

## **APPENDIX 4C      SURVEY DATA OF SUBTIDAL AND BENTHIC ASSEMBLAGES**

Table 4C.1 Subtidal Soft Bottom Survey Raw Data - Wet Season Abundance

Kingdom	Phylum	Class	Order	Family	Sample ID Species	OTM1		OTM2		OTM3		OTM4		OTM5	
						Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)
Animalia	Annelida	Polychaeta	Amphinomida	Amphinomidae	<i>Linopherus paucibranchiata</i>	0	0.0000	1	0.0101	0	0.0000	0	0.0000	1	0.0008
Animalia	Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice indica</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3	0.0110
Animalia	Annelida	Polychaeta	Eunicida	Lumbrineridae	<i>Lumbrineris</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0003
Animalia	Annelida	Polychaeta	Phyllodocida	Hesionidae	<i>Oxydromus angustifrons</i>	0	0.0000	0	0.0000	0	0.0000	1	0.0009	2	0.0031
Animalia	Annelida	Polychaeta	Phyllodocida	Nephtyidae	<i>Aglaophamus sinensis</i>	0	0.0000	1	0.0008	2	0.0075	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Phyllodocida	Nephtyidae	<i>Micronephtys sphaerocirrata</i>	2	0.0019	0	0.0000	0	0.0000	2	0.0005	3	0.0021
Animalia	Annelida	Polychaeta	Phyllodocida	Pilargidae	<i>Sigambra hanaokai</i>	26	0.0389	4	0.0038	0	0.0000	10	0.0058	10	0.0068
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Malacoceros</i> sp.	0	0.0000	1	0.0001	0	0.0000	2	0.0007	0	0.0000
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio cirrifera</i>	4	0.0009	0	0.0000	3	0.0001	1	0.0011	2	0.0001
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio ehlersi</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0019
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio malmgreni</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0018
Animalia	Annelida	Polychaeta	Terebellida	Cirratulidae	<i>Cirriformia</i> sp.	2	0.0028	0	0.0000	0	0.0000	0	0.0000	2	0.0006
Animalia	Annelida	Polychaeta	--	Capitellidae	<i>Capitella</i> sp.	0	0.0000	0	0.0000	0	0.0000	1	0.0005	1	0.0009
Animalia	Annelida	Polychaeta	--	Opheliidae	<i>Ophelina acuminata</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	4	0.0057
Animalia	Arthropoda	Copepoda	--	--	Unidentified copepods	0	0.0000	0	0.0000	1	0.0001	0	0.0000	5	0.0014
Animalia	Arthropoda	Malacostraca	Amphipoda	Caprellidae	<i>Caprella</i> sp.	0	0.0000	0	0.0000	0	0.0000	1	0.0003	0	0.0000
Animalia	Arthropoda	Malacostraca	Decapoda	Alpheidae	<i>Alpheus</i> sp.	1	0.0169	0	0.0000	0	0.0000	0	0.0000	1	0.0016
Animalia	Arthropoda	Malacostraca	Decapoda	Hexapodidae	<i>Mariaplax granulifera</i>	1	0.0039	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Animalia	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	<i>Ophioplithus inconveniens</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0004
Animalia	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Unidentified brittle stars	1	0.0077	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Animalia	Mollusca	Bivalvia	Cardiida	Semelidae	<i>Theora lata</i>	0	0.0000	0	0.0000	0	0.0000	2	0.0115	0	0.0000
Animalia	Mollusca	Bivalvia	Cardiida	Tellinidae	<i>Jittada culter</i>	0	0.0000	1	0.0079	0	0.0000	3	0.1366	0	0.0000
Animalia	Mollusca	Bivalvia	Cardiida	Tellinidae	<i>Nitidotellina lischkei</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0115
Animalia	Mollusca	Scaphopoda	Dentaliida	Gadiliniidae	<i>Episiphon kiaochohwanense</i>	0	0.0000	0	0.0000	1	0.0025	0	0.0000	0	0.0000
Animalia	Nemertea	--	--	--	Unidentified ribbon worms	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3	0.0001

Table 4C.2 Subtidal Soft Bottom Survey Raw Data - Dry Season Abundance

Kingdom	Phylum	Class	Order	Family	Sample ID Species	OTM1		OTM2		OTM3		OTM4		OTM5	
						Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)	Number	Biomass (g)
Animalia	Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice indica</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	23	0.1345
Animalia	Annelida	Polychaeta	Eunicida	Eunicidae	<i>Marphysa stragulum</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	7	0.0401
Animalia	Annelida	Polychaeta	Eunicida	Lumbrineridae	<i>Lumbrineris</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	4	0.0036
Animalia	Annelida	Polychaeta	Phyllodocida	Chrysopetalidae	<i>Bhawania brevis</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0001
Animalia	Annelida	Polychaeta	Phyllodocida	Glyceridae	<i>Glycera alba</i>	0	0.0000	0	0.0000	0	0.0000	1	0.0017	1	0.0008
Animalia	Annelida	Polychaeta	Phyllodocida	Glyceridae	<i>Glycera chirori</i>	0	0.0000	0	0.0000	0	0.0000	1	0.0285	1	0.0113
Animalia	Annelida	Polychaeta	Phyllodocida	Goniadidae	<i>Glycinde bonhourei</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3	0.0074
Animalia	Annelida	Polychaeta	Phyllodocida	Hesionidae	<i>Oxydromus angustifrons</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0001
Animalia	Annelida	Polychaeta	Phyllodocida	Nephtyidae	<i>Aglaophamus sinensis</i>	1	0.0040	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Phyllodocida	Nephtyidae	<i>Micronephthys sphaerocirrata</i>	51	0.0479	10	0.0240	50	0.0682	15	0.0106	1	0.0001
Animalia	Annelida	Polychaeta	Phyllodocida	Paralacydoniidae	<i>Paralacydonia paradoxa</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	4	0.0021
Animalia	Annelida	Polychaeta	Phyllodocida	Phyllodocidae	<i>Nereiphylla castanea</i>	2	0.0014	0	0.0000	0	0.0000	0	0.0000	12	0.0503
Animalia	Annelida	Polychaeta	Phyllodocida	Pilargidae	<i>Sigambra hanaokai</i>	38	0.0325	43	0.0601	23	0.0267	16	0.0076	23	0.0115
Animalia	Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Harmothoe</i> sp.	1	0.0149	0	0.0000	0	0.0000	0	0.0000	1	0.0444
Animalia	Annelida	Polychaeta	Phyllodocida	Sigalionidae	<i>Ehlersleanira incisa</i>	4	0.0378	2	0.0015	1	0.0009	4	0.0012	0	0.0000
Animalia	Annelida	Polychaeta	Sabellida	Sabellariidae	<i>Lygdamis</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	15	0.0541
Animalia	Annelida	Polychaeta	Sabellida	Sabellidae	<i>Laonome</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0015
Animalia	Annelida	Polychaeta	Spionida	Magelonidae	<i>Magelona</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0039
Animalia	Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i> sp.	1	0.0013	2	0.0008	0	0.0000	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus tricirratus</i>	0	0.0000	0	0.0000	1	0.1667	1	0.0008	9	0.0077
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Aonides oxycephala</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	9	0.0228
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Malacceros</i> sp.	18	0.0106	3	0.0012	8	0.0055	1	0.0001	1	0.0004
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Parapriospio pinnata</i>	2	0.0127	1	0.0040	0	0.0000	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Polydora</i> sp.	1	0.0010	1	0.0012	0	0.0000	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio cirrifera</i>	2	0.0004	21	0.0044	1	0.0001	6	0.0004	0	0.0000
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio ehlersi</i>	16	0.0395	8	0.0194	11	0.0212	5	0.0012	29	0.0117
Animalia	Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio malmgreni</i>	20	0.0077	19	0.0082	14	0.0045	4	0.0007	20	0.0161
Animalia	Annelida	Polychaeta	Terebellida	Cirratulidae	<i>Cirriformia</i> sp.	0	0.0000	0	0.0000	0	0.0000	1	0.0006	8	0.0138
Animalia	Annelida	Polychaeta	Terebellida	Cirratulidae	<i>Tharx</i> sp.	1	0.0004	1	0.0003	3	0.0024	0	0.0000	0	0.0000
Animalia	Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia bandera</i>	0	0.0000	0	0.0000	1	0.0347	0	0.0000	1	0.1571
Animalia	Annelida	Polychaeta	Terebellida	Trichobranchidae	<i>Terebellides stroemii</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0229
Animalia	Annelida	Polychaeta	--	Capitellidae	<i>Notomastus</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3	0.0183
Animalia	Annelida	Polychaeta	--	Chaetopteridae	<i>Chaetopterus</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	9	0.8734
Animalia	Annelida	Polychaeta	--	Ophelidae	<i>Ophelina acuminata</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	9	0.0073
Animalia	Annelida	Polychaeta	--	--	<i>Anelassorhynchus sabinus</i>	1	3.8778	0	0.0000	0	0.0000	0	0.0000	0	0.0000
Animalia	Arthropoda	Copepoda	--	--	Unidentified copepods	1	0.0003	0	0.0000	3	0.0005	3	0.0009	0	0.0000
Animalia	Arthropoda	Malacostraca	Amphipoda	Ampeliscaidae	<i>Ampelisca</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	5	0.0050
Animalia	Arthropoda	Malacostraca	Amphipoda	Aoridae	<i>Grandidierella</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	3	0.0013
Animalia	Arthropoda	Malacostraca	Amphipoda	Caprellidae	<i>Caprella</i> sp.	0	0.0000	1	0.0002	0	0.0000	0	0.0000	2	0.0005
Animalia	Arthropoda	Malacostraca	Amphipoda	Liljeborgiidae	<i>Idunella</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0023
Animalia	Arthropoda	Malacostraca	Amphipoda	Photidae	<i>Photis</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	5	0.0010
Animalia	Arthropoda	Malacostraca	Decapoda	Alpheidae	<i>Alpheus</i> sp.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0263
Animalia	Arthropoda	Malacostraca	Decapoda	--	Unidentified shrimp larvae	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0007
Animalia	Arthropoda	Malacostraca	--	--	Unidentified crustaceans	0	0.0000	3	0.0026	0	0.0000	1	0.0001	0	0.0000
Animalia	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	<i>Ophiura pteracantha</i>	0	0.0000	1	0.0434	2	0.0725	0	0.0000	16	0.0969
Animalia	Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Unidentified brittle stars	0	0.0000	0	0.0000	0	0.0000	1	0.0098	0	0.0000
Animalia	Mollusca	Bivalvia	Cardiida	Cardiidae	<i>Fulvia hungerfordi</i>	0	0.0000	0	0.0000	1	0.1517	1	0.1695	7	0.6047
Animalia	Mollusca	Bivalvia	Cardiida	Semellidae	<i>Theora lata</i>	23	0.7316	20	0.7802	15	0.4338	3	0.1099	6	0.0229
Animalia	Mollusca	Bivalvia	Cardiida	Tellinidae	<i>Tellina culter</i>	7	0.3493	2	0.1342	1	0.0451	2	0.0672	0	0.0000
Animalia	Mollusca	Bivalvia	Cardiida	Tellinidae	<i>Nitidotellina lischkei</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0289
Animalia	Mollusca	Bivalvia	Myioida	Corbulidae	<i>Corbula sinensis</i>	0	0.0000	0	0.0000	2	0.0892	0	0.0000	1	0.0225
Animalia	Mollusca	Bivalvia	Venerida	Veneridae	<i>Paratapes undulatus</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0419
Animalia	Mollusca	Bivalvia	Venerida	Veneridae	<i>Timoclea lionota</i>	0	0.0000	0	0.0000	1	0.0560	0	0.0000	0	0.0000
Animalia	Mollusca	Gastropoda	Cephalaspidea	Philiidae	<i>Philine</i> sp.	4	0.0219	0	0.0000	1	0.0106	1	0.0005	1	0.0007
Animalia	Mollusca	Scaphopoda	Dentaliida	Gadiliidae	<i>Episiphon kiaochohwanense</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0152
Animalia	Nemertea	--	--	--	Unidentified ribbon worms	6	0.0041	4	0.0561	6	0.0022	2	0.0007	8	0.0107
Animalia	Platyhelminthes	--	--	--	Unidentified flatworms	1	0.0237	0	0.0000	10	0.1688	0	0.0000	4	0.0095
Animalia	Sipuncula	Phascolosomatidea	Phascolosomatiformes	Phascolosomatidae	<i>Apionsoma trichocephalus</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0003
Animalia	Sipuncula	Phascolosomatidea	Phascolosomatiformes	Phascolosomatidae	<i>Phascolosoma esculenta</i>	0	0.0000	0	0.0000	0	0.0000	0	0.0000	2	0.0741

**Table 4C.3 Seabed Attributes along the Survey Transects at Outer Tap Mun**

	Transect					
	T1		T2		T3	
	Shallow	Deep	Shallow	Deep	Shallow	Deep
Transect depth (mCD)	-3 to -4	-5 to -6	-3 to -4	-5 to -6	-3 to -4	-5 to -6
<b>Substratum attributes</b>						
Bedrock	0	0	0	0	0	0
Continuous pavement	0	0	0	0	0	0
Rocks (<26 cm)	2	3	2	3	3	0
Large boulders (>50 cm)	4	0	3	2	2	0
Small boulders (<50 cm)	3	3	3	2	2	0
Rubble	2	3	2	2	3	0
Sand	3	4	2	3	3	6
Mud/ Silt	0	0	1	1	0	1
Other	0	0	0	0	0	0
<b>Ecological attributes</b>						
Hard coral	3	2	4	2	3	0
Dead Coral	1	0	1	0	1	0
Octocoral (Soft corals and gorgonians)	0	0	0	0	0	0
Black coral	1	2	0	0	0	0
Dead standing coral	0	0	1	0	0	0
Macroalgae	0	0	0	0	0	0
Other Benthos (including sponges, zoanthids, ascidians and bryozoans)	3	1	3	0	1	1

Notes:

(1) 0 = 0%, 1 = <5%, 2 = 5 -10%, 3 = 11 – 30%, 4 = 31- 50%, 5 = 51 – 75%, 6 = 76 – 100%

**Table 4C.4 Benthic Communities Recorded Along the Survey Transects at Outer Tap Mun**

	Transect					
	T1		T2		T3	
	Shallow	Deep	Shallow	Deep	Shallow	Deep
Transect depth (mCD)	-3 to -4	-5 to -6	-3 to -4	-5 to -6	-3 to -4	-5 to -6
<b>Hard corals</b>						
<i>Bernardpora stutchburyi</i>	1	1	0	0	1	1
<i>Coelastrea aspera</i>	2	1	0	0	1	1
<i>Cyphastrea chalcidicum</i>	1	0	0	1	0	1
<i>Cyphastrea japonica</i>	1	0	1	1	0	0
<i>Cyphastrea serailia</i>	1	0	0	1	1	0
<i>Dipsastraea danae</i>	0	1	0	1	0	0
<i>Dipsastraea favus</i>	1	1	1	1	1	1
<i>Dipsastraea lizardensis</i>	1	0	0	0	0	1
<i>Dipsastraea rotumana</i>	1	1	1	1	1	1
<i>Dipsastraea speciosa</i>	1	0	0	0	0	0
<i>Dipsastraea veroni</i>	0	0	0	1	1	0
<i>Duncanopsammia peltata</i>	1	1	0	0	1	1
<i>Echinophyllia aspera</i>	1	0	1	0	0	0
<i>Favites abdita</i>	2	0	1	1	0	1
<i>Favites acuticollis</i>	1	1	0	0	0	1
<i>Favites chinensis</i>	1	0	0	0	1	1
<i>Favites flexuosa</i>	2	1	1	1	2	2
<i>Favites magnistellata</i>	0	0	0	0	0	1
<i>Favites micropentagonus</i>	0	0	0	0	0	1
<i>Favites pentagona</i>	1	1	1	0	1	1
<i>Goniastrea favulus</i>	0	0	1	0	1	0
<i>Goniopora columna</i>	1	1	2	3	1	1
<i>Goniopora planulata</i>	0	0	1	0	0	0
<i>Hydnophora exesa</i>	1	0	0	0	0	0
<i>Lithophyllon undulatum</i>	1	1	1	1	1	0
<i>Montipora mollis</i>	1	0	0	0	0	0
<i>Oulastrea crispata</i>	1	0	0	0	0	1
<i>Pavona decussata</i>	1	1	4	1	1	1
<i>Platygyra acuta</i>	0	1	2	0	0	0
<i>Platygyra carnosa</i>	1	0	2	0	0	0
<i>Plesiastrea versipora</i>	3	2	1	1	1	1

<i>Portites</i> sp.	2	1	1	1	0	1
<i>Psammocora haimiana</i>	0	0	1	0	0	0
<i>Psammocora profundacella</i>	1	0	1	1	0	1
<i>Stylocoeniella guentheri</i>	1	1	1	1	0	0
<b>Black corals</b>						
<i>Antipathes curvata</i>	1	1	0	0	0	0
<b>Other benthos</b>						
<i>Dofleinia armata</i>	0	0	0	0	0	1
<i>Entacmaea quadricolor</i>	1	0	0	0	0	0
<i>Macrodictyla doreensis</i>	0	0	0	0	0	1
<i>Spheractis cheungae</i>	1	2	0	0	1	1
Zoanthid	1	1	1	0	0	0
Encrusting Sponge	0	1	0	0	1	0

Notes:

- (2) 0=absent, 1=rare, 2=uncommon, 3=common, 4=abundant, 5=dominant
- (3) The ranks shown in the Table above indicate the relative abundance of each coral in relation to other corals in the community. In other words, these broad categories rank taxa in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks are subjective assessments of abundance, rather than quantitative counts of each taxon. For instance, if a coral is ranked as 'common', it means it was more frequent than other coral species along the transect. It should be borne in mind that coral cover along all of the transects where corals occurred was very low (<10% cover).