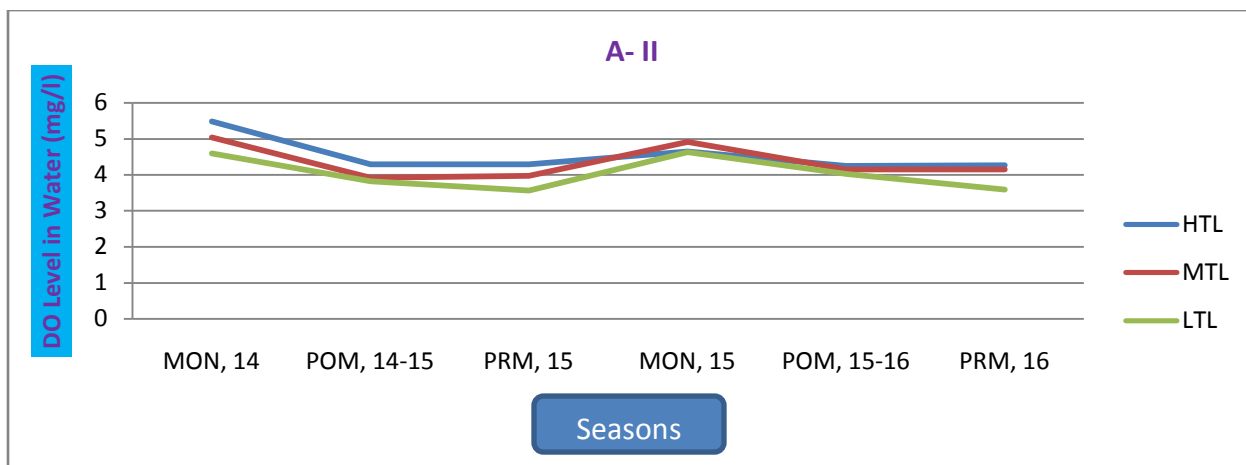
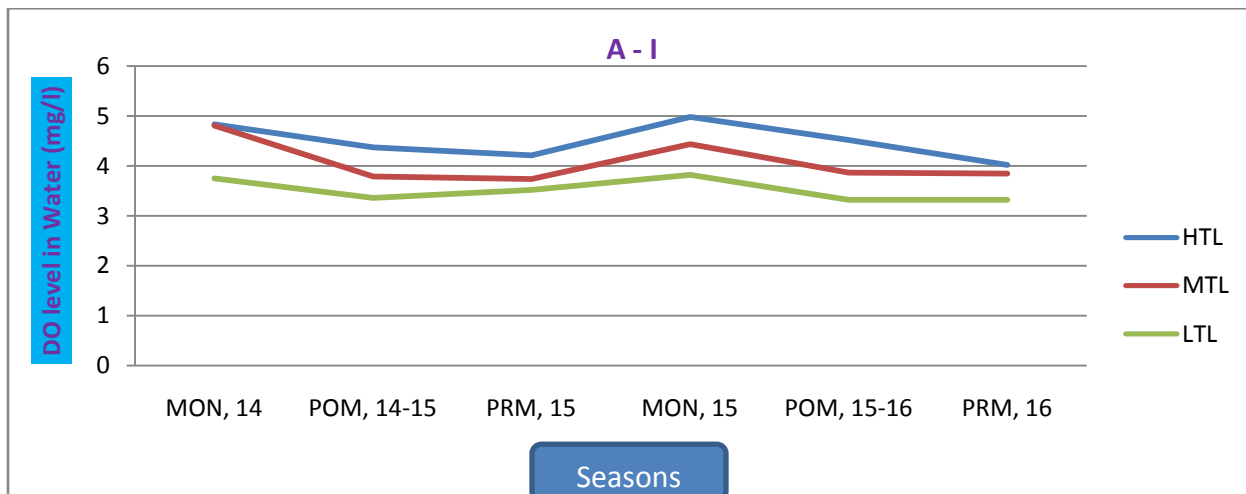
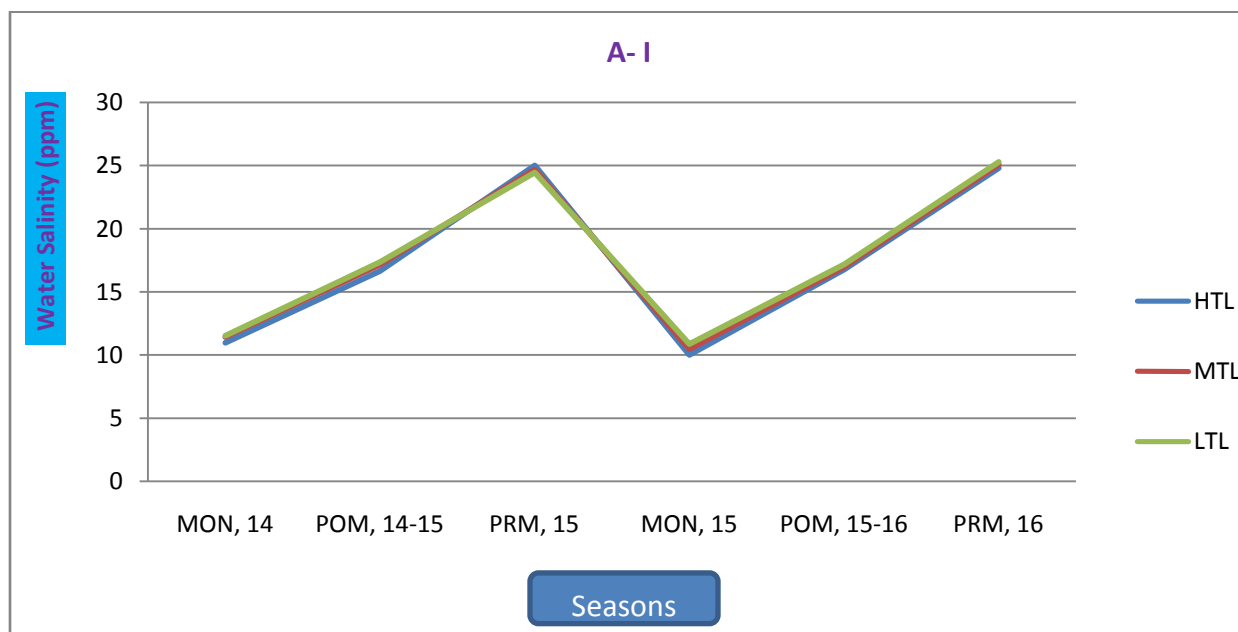


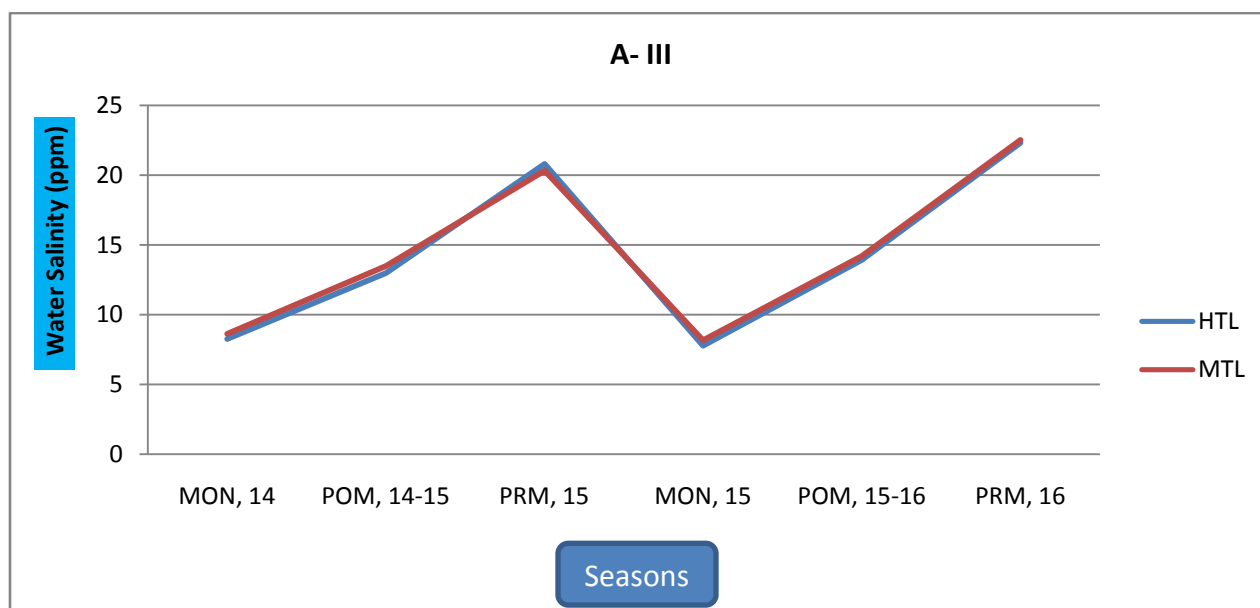
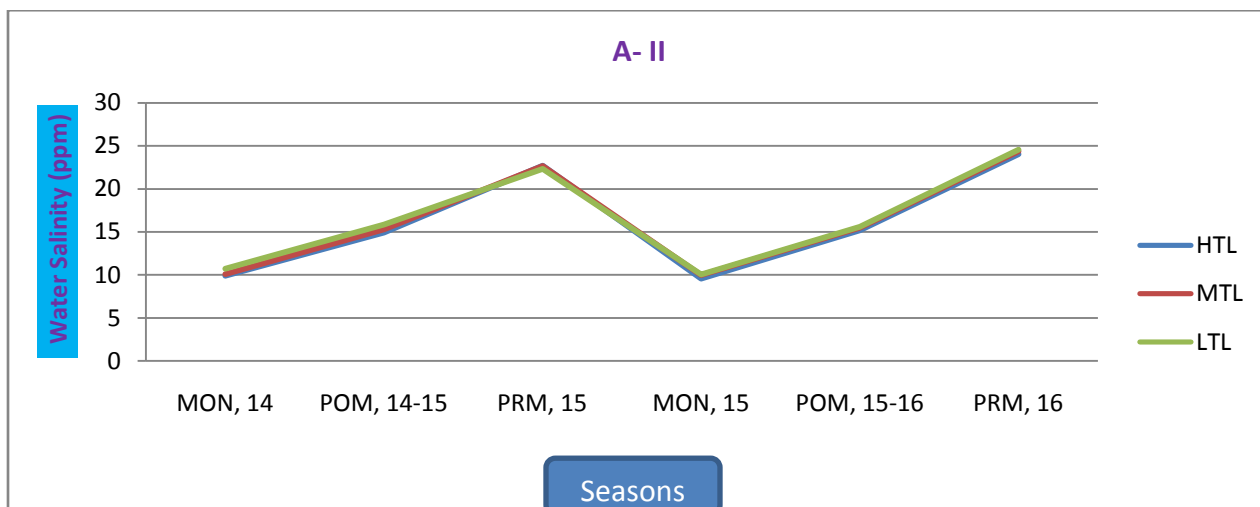
Diagram - 12: Seasonal (Mean) variations of Dissolved Oxygen (mg/l) of Interstitial Water collected From Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

The highest salinity of water ( $25 \pm 0.8$  ppt) is recorded during pre monsoon period, 2016 at Digha mohana and lowest ( $7 \pm 0.7$  ppt) during monsoon, 2015 at Udaypur ghat. Water salinity fluctuates  $18 \pm 0.1$  ppt. This high fluctuation is occurred due to high temperature in summer hours and addition of fresh water from a canal (Dubda water basin) and direct rainfall on sea water in rainy season.

**Table - 18:** Seasonal (Mean) variations of Salinity (ppt) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 To May, 2016

Season	A-1			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	$10 \pm 0.9$	$11 \pm 0.4$	$11 \pm 0.5$	$9 \pm 0.8$	$10 \pm 0.1$	$10 \pm 0.7$	$8 \pm 0.2$	$8 \pm 0.6$	$9 \pm 0.3$
POM, 14-15	$16 \pm 0.6$	$17 \pm 0.1$	$17 \pm 0.3$	$14 \pm 0.9$	$15 \pm 0.3$	$15 \pm 0.8$	$12 \pm 0.9$	$13 \pm 0.5$	$13 \pm 0.6$
PRM, 15	$25 \pm 0.1$	$24 \pm 0.6$	$24 \pm 0.4$	$22 \pm 0.7$	$22 \pm 0.6$	$22 \pm 0.3$	$20 \pm 0.8$	$20 \pm 0.3$	$20 \pm 0.2$
MON, 15	$10 \pm 0.2$	$10 \pm 0.4$	$10 \pm 0.8$	$9 \pm 0.5$	$9 \pm 0.9$	$10 \pm 0.6$	$7 \pm 0.7$	$8 \pm 0.1$	$8 \pm 0.4$
POM, 15-16	$16 \pm 0.7$	$16 \pm 0.9$	$17 \pm 0.2$	$15 \pm 0.2$	$15 \pm 0.4$	$15 \pm 0.6$	$13 \pm 0.9$	$14 \pm 0.2$	$14 \pm 0.4$
PRM, 16	$24 \pm 0.8$	$25 \pm 0.8$	$25 \pm 0.3$	$24 \pm 0.5$	$24 \pm 0.3$	$24 \pm 0.5$	$22 \pm 0.3$	$22 \pm 0.5$	$22 \pm 0.4$



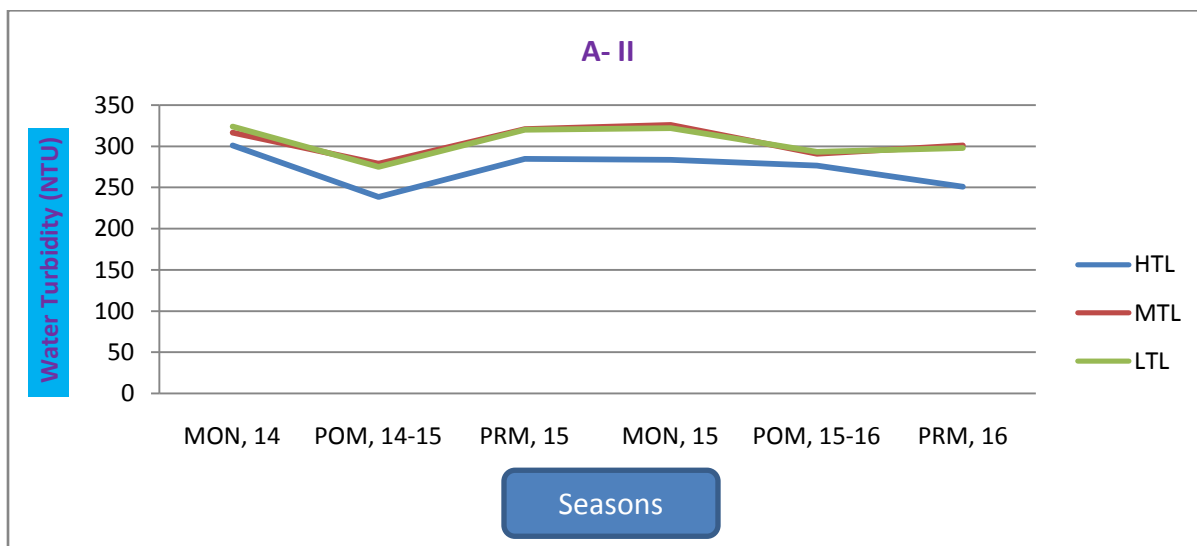
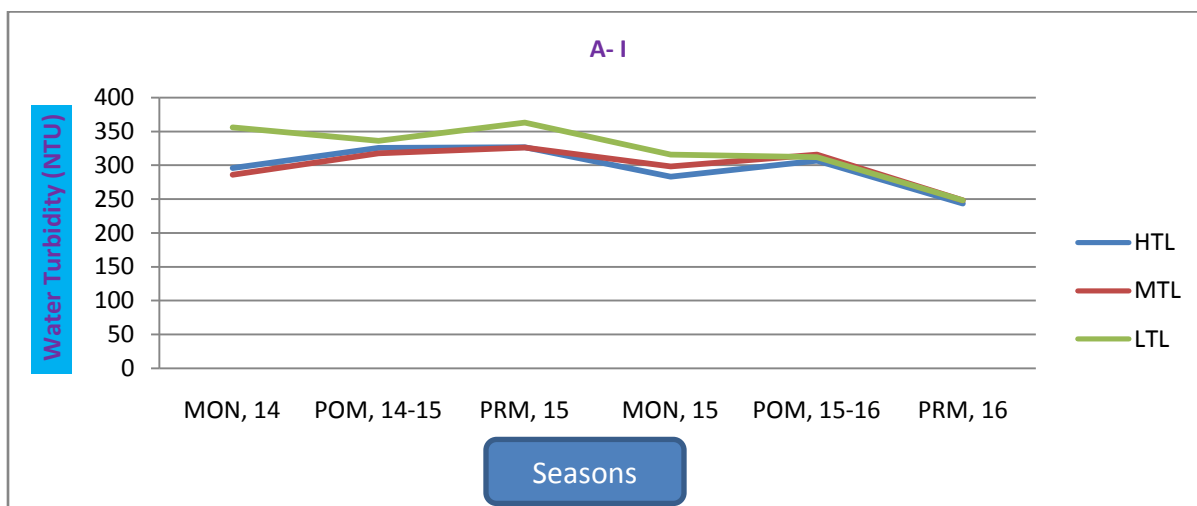


**Diagram - 13:** Seasonal (Mean) variations of Salinity (ppt) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

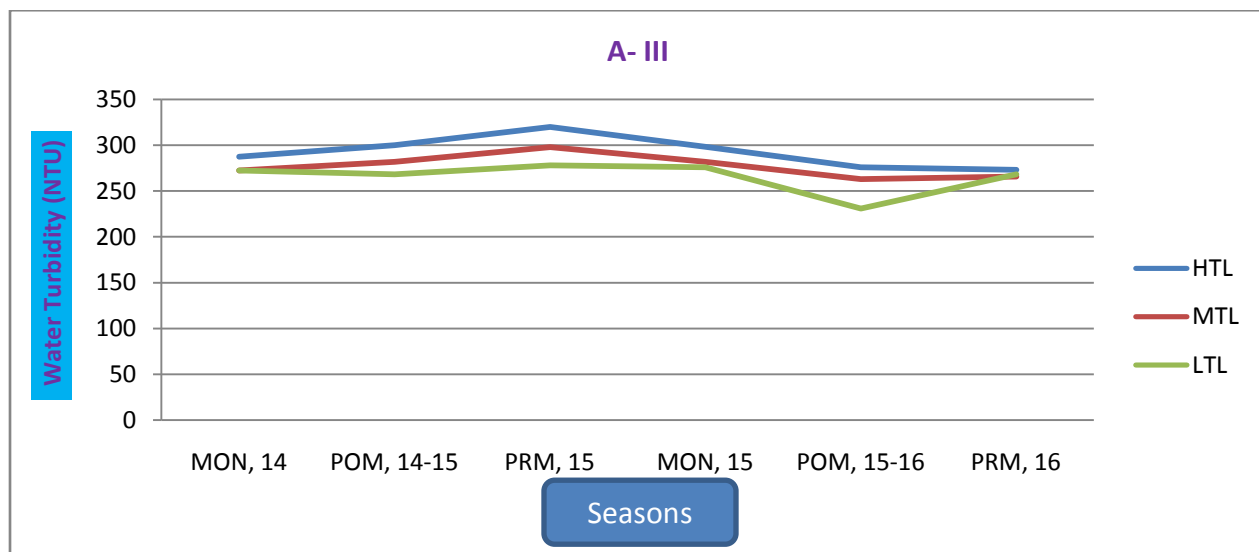
The mean value of water turbidity is highest ( $361 \pm 0.4$  NTU) during monsoon, 2015 at Digha mohana due to flow of water of the canal (Dubda water basin) and lowest ( $231 \pm 0.3$  NTU) during post monsoon period, 2015-16 at Udaypur ghat. The water turbidity fluctuate  $130 \pm 0.1$  NTU, recorded during 2 years range study period.

Table - 19: Seasonal (Mean) variations of Turbidity (NTU) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-I			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	296 ±0.5	286 ±0.2	356 ±0.3	301 ±0.3	316 ±0.6	324 ±0.2	287 ±0.6	272 ±0.5	272 ±0.5
POM, 14-15	326 ±0.3	318 ±0.4	336 ±0.2	238 ±0.6	279 ±0.4	275 ±0.5	300 ±0.3	282 ±0.8	268 ±0.1
PRM, 15	326 ±0.9	326 ±0.3	361 ±0.4	284 ±0.6	321 ±0.3	320 ±0.4	320 ±0.4	298 ±0.7	278 ±0.3
MON, 15	283 ±0.1	298 ±0.5	316 ±0.4	283 ±0.5	326 ±0.2	322 ±0.5	298 ±0.3	282 ±0.4	276 ±0.5
POM, 15-16	306 ±0.9	316 ±0.3	312 ±0.3	276 ±0.5	291 ±0.4	293 ±0.2	276 ±0.2	263 ±0.1	231 ±0.3
PRM, 16	243 ±0.4	248 ±0.1	248 ±0.2	251 ±0.3	301 ±0.3	298 ±0.1	273 ±0.2	266 ±0.4	268 ±0.1







**Diagram - 14:** Seasonal (Mean) variations of **Turbidity** (NTU) of Interstitial Water collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

In case of Soil, the highest temperature ( $34 \pm 0.4^{\circ}\text{C}$ ) is recorded during pre monsoon period, 2015 at new Digha ghat and lowest temperature is ( $15 \pm 0.1^{\circ}\text{C}$ ) during post monsoon period, 2015 – 16 at Udaypur ghat. Temperature fluctuation is  $19 \pm 0.3^{\circ}\text{C}$ . This is because very hot weather in summer season and cool weather in winter season.

**Table - 20:** Seasonal (Mean) variations of **Temperature** ( $^{\circ}\text{C}$ ) of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-1			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	31±0.4	31±0.8	31±0.9	31±0.4	31±0.8	31±0.8	31±0.2	31±0.4	31±0.2
POM, 14-15	15±0.5	16±0.2	16±0.2	15±0.6	15±0.6	15±0.5	16±0.2	16±0.5	16±0.4
PRM, 15	34±0.3	33±0.8	33±0.4	34±0.1	34±0.3	34±0.4	33±0.2	32±0.9	33±0.2
MON, 15	31±0.2	30±0.7	31±0.1	31±0.1	30±0.3	31±0.2	30±0.5	30±0.5	30±0.7
POM, 15-16	15±0.6	15±0.5	15±0.6	15±0.4	15±0.3	15±0.3	15±0.1	15±0.1	15±0.7
PRM, 16	32±0.9	33±0.5	33±0.5	32±0.5	32±0.5	32±0.5	33±0.1	32±0.8	32±0.9

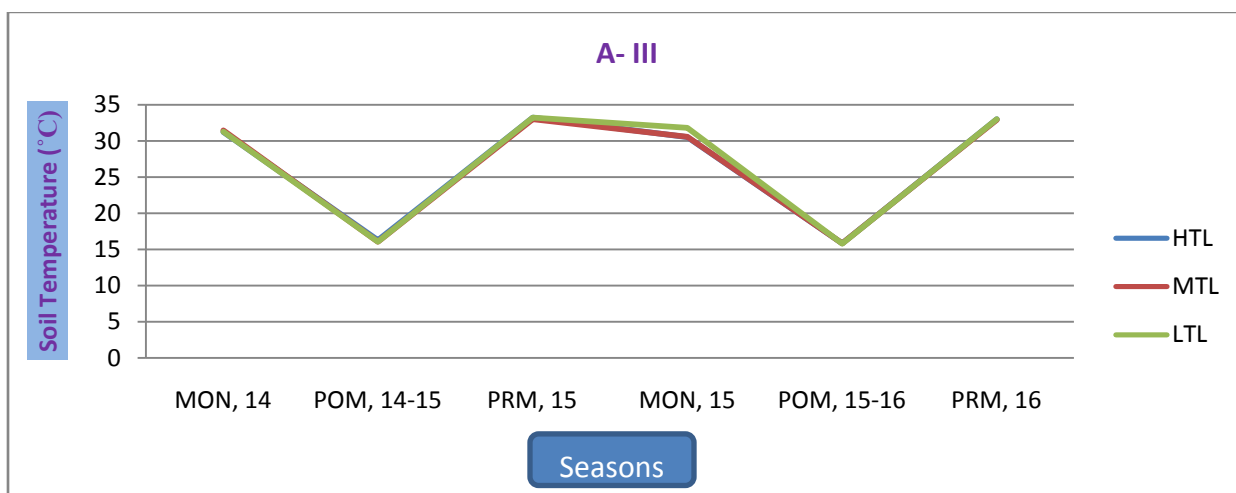
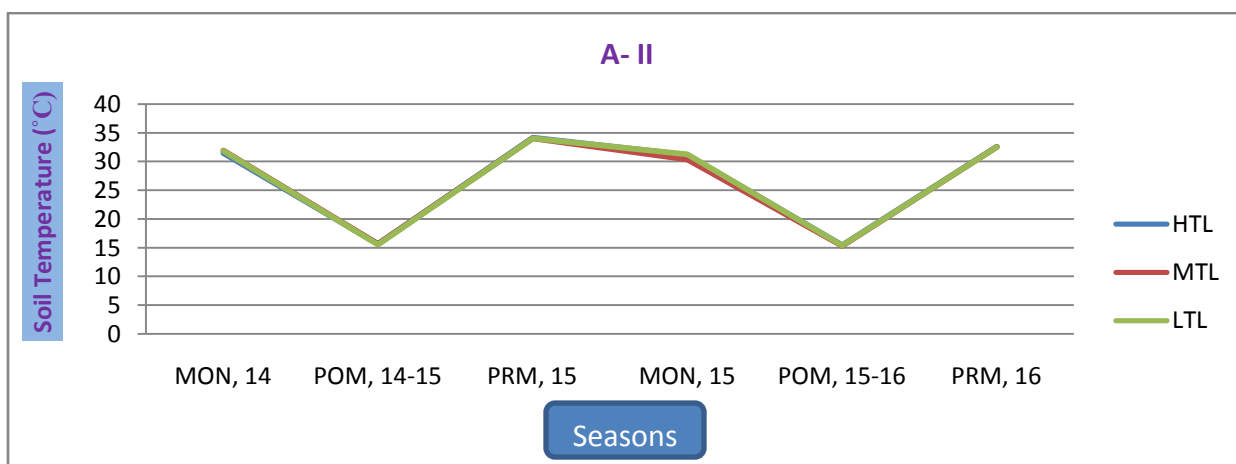
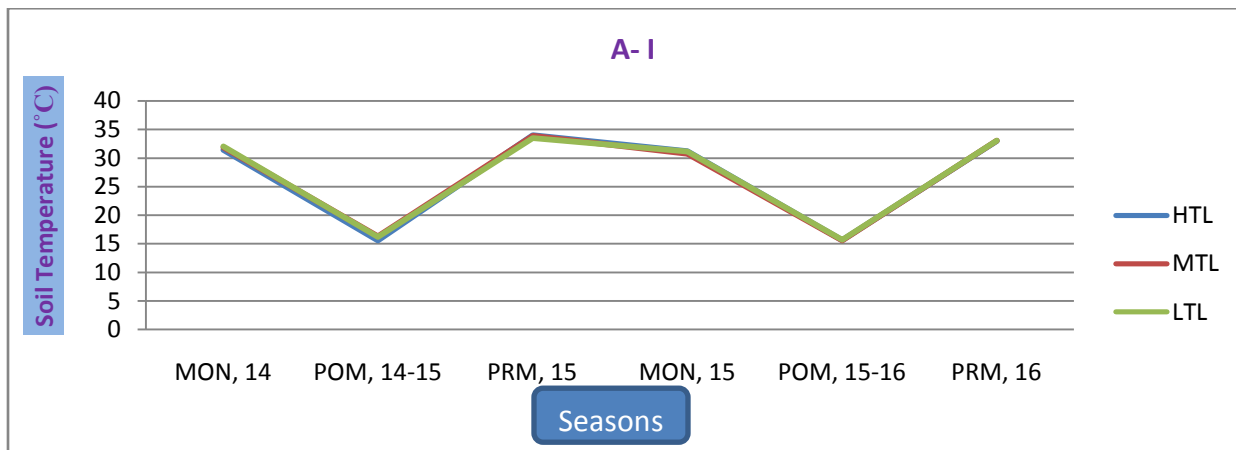
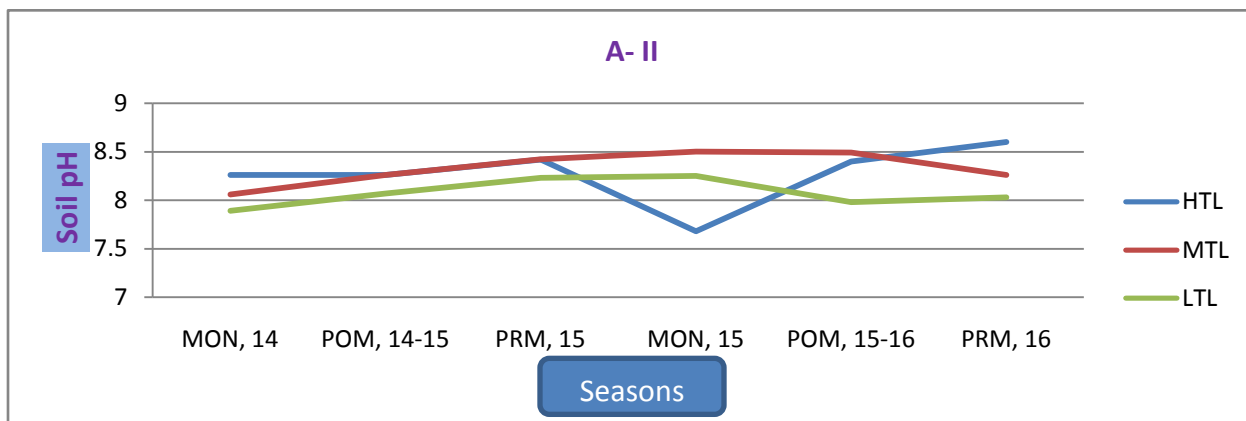
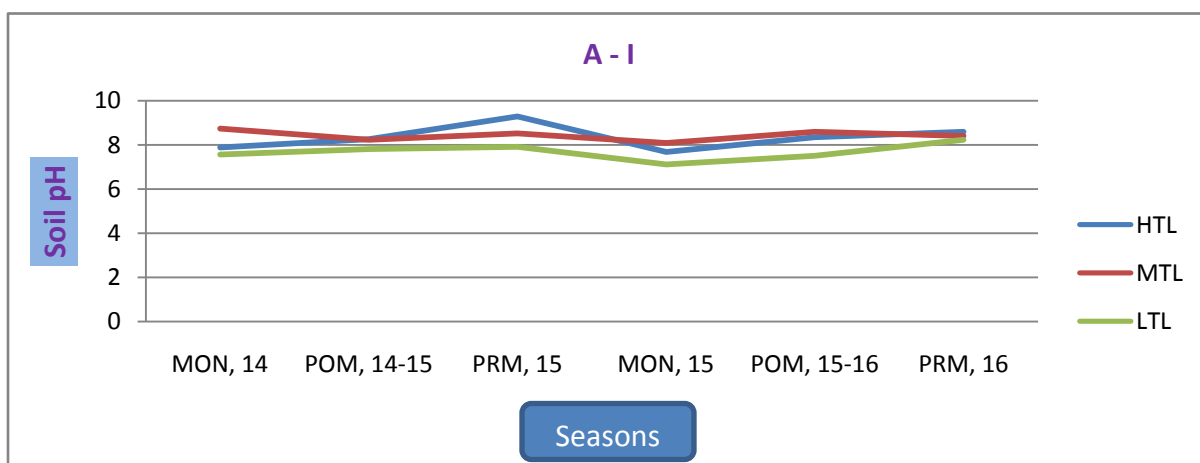


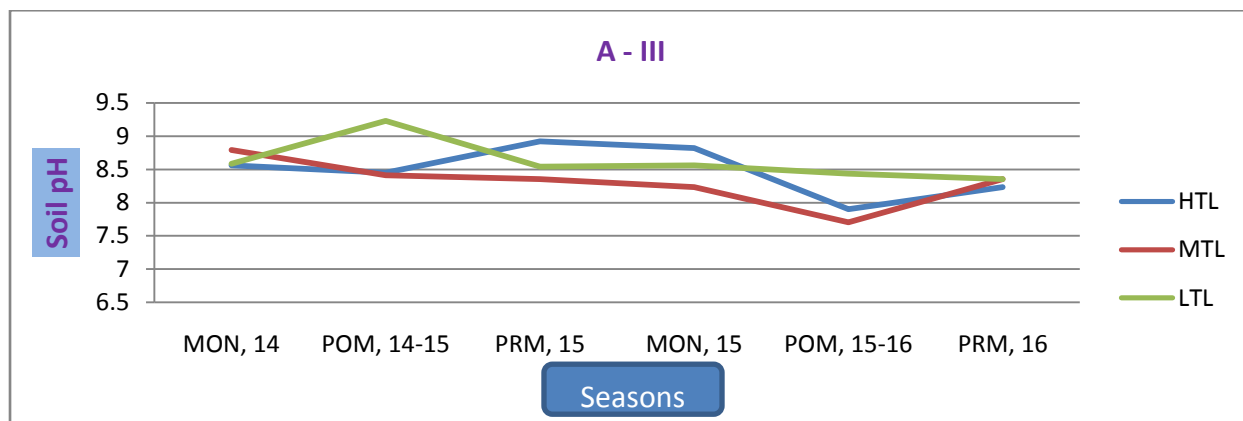
Diagram - 15: Seasonal (Mean) variations of Temperature (°C) of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

It is studied the pH value of soil, taking soil sample from three selected ghats. The highest pH is recorded  $9 \pm 0.7$  during pre monsoon period, 2015 at Digha mohana and lowest pH value is  $7 \pm 0.6$  during monsoon period, 2015 at Digha mohana and New Digha ghat. Soil pH fluctuation is  $2 \pm 0.1$ .

**Table - 21:** Seasonal (Mean) variations of pH of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-1			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	$7 \pm 0.8$	$8 \pm 0.7$	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.6$	$7 \pm 0.8$	$8 \pm 0.5$	$8 \pm 0.7$	$8 \pm 0.5$
POM, 14-15	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.2$	$8 \pm 0.7$	$8 \pm 0.4$	$8 \pm 0.4$	$9 \pm 0.2$
PRM, 15	$9 \pm 0.7$	$8 \pm 0.5$	$8 \pm 0.8$	$8 \pm 0.5$	$8 \pm 0.4$	$8 \pm 0.2$	$8 \pm 0.9$	$8 \pm 0.3$	$8 \pm 0.5$
MON, 15	$7 \pm 0.6$	$8 \pm 0.8$	$8 \pm 0.5$	$7 \pm 0.7$	$8 \pm 0.5$	$8 \pm 0.2$	$8 \pm 0.8$	$8 \pm 0.2$	$8 \pm 0.5$
POM, 15-16	$8 \pm 0.3$	$8 \pm 0.6$	$8 \pm 0.2$	$8 \pm 0.4$	$8 \pm 0.4$	$7 \pm 0.9$	$7 \pm 0.9$	$7 \pm 0.7$	$8 \pm 0.4$
PRM, 16	$8 \pm 0.6$	$8 \pm 0.4$	$8 \pm 0.5$	$8 \pm 0.6$	$8 \pm 0.2$	$8 \pm 0.3$	$8 \pm 0.2$	$8 \pm 0.3$	$8 \pm 0.3$





**Diagram - 16:** Seasonal (Mean) variations of pH of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

The salinity of soil is highest ( $32 \pm 0.6$  ppt) during pre monsoon period, 2016 at New Digha ghat and lowest ( $11 \pm 0.2$  ppt) during monsoon period, 2014 at Digha mohana. Soil salinity fluctuation ranges  $21 \pm 0.4$  ppt due to temperature difference.

**Table - 22:** Seasonal (Mean) variations of Salinity (ppt) of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

Season	A-I			A-II			A-III		
	HTL	MTL	LTL	HTL	MTL	LTL	HTL	MTL	LTL
MON, 14	11±0.2	11±0.4	11±0.4	13±0.5	13±0.3	15±0.3	12±0.3	12±0.4	13±0.4
POM, 14-15	21±0.4	19±0.8	20±0.6	22±0.5	22±0.9	22±0.3	22±0.6	22±0.7	22±0.3
PRM, 15	25±0.8	25±0.9	25±0.8	27±0.5	27±0.8	26±0.9	27±0.5	27±0.7	27±0.2
MON, 15	17±0.7	12±0.3	12±0.9	13±0.5	13±0.8	13±0.8	12±0.5	13±0.1	12±0.6
POM, 15-16	21±0.4	22±0.2	21±0.9	22±0.8	22±0.7	23±0.3	22±0.6	21±0.4	22±0.4
PRM, 16	30±0.9	30±0.5	30±0.6	30±0.4	31±0.9	32±0.6	30±0.2	30±0.6	30±0.8

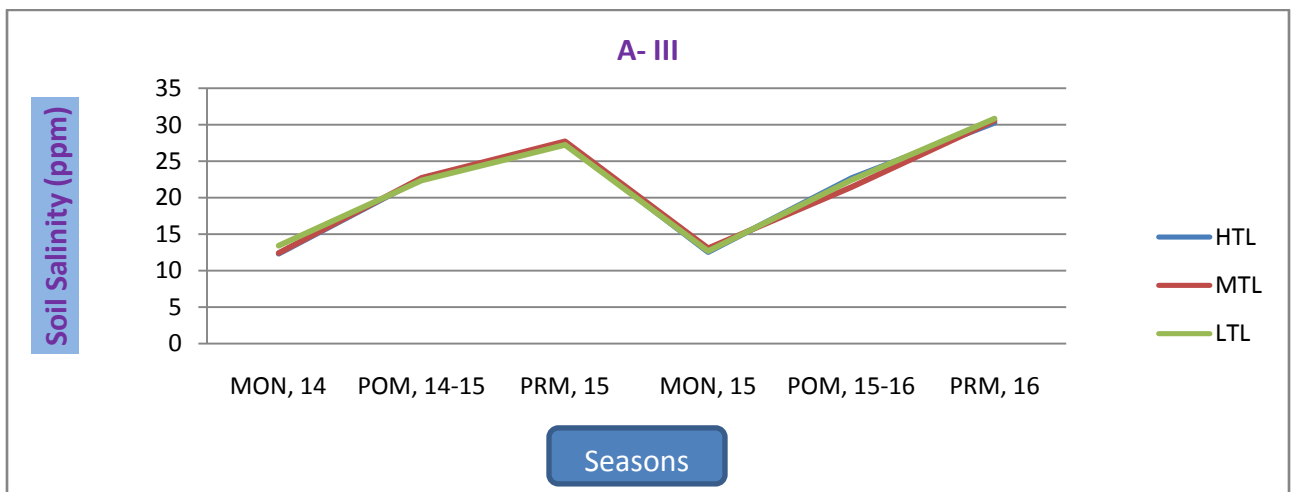
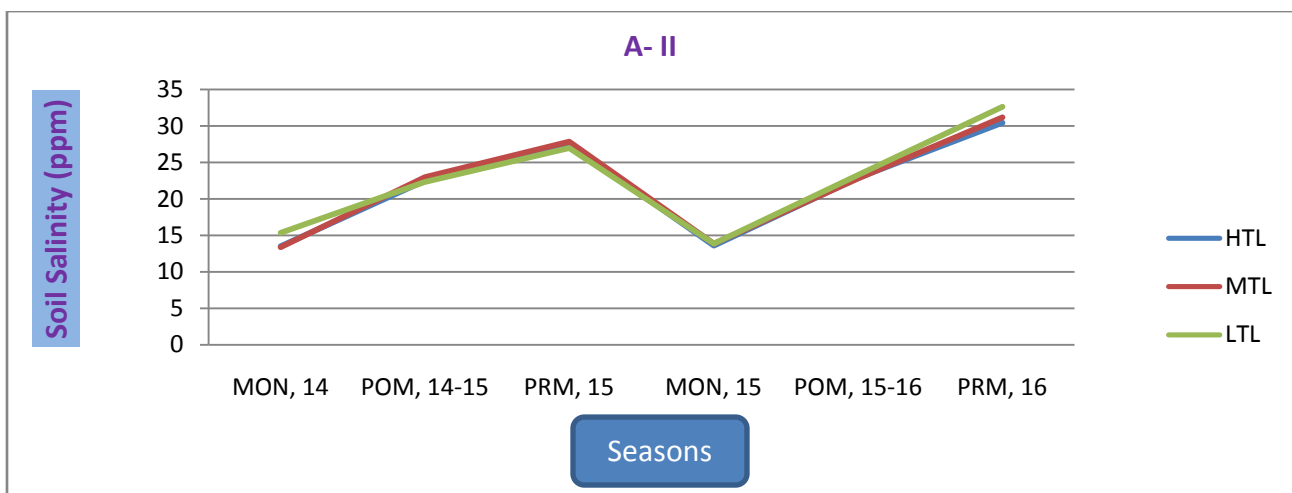
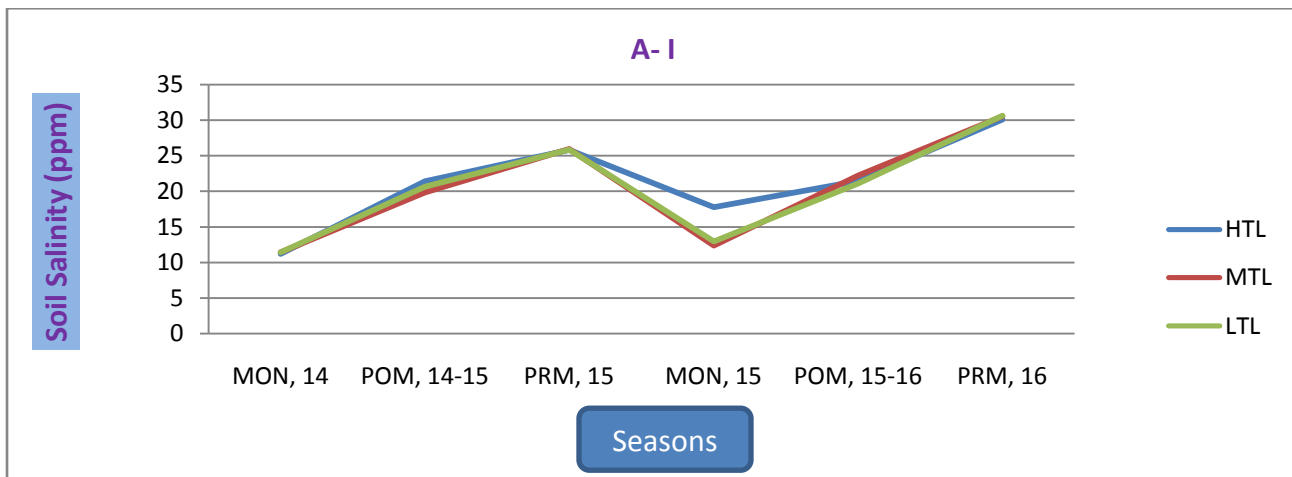


Diagram - 17: Seasonal (Mean) variations of Salinity (ppt) of Soil collected from Digha Mohana, New Digha and Udaypur at A-I, A-II and A-III respectively during June, 2014 to May, 2016

### 5.6. Available edible marine molluscan fauna at Digha coast:

During the study period it had an interview with some poor villagers and fishermen lived in coastal villages at Digha and adjacent area like Padima, Mirjapur, Dattapur, Mandala and Raghusardarbard village. From this survey it is known that 12 bivalves species belonging to 5 orders, 6 families and 8 genera out of 54 available bivalves species, 2 gastropods species belonging to 2 orders, 2 families and 2 genera out of 35 available gastropods species and 4 cephalopods species belonging to 3 orders, 3 families and 4 genera out of 4 available cephalopods species are edible (Table – 24 to 26 and Figure – 120 to 137). But it is a matter of concern that most of the local people do not know few molluscs species is edible, the meat is highly nutritious and few are delicious. All villagers do not consume it. A very little number of coastal villagers consume the meat of cephalopods and other edible molluscs meat sometimes. They use marine fishes as their daily non vegetarian food item because marine fishes are abundantly available and cheap. But it is true that the edible molluscs meat is cheaper than any kind of marine fishes available at Digha coast. The survey report in gist form is mentioned in Table – 23.



Table – 23: Survey report on edible molluscan species in coastal villages at Digha coast

Sl. No	Dates of survey	Name of village Surveyed	Number of fishermen which interview taken	Name of detected edible molluscan species available at Digha coast	Total Village Population and House Hold as per census -2011	Number of people, house hold & percentage of people consumed molluscs meat	Remarks
1.	02.03.2014 15.03.2014	Padima (Village Code – 346968)	15 (Fifteen) numbers	18 (Eighteen) numbers			Mainly cephalopods meat are taken regularly but other edible molluscs meat are taken rare.
2.	30.03.2014 20.04.2014	Mirjapur (Village Code – 346986)			Population- 4656 nos (In 5 villages)	People consumed – 224 nos (In 5 villages)	
3.	26.04.2014 04.05.2014	Dattapur (Village Code – 346969)			House hold – 930 nos (In 5 villages)	Percentage - 4.8%	
4.	10.05.2014 25.05.2014	Raghu Sardarbard (Village Code – 346199)					
5.	12.06.2014	Mandala (Village Code– 346965)					

**Table – 24: List of edible marine bivalvia available at Digha coast**

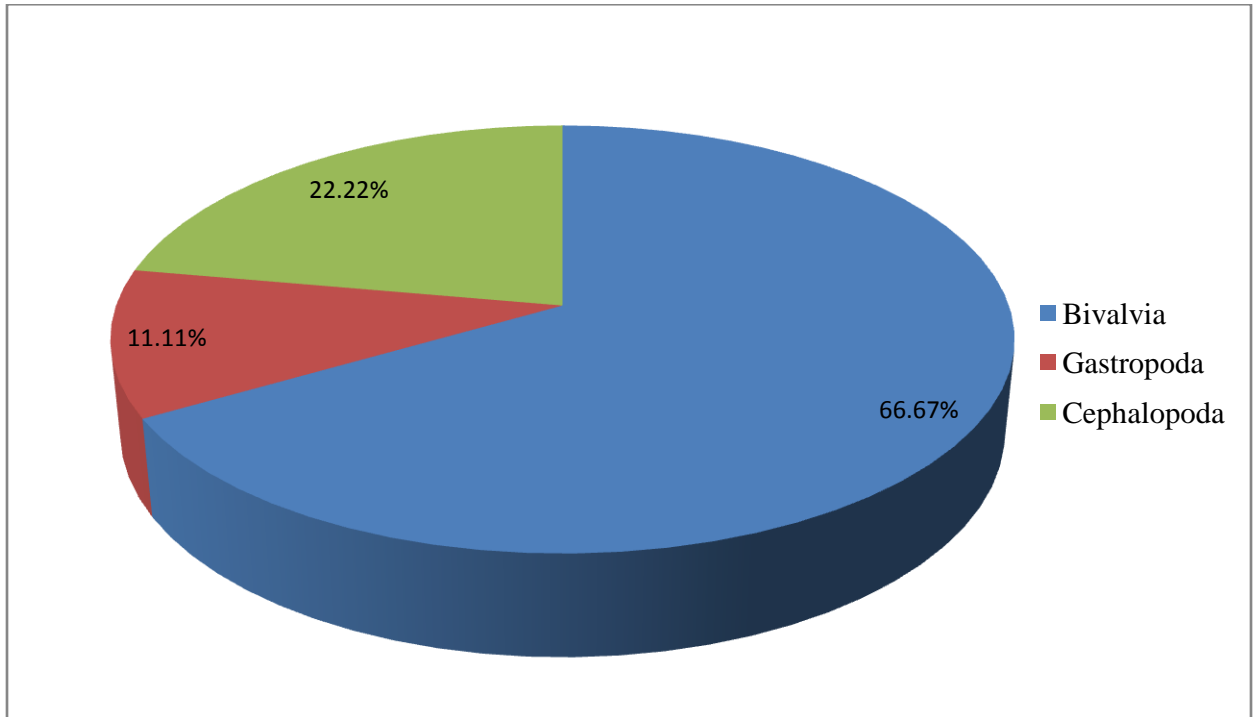
Sl.No.	Family Name (6)	Genera (8)	Specimen (12)
1.	Arcidae	<i>Anadara</i>	<i>Anadara granosa</i> (Linnaeus, 1758)
			<i>Anadara inequivalvis</i> (Bruquiere, 1789)
			<i>Anadara antiquata</i> (Linnaeus, 1758)
2.	Donacidae	<i>Donax</i>	<i>Donax incarnates</i> (Gmelin, 1791)
			<i>Donax scortum</i> (Linnaeus, 1758)
3.	Mytilidae	<i>Perna</i>	<i>Perna viridis</i> (Linnaeus, 1758)
4.	Ostreidae	<i>Saccostrea</i>	<i>Saccostrea cucullata</i> (Born, 1778)
		<i>Crassostrea</i>	<i>Crassostrea gryphoides</i> (Scholthein, 1813)
5.	Solenidae	<i>Solen</i>	<i>Solen brevis</i> (Gray, 1842)
6.	Veneridae	<i>Katelysia</i>	<i>Katelysia opima</i> (Gmelin, 1791)
		<i>Meretrix</i>	<i>Meretrix meretrix</i> (Linnaeus, 1758)
			<i>Meretrix casta</i> (Gmelin, 1791)

**Table - 25: List of edible marine gastropoda available at Digha coast**

Sl. No.	Family Name (2)	Genera (2)	Specimen (2)
1.	Olividae	<i>Olivancillaria</i>	<i>Olivancillaria gibbosa</i> (Born, 1778)
2.	Trochidae	<i>Umbonium</i>	<i>Umbonium vestiarium</i> (Linnaeus, 1758)

**Table - 26: List of edible marine cephalopoda available at Digha coast.**

Sl. No.	Family Name (3)	Genera (4)	Specimen (4)
1.	Loliginidae	<i>Loligo</i>	<i>Loligo duvauceli</i> (d'Orbigny, 1848)
2.	Octopodidae	<i>Octopus</i>	<i>Octopus macropus</i> (Risso, 1826)
3.	Sepiidae	<i>Sepia</i>	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )
		<i>Sepiella</i>	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )



Diaramg -18: Composition of edible marine molluscs groups available at Digha coast

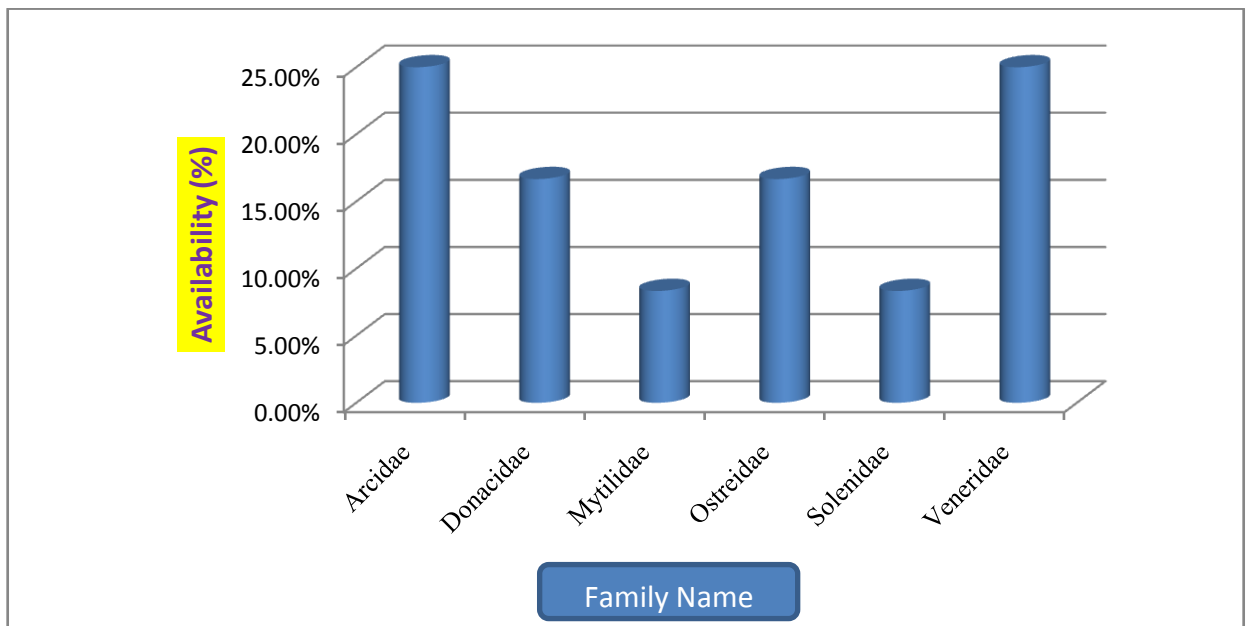


Diagram – 19: Showing distribution of **edible bivalvia** in family-wise (%) from study area

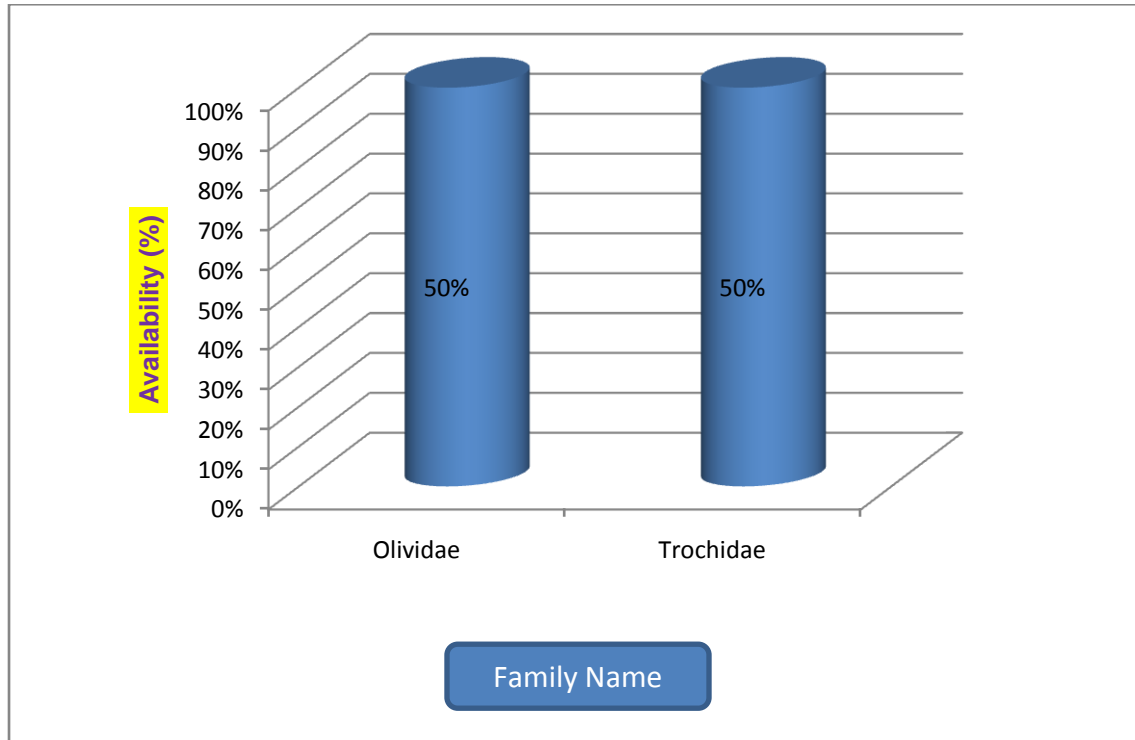


Diagram – 20: Showing distribution of **edible gastropods** in family-wise (%) from study area

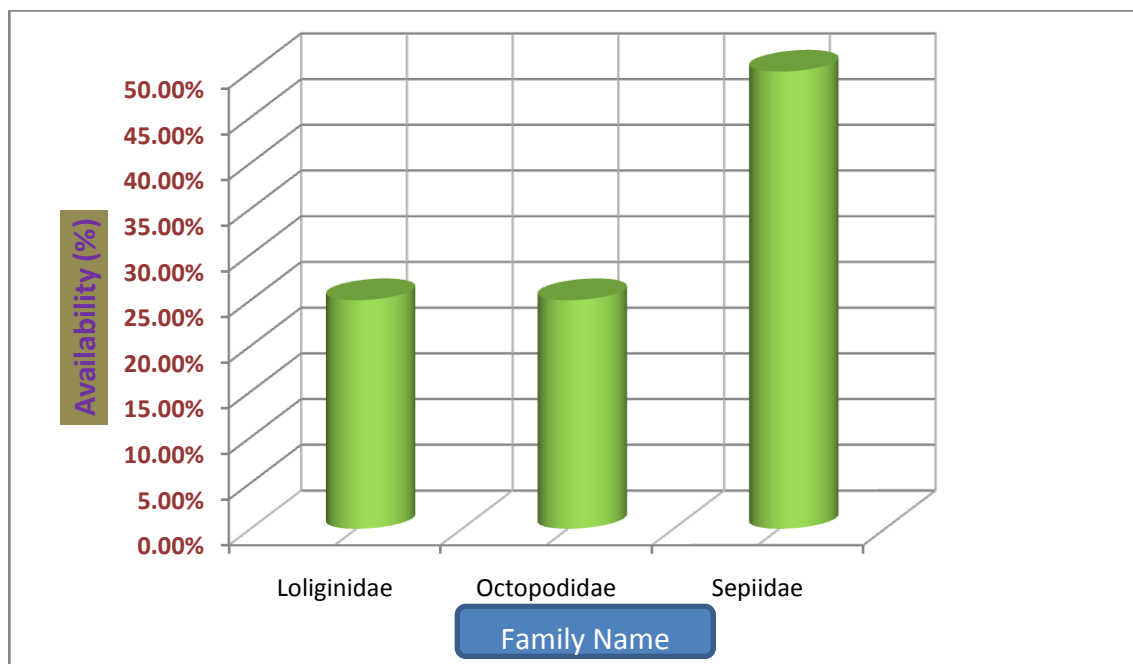


Diagram – 21: Showing distribution of **edible cephalopods** in family-wise (%) from study area

Photographs of Edible Marine Molluscs Species Available at Digha Coast:



Fig. – 120: *Anadara granosa*



Fig. – 121: *Anadara inequivalvis*

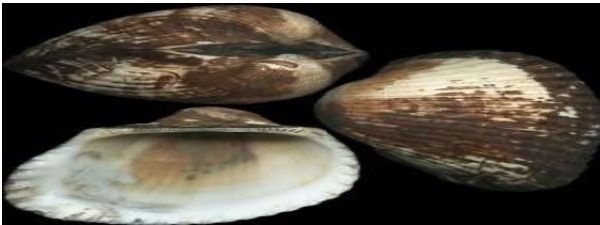


Fig. – 122: *Anadara antiquata*

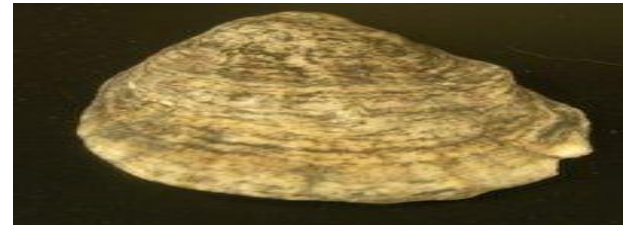


Fig. – 123: *Crassostrea gryphoides*



Fig. – 124: *Donax incarnates*



Fig. – 125: *Donax scortum*



Fig. – 126: *Katelaysia opima*



Fig. – 127: *Meretrix meretrix*



Fig. – 128: *Meretrix casta*



Fig. – 129: *Perna viridis*



Fig. – 130: *Saccostrea cucullata*



Fig. – 131: *Solen brevis*



Fig. – 132: *Olivancillaria gibbosa*



Fig. – 133: *Umbonium vestiarius*



Fig. – 134: *Loligo duvauceli*



Fig. – 135: *Octopus macropus*



Fig. – 136: *Sepia aculeata*



Fig. – 137: *Sepiella inermis*



**Photographs taken in coastal villages during survey:**

Fig. – 138: Sacks full of molluscs shell



Fig. – 139: Family men who collect molluscs and Consume edible molluscs meat



Fig. – 140: A boy who collects molluscs and his family consume molluscs meat



Fig. – 141: Molluscs shell sacks with Collector



Fig. – 142: Sacks full of molluscs shell



Fig. – 143: A heap of molluscs in a village

### 5.7. Size and weight variations of edible marine molluscan fauna at Digha coast:

During the study period it is found at Digha coast (also early mentioned) that 54 bivalve species under 8 orders, 18 families and 34 genera, 35 gastropod species under 4 orders, 18 families and 27 genera & 4 cephalopod species under 3 orders, 3 families and 4 genera are available. Out of them 12 bivalves under 5 orders, 6 families and 8 genera, 2 gastropods species under 2 orders, 2 families and 2 genera and 4 cephalopods species under 3 orders, 3 families and 4 genera are edible species as per local survey. It is calculated the size and weight variation of all available edible marine molluscs along the Digha sea beach by taking 10 species each. It is selected 10 numbers of each edible molluscs species of different size and weight group for the study of weight and size variation. It is found that *Octopus macropus* is gigantic and largest one where as *Umbonium vestiarius* is smallest one among all the available edible marine molluscs species at Digha. *Octopus macropus* shows maximum weight (2 kg) and *Umbonium vestiarius* shows minimum weight (0.76 g). In case of common weight *Octopus macropus* shows the highest common weight (0.5 kg) and *Umbonium vestiarius* is the lowest (1.06 g). In case of size variation it is seen that *Octopus macropus* reveals maximum length (150 cm) and *Umbonium vestiarius* shows minimum length (0.8 cm). In case of maximum common length, *Octopus macropus* is 20 cm long and *Umbonium vestiarius* is 1 cm long on an average basis (Table – 27 to 29 and Diagram – 22 to 24).

**Table – 27: Size & weight variation of marine edible bivalves available at Digha coast**

Sl. No	Molluscs Species	Maximum Size	Common Size	Common Shell Weight	Common Meat Weight
1.	<i>Anadara granosa</i> (Linnaeus, 1758)	9 cm	6 cm	22.82 gm	9.41 gm
2.	<i>Anadara inequivalvis</i> (Bruquiere, 1789)	9.5 cm	8 cm	23.14 gm	13.31 gm
3.	<i>Anadara antiquata</i> (Linnaeus, 1758)	10.5 cm	7 cm	26.18 gm	15.06 gm
4.	<i>Crassostrea gryphoides</i> (Scholtheim, 1813)	17 cm	7 cm	88.65 gm	32.35 gm
5.	<i>Donax incarnates</i> (Gmelin, 1791)	4 cm	2 cm	14.58 gm	9.32 gm
6.	<i>Donax scortum</i> (Linnaeus, 1758)	9 cm	6 cm	7.16 gm	3.31 gm
7.	<i>Katelsia opima</i> (Gmelin, 1791)	1.2 cm	0.6 cm	6.9 gm	4.1 gm

Sl. No	Molluscs Species	Maximum Size	Common Size	Common Shell Weight	Common Meat Weight
8.	<i>Meretrix meretrix</i> (Linnaeus, 1758)	9.1cm	6 cm	35.44 gm	20.87 gm
9.	<i>Meretrix casta</i> (Gmelin, 1791)	5 cm	3.23 cm	2.36 gm	2.1 gm
10.	<i>Perna viridis</i> (Linnaeus, 1758) Or <i>Mytilus viridis</i> (Hornell,1921)	16.5 cm	10 cm	21.1 gm	16.2 gm
11.	<i>Saccostrea cucullata</i> (Born, 1778)	12 cm	6 cm	65.2 gm	36.8 gm
12.	<i>Solen brevis</i> (Gray, 1844)	9.76 cm	4 cm	35.1 gm	20.9 gm

**Table - 28: Size and weight variation of marine edible gastropods available at Digha coast**

Sl. No	Molluscs Species	Maximum Size	Common Size	Common Shell Weight	Common Meat Weight
1.	<i>Olivancillaria gibbosa</i> (Born, 1778)	6.76 cm	3.9 cm	4.68 gm	2.31 gm
2.	<i>Umbonium vestiarium</i> (Linnaeus, 1758)	2 cm	1 cm	0.71 gm	0.35 gm

**Table - 29: Size and weight variation of marine edible cephalopods available at Digha coast**

Sl. No	Molluscs Species	Maximum Size	Common Size	Common Shell Weight	Common Meat Weight
1.	<i>Loligo duvauceli</i> (d'Orbigny,1848)	41.5 cm	13 cm	15 gm	61 gm
2.	<i>Octopus macropus</i> (Risso, 1826)	150 cm	20 cm	48 gm	452 gm
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848)	23 cm	12.4 cm	7 gm	49 gm
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848)	8 cm	5.3 cm	8 gm	35 gm

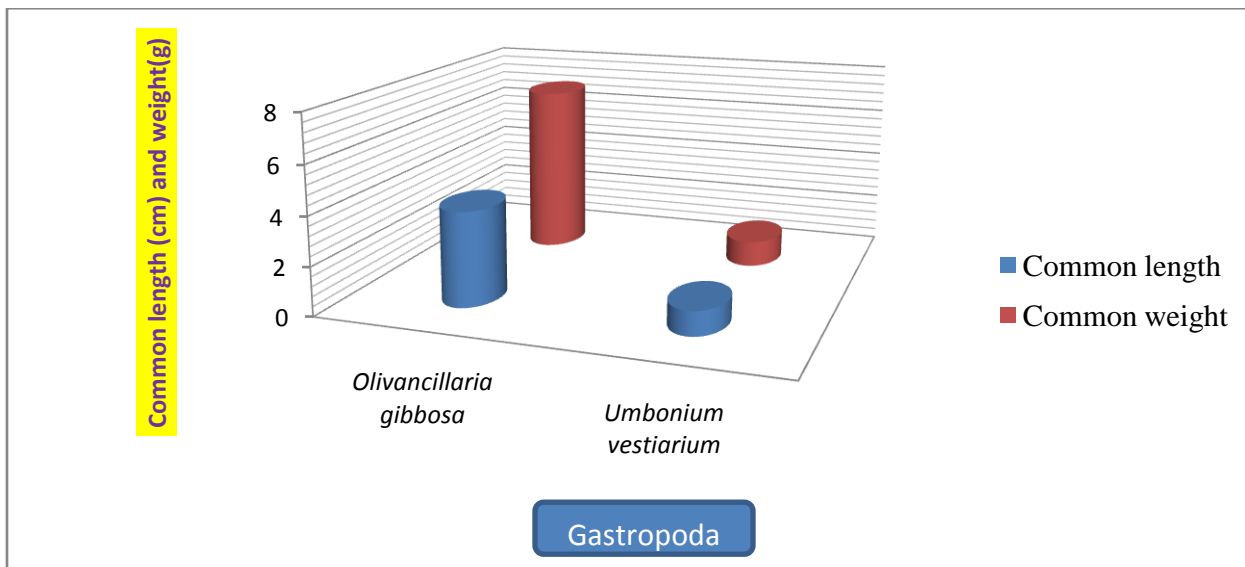


Diagram - 22: Showing common length (cm) and weight (g) of edible gastropoda available at Digha coast

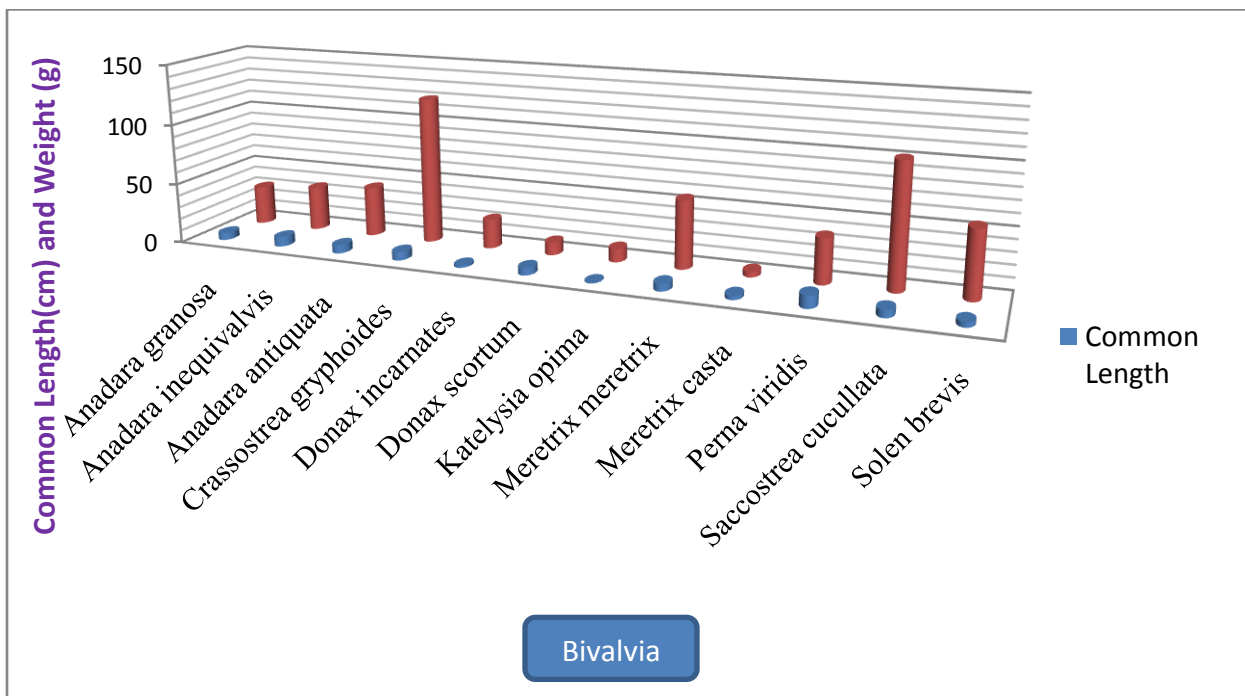


Diagram - 23: Showing common length (cm) and weight (g) of edible bivalvia available at Digha coast

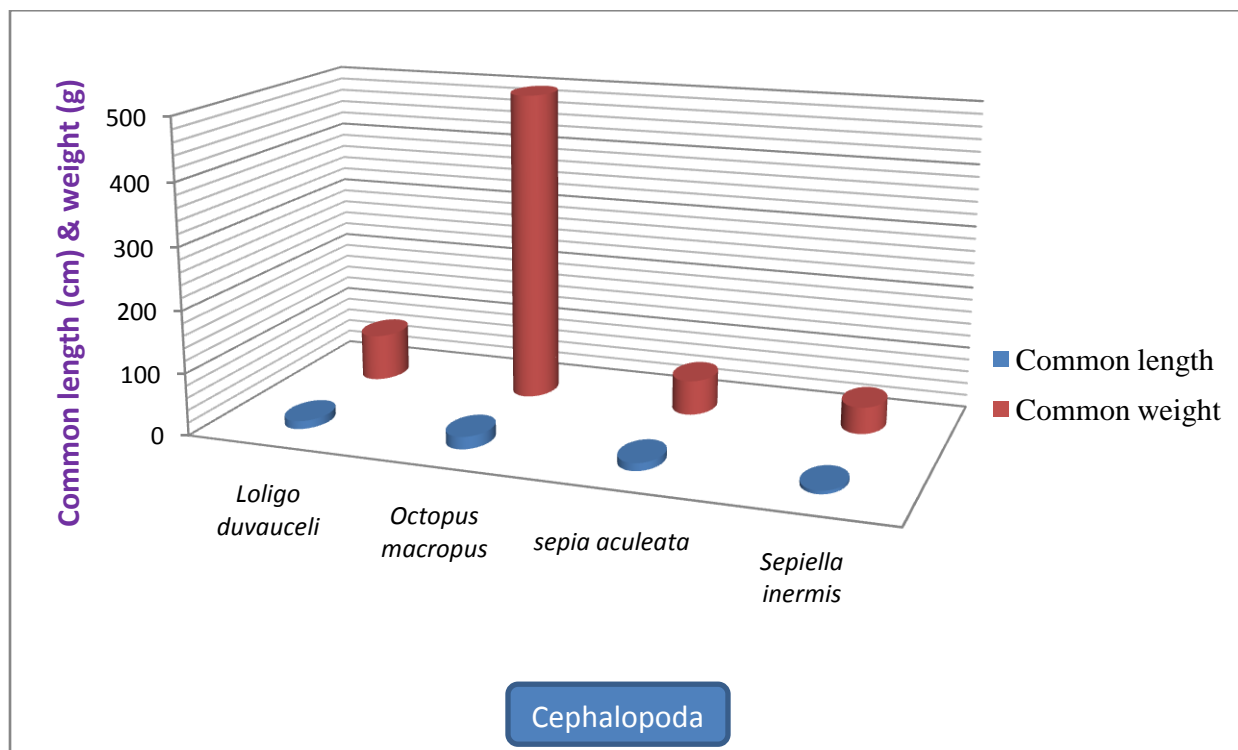


Diagram - 24: Showing common length (cm) and weight (g) of edible cephalopoda available at Digha coast

## 5.8. Nutritional values of marine edible cephalopods found at Digha coast:

**5.8.1. Moisture Content** - The moisture content of overall edible marine molluscs is relatively high throughout the year. During monsoon season, high values of moisture content are obtained from the month of July and onwards. Low values of moisture content are decreased from November and onwards during the post monsoon season. The average value of moisture content is low during the pre monsoon period compared to the monsoon and post monsoon seasons. Lowest and highest values of moisture content are observed in the month of March and July in a year respectively. In general, the moisture content of the tissue of bivalves usually gives an indication of the time of spawning. The result after analysis of moisture content in wet condition of 4 edible cephalopods is shown in Table – 30 (values expressed as percentage of wet weight).



Table - 30: Nutritive value (Moisture Content) of marine edible cephalopods available at Digha coast

Sl. NO	Specimen	Moisture Content (%)
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	83.35±2.04
2.	<i>Octopus macropus</i> (Risso, 1826)	82.57±2.97
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	84.44±3.21
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	81.19±2.09

**5.8.2. Carbohydrate Content** – The carbohydrate values fluctuate widely in all the months. Maximum value is in the month of July and minimum in May. In general glycogen content shows variations with the breeding behaviour and development of the gonad. Carbohydrate percentage is at the peak in July and it decreases in September. In the month of November, the glycogen value is high again and the lowest value is recorded during the pre monsoon season. Glycogen has been long considered to be the principle reserve of marine bivalves. The result after analysis of carbohydrate content in dry condition of 4 edible cephalopods is shown in Table – 31 (values expressed as percentage of dry weight).

Table - 31: Nutritive value (Carbohydrate Content) of marine edible cephalopods available at Digha coast

Sl. No	Specimen	Carbohydrate Content (%)
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	2.14±0.12
2.	<i>Octopus macropus</i> (Risso, 1826)	1.74±0.18
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	1.76±0.20
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	1.32±0.15

**5.8.3. Protein Content** - The protein content of molluscs species is at relatively high level throughout the year. It is being maximum in the month of May and minimum in the month of November. In the month of March and April, the protein content is high reaching its peak in the month of May. Afterwards, it decreases during the monsoon period. Generally seasonal changes in the biochemical composition are the characteristics of the seasonal activities of bivalves. Variations in biochemical constituents seem to be mainly influenced by reproductive cycle and availability of food. In marine molluscs, the reproductive cycle is governed by a number of factors like salinity, water temperature, day length and density of the surrounding medium. The result after analysis of protein content in dry condition of 4 edible cephalopods is shown in Table – 32 (values expressed as percentage of dry weight).



Table - 32: Nutritive value (Protein Content) of marine edible cephalopods available at Digha coast

Sl. NO	Specimen	Protein Content (%)
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	12.17±0.84
2.	<i>Octopus macropus</i> (Risso, 1826)	12.71±1.02
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	11.48±0.91
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	14.53±1.52

**5.8.4. Fat content** - The fat content of marine molluscs shows a gradual increase from the month of February and peak in the gravid population of May before spawning. In June, the lipid content is sharply decreased and remained at low level up to July due to continuous spawning. Possibility of an increase in fat content in bivalves during phytoplankton bloom has been reported. Lipid levels of almost same magnitude have been reported in the literatures from Indian waters. The result after analysis of crude fat content in dry condition of 4 edible cephalopods is shown in Table – 33 (values expressed as percentage of dry weight).

Table - 33: Nutritive value (Fat Content) of marine edible cephalopods available at Digha coast

Sl. No	Specimen	Fat Content (%)
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	0.56±0.08
2.	<i>Octopus macropus</i> (Risso, 1826)	0.60±0.06
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	0.51±0.08
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	0.69±0.05

**5.8.5. Ash Content** – The ash content in marine molluscs body also fluctuates in a year. It is highest in the month of May and lowest in the month of August. Ash content is similar with percentage of protein and lipid. However, changes in carbohydrate percentage show a completely different resulting in an inverse relationship between carbohydrate and protein. The result after analysis of ash content in dry condition of 4 edible cephalopods is shown in Table – 34 (values expressed as percentage of dry weight).

**Table - 34: Nutritive value (Ash Content) of marine edible cephalopods available at Digha coast**

Sl. NO	Specimen	Ash Content (%)
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	0.76±0.02
2.	<i>Octopus macropus</i> (Risso, 1826)	1.41±0.04
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	0.90±0.01
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	1.34±0.03

**5.8.6. Minerals Content** – The minerals are also a needful nutrient in food items required to save human body from some specific diseases. Depending upon the requirement, minerals are two types i.e. macro or major elements and micro or minor elements. The macro or major elements are required in small quantities but most essential for animal and plant nutrition. The macro or major elements are C, H, O, N, S, P, K, Ca, Mg and Fe. The micro or minor element is otherwise known as trace element. The micro or minor elements are required in human body in very small quantities as food nutrients. The micro or minor elements are B, Mo, Si, Cu, Mn, Na, and Zn. The result after analysis of minerals content (Na, K and Ca) of 4 edible cephalopods is shown in Table – 35.

**Table - 35: Nutritive value (Minerals content) of marine edible cephalopods available at Digha coast**

Sl.No	Specimen	Minerals Content		
		Na	K	Ca
1.	<i>Loligo duvauceli</i> (d'Orbigny, 1848)	994.03 mg/100g	1391.65 mg/100g	198.80 mg/100g
2.	<i>Octopus macropus</i> (Risso, 1826)	2081.26 mg/100g	1688.00 mg/100g	401.10 mg/100g
3.	<i>Sepia aculeata</i> (Ferussac and d'Orbigny, 1848 )	1603.20 mg/100g	1503.00 mg/100g	340.60 mg/100g
4.	<i>Sepiella inermis</i> (Ferussac and d'Orbigny, 1848 )	1569.03 mg/100g	1882.84 mg/100g	334.70 mg/100g

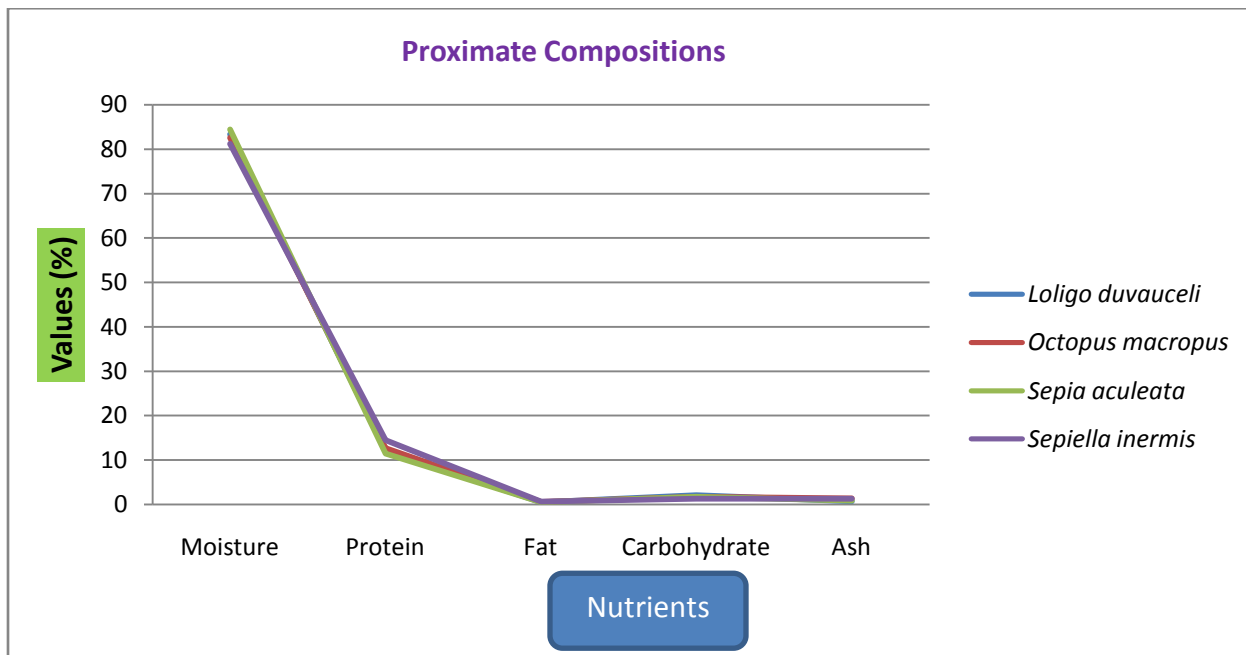


Diagram - 25: Proximate compositions (Moisture, Protein, Fat, Carbohydrate and Ash) of edible cephalopods meat found at Digha coast

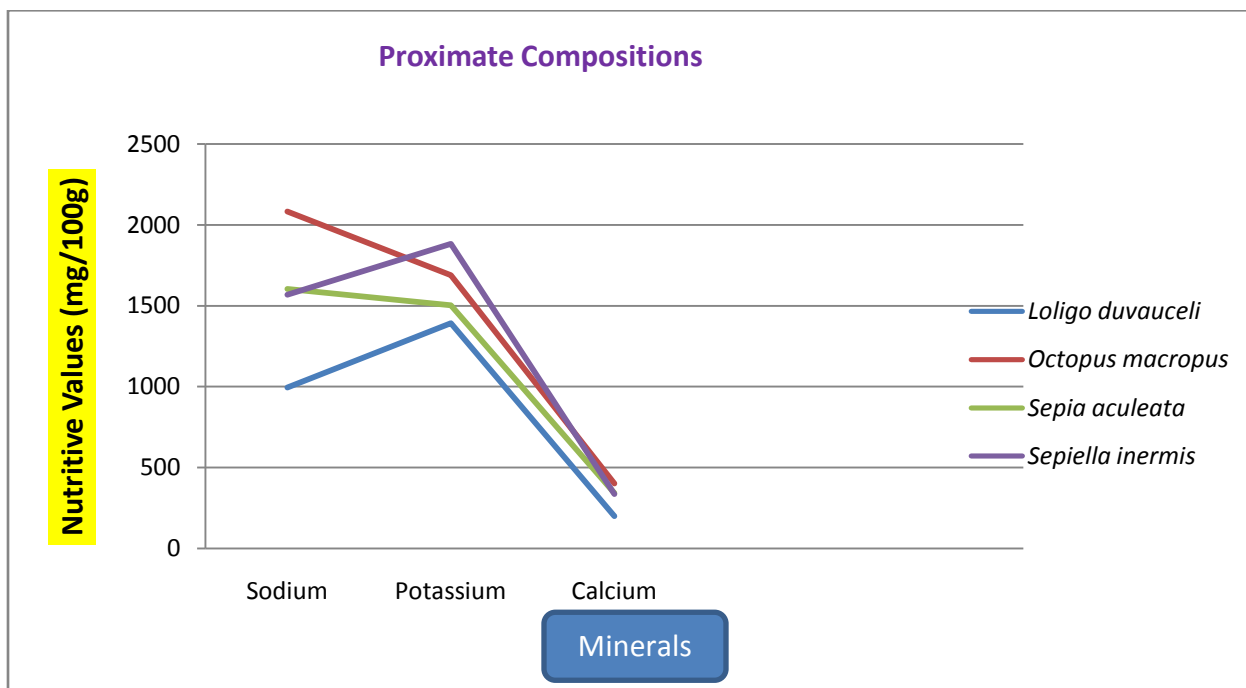


Diagram - 26: Proximate composition (minerals) of edible cephalopods meat found at Digha coast

**Photographs of Uses of Molluscs Taken at Digha Coast:**



Fig. – 144: A doll of Molluscs Shells



Fig. – 145: Cradle made of Molluscs Shell



Fig. – 146: Decoration works made of molluscs shell



Fig. – 147: Sankha in a shop



Fig. - 148: Idol decorated by molluscs shells



Fig. – 149: Garland made of pearls





Fig. –150: Sankha (Conch) in a shop



Fig. – 151: Molluscs shell dust



Fig. – 152: Doll made of molluscs Shell



Fig. – 153: Molluscs shell garland



Fig. – 154: Mirrors decorated by molluscs shell



Fig. – 155: Key holder ring

**Photographs of Concerned Matters at Digha Sea Shore:**

Fig. – 156: Confirm death of other unwanted animals by fishermen



Fig. – 157: Collecting *Penaeus monodon* seeds & confirm death of other animal's seeds



Fig. – 158: Caught all marine animals



Fig. – 159: People occupying sea shore