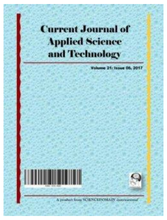

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Aspects of Polychaete Habitat Preferences in the Intertidal and Subtidal Zones of Bonny River, Nigeria

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Shoreline Intertidal and Midchannel–subtidal polychaete assemblages of the Bonny River in Nigeria were studied during the months of July, August, September and October 2013 to represent the wet season and December 2013, January 2014, February to March 2014 to represent the dry season. The study showed evidence of Polychaete differences in the species associations that occurred in the intertidal and subtidal habitats along stations on the Bonny River. The cluster analysis from a presence-absence model revealed two groups of Specialists and one group of Generalists. Within the Generalist category, the abundance model revealed three (3) sub-Generalist associations that indicated habitat preferences within stations. The study determined the presence of a generalist-specialist continuum between habitats from Bonny to Iwofe along the Bonny River. Based on the incidence model (presence-absence), the generalist-specialist associations coexisted in a non-linear pattern of habitat-preference between stations. Habitat preference among the Polychaete species was highest for Generalists only at Bonny station (58%). They coexisted with Specialists at Opudakiri (18%), Okrika (15%), Isaka (3%) and Iwofe (6%). For the Specialists, habitat preference between the intertidal and subtidal was interspersed between stations without a discernible pattern at Bonny (33%:13%), Opudakiri (38%:41%), Okrika (13%:21%), Isaka (16%:10%) and Iwofe (9%:0%). Altogether, fine differences in habitat preference were shown for the twenty-eight (28)

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Generalists. Only two species of Generalists, namely *Glycera tridactyla,* and *Notomastus aberans*, had the highest distribution on the basis of their occurrence at five (5) of the intertidal and subtidal stations at Bonny, Opudakiri, Okrika, Isaka and Iwofe. Similar fine-tuned differences were inferred from preferences shown by the Specialists at the intertidal locations between stations. Three species, namely *Neanthes* sp*., Nephthys assimilis* and *Sigambra tentaculata* emerged as those with the highest overall distribution among the intertidal specialists having occurred in five stations from Bonny to Iwofe stations. In contrast, there was no wide overall habitat preference shown by any of the Polychaete species among the midchannel subtidal specialists. Only one species, *Sabillides* sp., had narrow occupancy in two stations at the mouth of Bonny River, namely Bonny and Opudakiri. As a result, the lines of evidence show that three ecologically relevant findings are plausible. Firstly the wide distribution of few specialists and generalist show they are neither transitional nor opportunistic. Secondly they indicate ecological fitness in inhabiting either the intertidal or subtidal irrespective of episodic changes to the sediment. Thirdly it is plausible that as in some Polychaete and Fish associations they provide biotic cues that may affect behavioral attributes of recruitment for transitional and opportunistic species. Future research priorities by ecologists can use the observed indicator associations and their resource requirements, to interpret changes in habitat preference as Polychaetes respond to man-made and natural environmental changes.

Keywords: Polychaete; shoreline; intertidal; mid channel; subtidal; habitat preference; niche breadth.

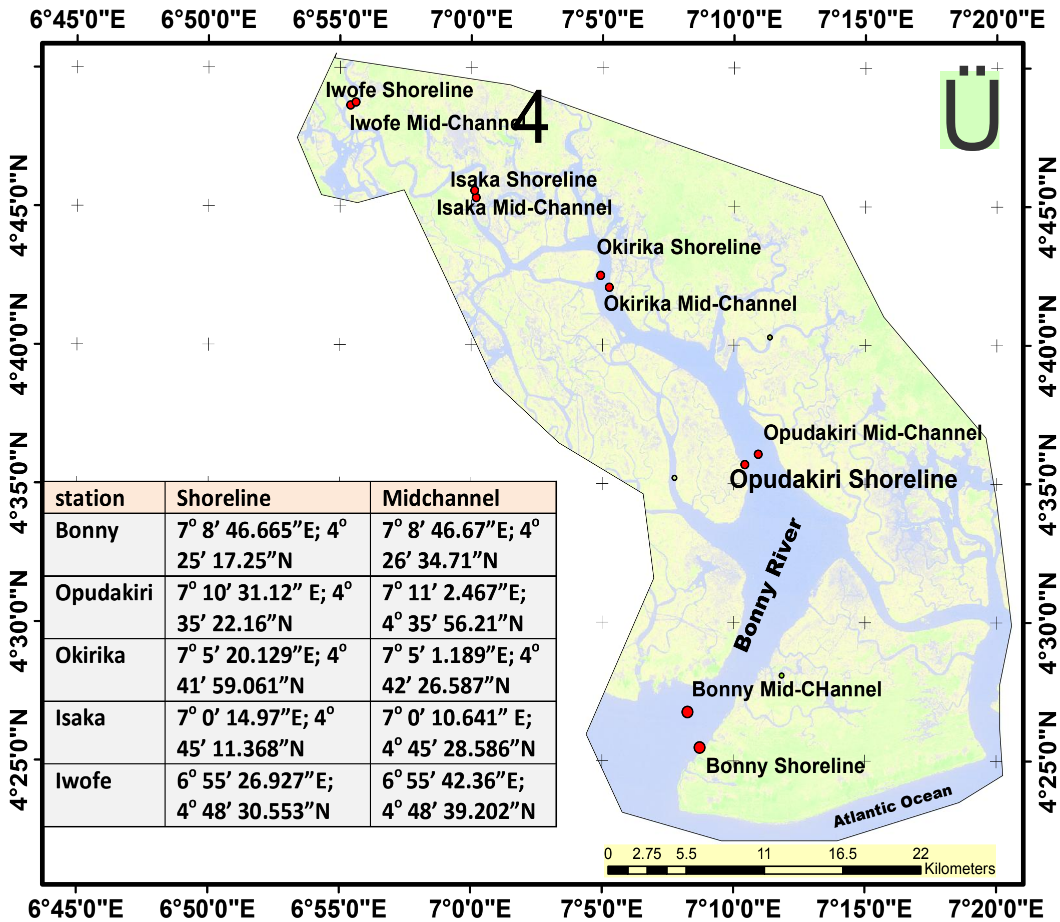
1. INTRODUCTION

Polychaetes are a diverse group of worms. They are resilient inhabitants of diverse microhabitats within the marine ecosystem and are found in the intertidal, shallow water and deep water habitats [1,2,3]. Their abundance and dominance in a wide variety of marine habitats [4,5,6], and their distribution patterns often make them significant biotic indices for the measurement of ecosystem health [6,7]. Studies have shown that this ability to occupy various microhabitats provides an understanding of their levels of opportunism and the roles they play in ecological function and structure [8,9,10,11]. Their opportunism is exhibited in their sensitivity and tolerance to different environmental conditions and their ability to quickly respond to environmental changes [5,12,13,14]. Along with habitat gradients, evidence of spatial heterogeneity has been correlated with different factors [15,16,17,18,19]. Despite their resilience in occupying different habitats, studies indicate that intertidal conditions, which have intermittent exposure, provide more changes in environmental conditions [11,20] than subtidal areas, that are consistently submerged.

During the last two decades, an increasing number of studies on the macrobenthos of Bonny River have provided information on the Polychaete fraction from results of distribution and abundance [21,22,23,24,25,26]. Other studies on Polychaetes of Bonny River [27,28,29] have provided additional descriptions of taxonomical abundance, longitudinal zonation in subtidal portions and feeding guild relationships. What remains poorly studied is the spatio-temporal variation along a horizontal gradient, between the intertidal and the subtidal environment and the biotic composition, influencing diversity and ecological processes. This paucity of information is in a period of escalating rate of deepening of channels along with many stations of Bonny River through maintenance dredging. As a consequence demand for the basis of understanding, interpreting and predicting ecological impact using Polychaetes has become necessary for routine biological resources monitoring. In this context, the paper examines the habitat preferences from which niche breadth can be deduced through co-occurrence and specialization patterns observable between the intertidal and subtial habitats

1.1 Study Area

The Bonny estuary is located on the immediate eastern flank of the Niger Delta, between longitudes 7°00' and 7°15'E and latitudes 4°25' and 5°50'N, southern Nigeria (Fig. 1). The strategic location of the estuary serves as an entrance point to Port-Harcourt, Onne, Okrika ports in Rivers State. Immediately east of the estuary is the Bonny barrier island. The mouth of the estuary is jointly shared by the Cawthrone Channel and the New Calabar River. The width of the estuary's mouth is 13.5km and drains a total area of 621,351 km2. It has an estimated area of 206 km2 and extends 7km offshore. The tidal regime of the Bonny River estuary has a



station	Shoreline	Midchannel
Bonny	7° 8′ 46.665″E; 4° 25′ 17.25″N	7° 8′ 46.67″E; 4° 26′ 34.71″N
Opudakiri	7° 10′ 31.12″ E; 4° 35′ 22.16″N	7° 11′ 2.467″E; 4° 35′ 56.21″N
Okirika	7° 5′ 20.129″E; 4° 41′ 59.061″N	7° 5′ 1.189″E; 4° 42′ 26.587″N
Isaka	7° 0′ 14.97″E; 4° 45′ 11.368″N	7° 0′ 10.641″ E; 4° 45′ 28.586″N
Iwofe	6° 55′ 26.927″E; 4° 48′ 30.553″N	6° 55′ 42.36″E; 4° 48′ 39.202″N

Fig. 1. Sampling stations along the Bonny River estuary

range of 0.8m at neap tide and 2.4 m during spring tides [30]. This tidal regime extends inland, up to 66km, where it meets with the New Calabar River at Aluu, where there is a greater freshwater flushing. The Bonny River System is known to have the largest tidal volume of all river systems in the Delta. There is generally a net flux of tidal water up the river which disperses into various creeks and channels [30]. The Bonny River is one of the most environmentally stressed rivers in the Niger Delta due to shipping activities associated with four-port complexes (Port Harcourt, Onne, Okrika and Bonny) and other boat landings, such as Buguma, which service oil and gas production. Several oil fields are located in and around the Bonny estuary, including Orubiri field on Primrose Creek; Onne fields on Ogu creek and Bomu, Bodo and Bonny fields on the eastern part of the Bonny estuary. Also located within the river system are the Nigerian National Petroleum Corporation (NNPC), Petroleum loading Jetty at Okrika, and NAFCON fertilizer plant on Ogu creek. There is also the Bonny Crude oil Tank Farm, an LNG plant of NNPC and NGL plant of Exxon-Mobil, located at the mouth of Bonny River. Several dredging activities go on periodically to keep the channels open for the numerous, continuous shipping logistics.

2. METHODOLOGY

Five stations were sampled on the Bonny River. The stations were the Bonny at the river mouth, and upriver along a gradient, Opudakiri, Okrika, Isaka, and Iwofe. Samples were collected from the shoreline and mid-channel locations at each station during the months of July, August, September and October 2013 to represent the wet season (a period of mean rainfall (2000 mm), mean humidity (99%) and average temperature (22 deg C) and December 2013, January 2014, February to March 2014 to represent the dry season (a period of mean rainfall (97 mm), average humidity (75%), and average temperature (27 deg C). The shoreline represents areas that are exposed to air twice a day for a period of six hours between low tide periods. The subtidal were areas covered by water at all periods of the tide. All locations have a combined activity history of commercial/ industrial and dredging footprint. At each location, five random samples were taken using a 0.023m^2 Ekman grab. At each site, all samples were composited, washed with water in 45μ nitex bags and preserved in 10% buffered formalin containing three to four drops of 1g/100 ml Rose Bengal solution. The benthic samples were sorted for polychaete fauna, identified with stereo and compound microscopes and categorized into families and genera. Further identification was conducted with Polychaete keys of Day [31], Fauchald [32] and Kierkegaard [33]. Species were identified to the lowest taxonomic level.

Two aspects of community structure, namely species co-occurrence and relative abundance, were analyzed. Co-occurrence was analyzed from presence-absence using cluster analyses to identify the Polychaete species that occurred together between shoreline-intertidal and midchannel-subtidal habitats. The abundance data was used in contingency analyses to test the difference between proportions in the distribution of categorical variables. These were namely species adaptation (generalist and specialist) and occurrence (shoreline-intertidal and midchannel-subtidal). Five categorical variables namely Midchannel Subtidal (MST); Shoreline Intertidal (SHI); Shoreline_Midchannel (SHMC); Shoreline_Dominant Generalist (SDGN) and Midchannel Dominant_Generalist (MDGN) were tested.

3. RESULTS

Fig. 2 is a dendrogram showing a hierarchical cluster of polychaete from the shoreline and mid-channel locations at Bonny station based on presence-absence. The dendrogram shows clusters of Polychaetes separated into three communities, namely specialists that occur at the shoreline-intertidal, midchannel-subtidal, and a generalist community which have polychaetes occurring in both habitats.

A total of fourteen (14) Polychaetes belonged to the shoreline-intertidal clade, namely *Aglaophamus lyrochaeta, Ceratonereis (composetia) costae, Dasychone serratibranchis. Glycinde kameruniana, Gyptis incise, Isolda whydahaensis, Lumbrineris heteropoda difficilis, Lysidice collari, Maldane sarsi, Melinna palmate, Nephthys assimilis, Paraonis pygoenigmatica, Sigambra tentaculata* and *Simplisetia erythraeensis*

The dendrogram clade of midchannel- subtidal community comprises five (5) species, *Lumbrinereis fragilis, Eteone picta, Chaetozone setosa, Heterospio longissima,* and *Sigalion opalinum*.

The dendrogram clade that occurs in both the shoreline-intertidal and midchannel-subtidal comprises nineteen (19) Polychaetes namely *Aglaophamus malmgreni, Aricidea simplex, Cossura longocirrata, Diopatra neapolitana, Glycera prashadi, Glycera tridactyla, Lumbrineriopsis paradoxa, Lumbrineris aberrans, Lumbrineris coccinea, Lumbrineris latreilli, Lumbrineris tetraura, Malacoceros indicus, Ninoe lagosiana, Notomastus aberans, Notomastus latericeus, Paracapitella pettiboneae, Scoloplos (scoloplos) armiger, Scoloplos (leodamas) johnstonei, and Sternapsis scutata.*

In Fig. 3, a total of thirty-five (35) species of Polychaetes were observed to have occurred at the Opudakiri stations between shoreline-intertidal and mid-channel-subtidal habitats. The cluster of presence-absence for the period of sampling shows that only six (6) species co-occurred at the two stations. These were *Notomastus aberans, Heteromastus sp., Malacocerous indicus, Chaetozone setosa, Diopatra neapolitana* and *Starnapsis scutata*. A total of seventeen (17) species occurred exclusively at the shoreline-intertidal habitat. These were *Paraonis fulgens, Lumbinereis tetraura, Ninoe lagosiana, Isolda whydahaensis, Euclymene oerstedi, Aglaophamus lyrochaeta, Eteone picta, Scoolplos (scoloplos) armiger, Glycera prashadi, Glycera Africana, Loimia medusa, Sigambra tentaculata, Cossura longocirrata, Travisia sp., Stygocapitella sp., and Spaerodoropsis sp.*

The third cluster clade showed an exclusive occurrence of twelve species (12) at the midchannel-subtidal station. These were *Aricidea (aricidea) sp., Paraonis sp., Lumbrinereis coccinea, Notomastus sp., Polydora sp., Melinna plamate, Melinna sp., Nicomache sp., Glycera tridactyla, Tharynx dorsobranchialis, Eurythoe pervecarnuculata, and Sabillides sp.*

In Fig. 4, a total of seventeen (17) species of Polychaetes were observed to occur at the Okrika stations between shoreline-intertidal and midchannel-subtidal habitats. The first cluster

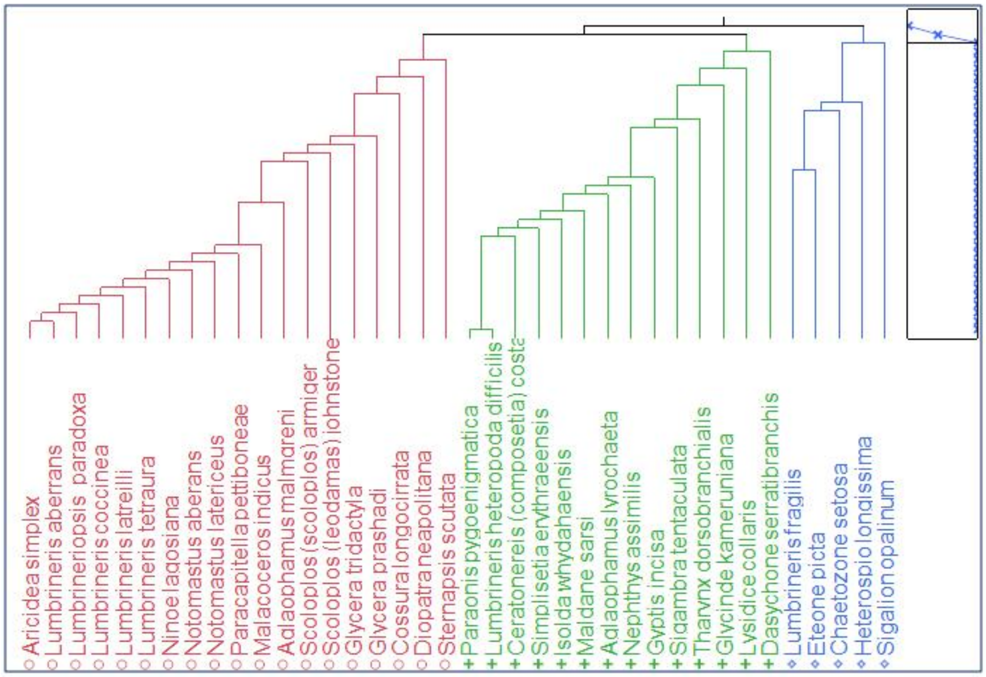


Fig. 2. Dendrogram of polychaete assemblages from shoreline and mid-channel locations at Bonny station

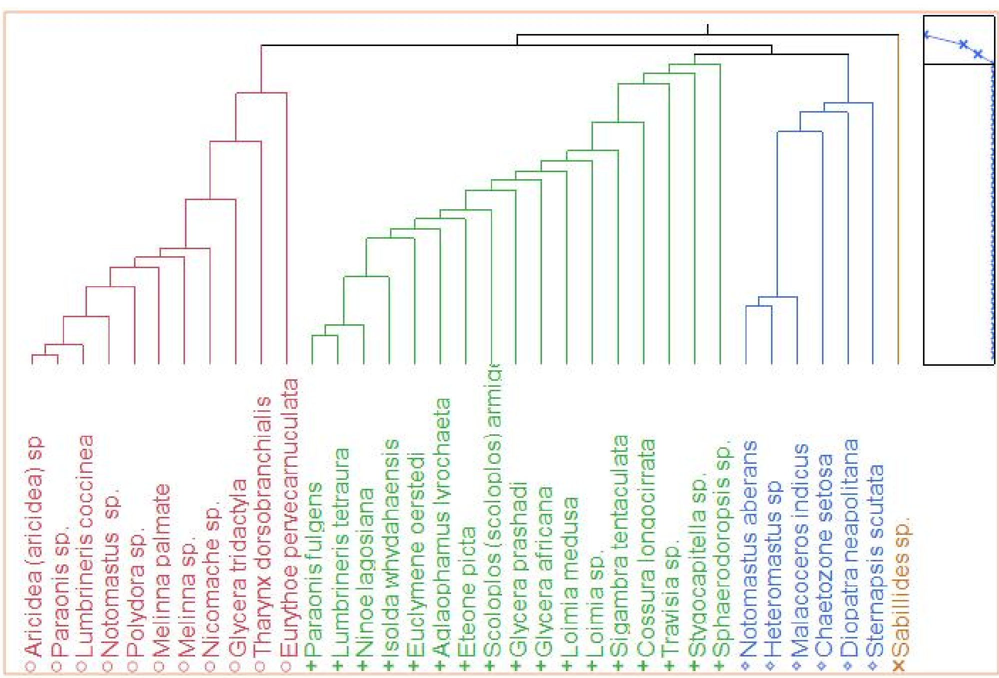


Fig. 3. Dendrogram of polychaete assemblages from shoreline and midchannel locations at Opudakiri station

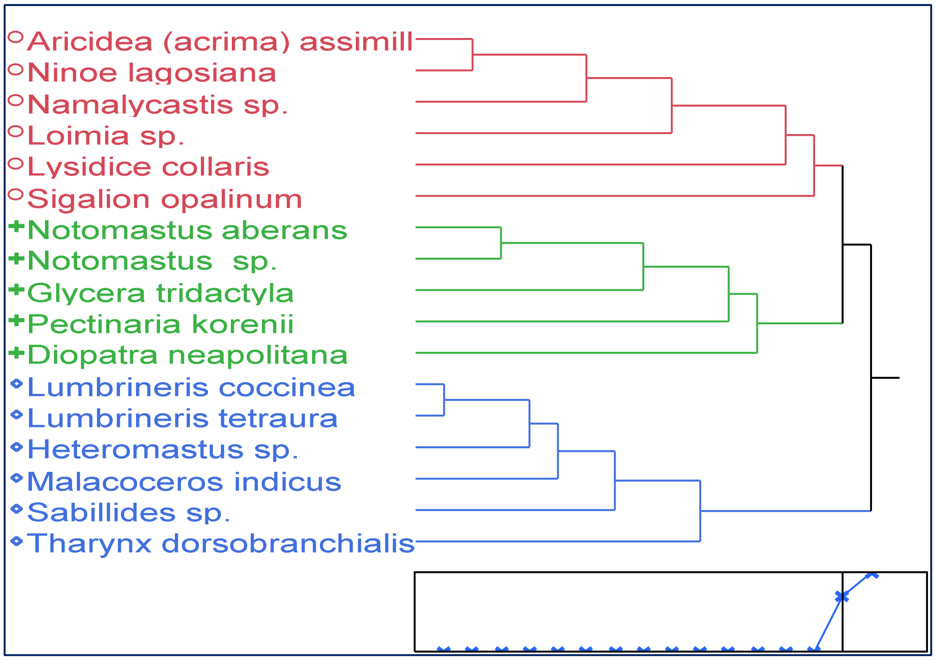


Fig. 4. Dendrogram of polychaete assemblages from shoreline and midchannel locations at Okrika station

clade of presence-absence for the period of sampling shows that only five (5) species co-occurred at the two stations. These were *Notomastus aberans, Notomastus sp., Glycera tridactyla, Pectinaria korenii, and Diopatra neapolitana.* At the shoreline–intertidal, the second cluster clade showed an exclusive occurrence of six (6) Polychaete species which were *Ariciea (acrima) assimillis, Ninoe lagosiana, Namalycastis sp., Loimia medusa, Lysidice collaris and Sigalion opalinum.* At the midchannel-subtidal, the third cluster clade also showed an exclusive occurrence of six (6) polychaete species. These were *Lumbinereis coccinea, Heteromastus sp., Malacoceros indicus, Sabillides sp. and Tharynx dorsobranchialis.*

In Fig. 5, a total of eleven (11) species of Polychaete were observed to occur at the Isaka stations between shoreline-intertidal and midchannel-subtital habitats. The first cluster clade of presence-absence for the period of sampling shows that only one (1) species, *Glycera tridactyla,* co-occurred at the two stations. The second cluster clade showed an exclusive occurrence of seven (7) species of polychaete at the shoreline-intertidal station. The species were *Ninoe lagosiana, Heteromastus sp., Prionospio sp., Polydora sp., Tharynx dorsobranchialis, Stenapsis scutata and Harmathoe* sp. The third cluster clade showed that only three (3) species occurred exclusively at the midchannel-subtidal station. The species were *Lumbrinereis coccinea, Malacoceros indicus* and *Diopatra neapolitana.*

In Fig. 6, a total of six (6) species of Polychaetes were observed to occur at the Iwofe stations between shoreline-intertidal and midchannel-subtital habitats. The first cluster clade of presence-absence shows that only two (2) species, *Notomastus aberans* and *Glycera tridactyla,* co-occurred at both habitats. The second cluster clade showed an exclusive occurrence of four (4) species of Polychaetes at the shoreline-intertidal station. The Polychaete species were *Neanthes sp., Nephthys assimilis, Scolplos (scoloplos) armiger and Sigambra tentaculata.* There were no species that occurred exclusively at the midchannel-subtidal station.

3.1 Co-Occurring Polychaetes

The co-occurring polychaete species at the intertidal and mid-channel in all the stations which are termed Generalists were categorized into classes through a categorical test of proportion. Three categories were identified as those with equal proportion at the shoreline and mid-channel [Shoreline_Midchannel (SHMC)]; those with greater proportion at the shoreline [Shoreline-Dominant- Generalists (SDGN)] and those with greater proportion at the mid-channel [Midchannel-Dominant –Generalist (MDGN)]. In Fig. 7, the mosaic plot of a test of proportion shows the proportionality of the three categories (SHMC, SDGN and MDGN) of the Generalist species in the dataset at the margins. On the other hand the main plot shows the contingent proportionality of the groups within each Generalist category. The Pearson statistics with the p-values less than 0.01, showed that the distribution of the different categories had a significant difference in the probability and the occurrence proportion of Generalist categories (i.e. Generalist types were not homogenous across the three groups of occurrence).

4. DISCUSSION

The study has shown evidence of Polychaete species associations occurring in the intertidal and subtidal habitats along stations on the Bonny River. The presence-absence model in cluster analysis revealed two categories of Specialists and one Generalist category. Within the Generalist category, the abundance model revealed three (3) Generalist associations in categorical analysis that indicate habitat preferences within stations. At the Bonny station, the presence-absence showed an association of species whose habitat-preference was highest for the co-occurring cluster (51%) than for Specialists at the shoreline-intertidal (38%) and mid-channel-subtidal (10%). In contrast to the Bonny station, Opudakiri station (7km upriver) showed a significantly higher habitat-preference for Specialist associations restricted to the intertidal (49%) and the subtidal (34%) than co-occurring (Generalist) species (17%). At the Okrika stations, the cluster from presence-absence also followed similar higher proportions of habitat-preference for Specialists at the intertidal (39.2%) and subtidal (39.2%) habitats and corresponding lower values for co-occurring (Generalists) association (29.4%). Specialists also outperformed the Generalists at Isaka and Iwofe with respect to presence-absence. Habitat-preference at Isaka was much higher for the intertidal association (64%) and subtidal (27%) than the co-occurring (Generalists) association (9%).

Consistent with the evidence of habitat preference, the sub-categorization of the Generalists (co-occurrence taxa) with abundance data indicated higher preference for the shoreline intertidal (61.5%) compared to mid-channel-subtidal inhabitants (34.4%). This line of evidence of a higher habitat preference at the shoreline- intertidal is supported by the higher ratio of the dominant Generalists (1:5) at the shoreline-intertidal than those at the mid-channel-subtidal (1:2) suggesting that the intertidal increases the likelihood for higher dispersal of generalist species.

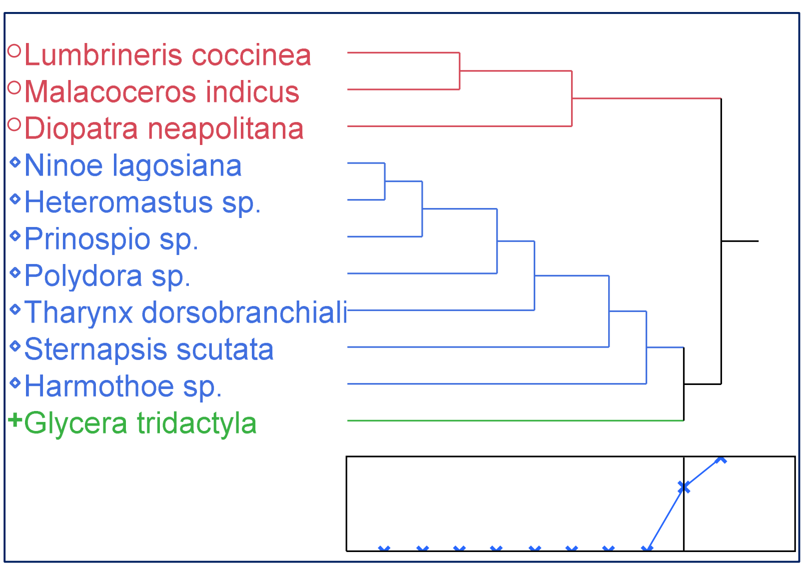


Fig. 5. Dendrogram of polychaete assemblages from shoreline and mid-channel locations at Isaka station

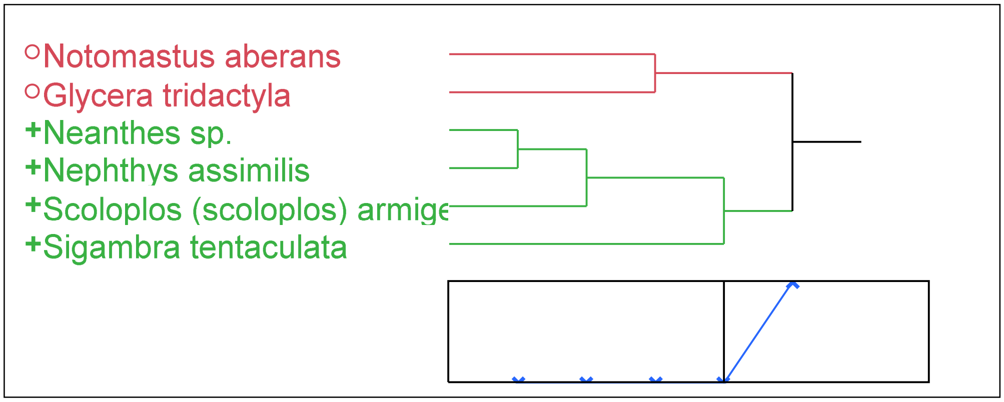
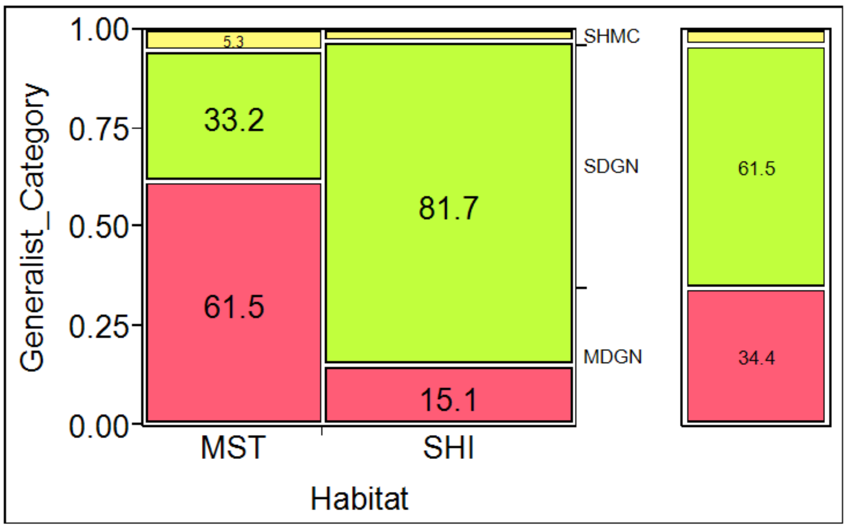


Fig. 6. Dendrogram of polychaete assemblages from shoreline and mid-channel locations at Iwofe station



MST = Midchannel Subtidal; SHI = Shoreline Intertidal;
SHMC=Shoreline_Midchannel category; SDGN=Shoreline_Dominant Generalist category;
MDGN = Midchannel Dominant_Generalist category;

Count row %	MDGN	SDGN	SHMC	
MST	209	113	18	340
	61.47	33.24	5.29	
SHI	72	389	15	476
	15.13	81.72	3.15	
	281	502	33	816

Test	Chi square	Prob>ChiSq
Likelihood Ratio	207.729	<.0001*
Pearson	201.749	<.0001*

Fig. 7 Mosaic plot of proportion of distribution by adaptation of the generalists across all the 10 stations

In general, the study has shown a generalist–specialist continuum between habitats from Bonny to Iwofe along the Bonny River. Based on the incidence model (presence-absence), the generalist-specialist associations coexisted in a non-linear pattern of habitat-preference between stations. Habitat preference among the Polychaete was highest for the Generalists only at Bonny station (58%) coexisting with specialists at Opudakiri (18%), Okrika (15%), Isaka (3%) and Iwofe (6%). For the Specialists, habitat preference between the intertidal and subtidal was interspersed between stations without a discernible pattern at Bonny (33%:13%), Opudakiri (38%:41%), Okrika (13%:21%), Isaka (16%:10%) and Iwofe (9%:0%). The likelihood of higher dispersal due to habitat preference would seem therefore to depend on local intraspecific processes which, like other species, are consistent with ecological concepts that explain niche limitation at local scale [34]. From the results, it is plausible to infer, in agreement with many studies, that the polychaete associations were tied to the intertidal and subtidal habitats according to the breadth of habitat requirement [35,36,37,38,39]. Supported by these observations, this study is indicative of the degree of specialization and a measure of habitat limitation at local scale for either Generalists or Specialists. , According to the occurrence metric along the continuum from Bonny to Iwofe fine differences in habitat preference were shown for the twenty-eight (28) Generalists. Among the Generalists, only two species, *Glycera tridactyla*, and *Notomastus aberans,* had the highest habitat- preference value on the basis of their occurrence at five (5) of the intertidal and subtidal stations at Bonny, Opudakiri, Okrika, Isaka and Iwofe. A moderate value of habitat-preference was observed for two other species, *Diopatra neapolitana* and *Tharynx dorsobranchialis*, whose habitat preference were localized at the intertidal and subtidal stations of Bonny, Opudakiri and Okrika. The lowest value of habitat preference was shown by five (5) species, *Eteone picta*, *Melinna palmate*, *Polydora* sp., *Sigalion opalinum* and *Sternapsis scutata* whose occurrence, was localized in only two stations, namely Bonny and Opudakiri or Opudakiri and Isaka. The fourth group of generalists contains thirteen (13) species whose habitat preference was confined to one station, mostly at Bonny which is the mouth of the river. These were *Aricidea simplex, Chaetozone setosa*, *Glycera prashadi*, *Lumbinereis coccinea*, *Lumbrinereis aberrans, Lumbrinereis latreilli, Lumbrinereis paradoxa, Lumbrinereis tetraura, Malacocerous indicus, Notomastus* sp*., Paracapitella pettiboneae, Pectinaria korenii*, and *Scoloplos (leodamas) johnstonei*.

Similar fine-tuned differences in habitat specialisation were deduced from preferences shown by the specialists at the intertidal or subtidal areas between stations. Three species, namely *Neanthes* sp*., Nephthys assimilis and Sigambra tentaculata,* emerged as those with the highest overall distribution at the local scale among the intertidal specialists, having occurred in five stations from Bonny to Iwofe stations. In contrast, there was no wide overall distribution at a local scale shown by any of the Polychaete species among the midchannel subtidal specialists. Only one species, *Sabillides* sp., had narrow local scale habitat occupancy in two stations at the mouth of the Bonny River, namely Bonny and Opudakiri. As a result, the attachment of species associations to individual habitats on the Bonny River shows considerable differences among many species. However three ecologically relevant findings are plausible. Firstly the wide distribution of few specialists and generalist shows they are neither transitional nor opportunistic. Secondly they indicate ecological fitness in inhabiting either the intertidal or subtidal irrespective of episodic changes to the sediment. Thirdly it is plausible that as in some Polychaete and Fish associations [40,41] they provide biotic cues that may affect behavioral attributes of recruitment for transitional and opportunistic species.

A number of studies are still necessary in order to improve on our understanding of the isolating effects of niche requirements that act to differentiate observed patterns of habitat preference at this local scale. In particular the relationship of resource availability to population and species densities and their responses to combined footprint of disturbance is required especially in marginal areas of species habitat preference. From this study, future research can use the indicator associations and their resource requirements, to predict changes in habitat preference as polychaetes respond to man-made and natural environmental changes. By examining the trade-offs between specialization and generalization, results of patchiness and plasticity of polychaetes can be interpreted during environmental assessment and monitoring surveys.

5. CONCLUSION

The study has highlighted the indicative associations of Polychaetes and their habitat preferences between the intertidal and the subtidal zones along the environmental gradient on Bonny River. It has provided ecologists a basis to research species resource requirements that influence distribution and abundance in each habitat under various environmental conditions.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Appendix 1

Total abundance of polychaete species throughout the months of July, August, September, October and December 2013, January 2014, February to March 2014

Species	Bonny_shoreline	Opudakiri_shoreline	Okrika_shoreline	Isaka_shoreline	Iwofe_shoreline	Bonny_midchannel	Opudakiri_midchannel	Okrika_midchannel	Isaka_midchannel	Iwofe_midchannel
Aglaophamus lyrochaeta	2	3	0	0	0	0	0	0	0	0
Aglaophamus malmgreni	114	0	0	0	0	14	0	0	0	0
Aricidea (Acrima) assimills	0	0	1	0	0	0	0	0	0	0
Aricidea (Aricidea) sp.	0	0	0	0	0	0	1	0	0	0
Aricidea simplex	2	0	0	0	0	3	0	0	0	0
Ceratonereis (Composetia) costae	1	0	0	0	0	0	0	0	0	0
Chaetozone setosa	0	9	0	0	0	33	14	0	0	0
Cossura longocirrata	11	15	0	0	0	19	0	0	0	0
Dasychone serratibranchis	1	0	0	0	0	0	0	0	0	0
Diopatra neapolitana	21	5	1	0	0	41	19	10	10	0
Eteone picta	0	4	0	0	0	1	0	0	0	0
Euclymene oerstedi	0	9	0	0	0	0	0	0	0	0
Eurythoe pervecarnuculata	0	0	0	0	0	0	1	0	0	0
Glycera africana	0	4	0	0	0	0	0	0	0	0
Glycera prashadi	9	2	0	0	0	2	0	0	0	0
Glycera tridactyla	12	0	2	7	1	3	3	1	3	4
Glycinde kameruniana	3	0	0	0	0	0	0	0	0	0
Gyptis incisa	4	0	0	0	0	0	0	0	0	0
Harmothoe sp.	0	0	0	1	0	0	0	0	0	0
Heteromastus sp.	0	12	0	15	0	0	6	5	0	0
Heterospio longissima	0	0	0	0	0	2	0	0	0	0
Isolda whydahaensis	1	1	0	0	0	0	0	0	0	0
Loimia medusa	0	1	0	0	0	0	0	0	0	0
Loimia sp.	0	1	1	0	0	0	0	0	0	0
Lumbrineriopsis paradoxa	1	0	0	0	0	8	0	0	0	0
Lumbrineris aberrans	1	0	0	0	0	4	0	0	0	0
Lumbrineris coccinea	2	0	0	0	0	7	3	4	8	0
Lumbrineris fragilis	0	0	0	0	0	6	0	0	0	0
Lumbrineris heteropoda difficilis	26	0	0	0	0	0	0	0	0	0
Lumbrineris latreilli	1	0	0	0	0	1	0	0	0	0
Lumbrineris tetraura	8	10	0	0	0	1	0	2	0	0
Lysidice collaris	1	0	1	0	0	0	0	0	0	0
Malacoceros indicus	4	2	0	0	0	3	4	1	1	0
Maldane sarsi	4	0	0	0	0	0	0	0	0	0
Melinna palmate	2	0	0	0	0	0	2	0	0	0
Melinna sp.	0	0	0	0	0	0	2	0	0	0
Namalycastis sp.	0	0	2	0	0	0	0	0	0	0
Neanthes sp.	0	0	0	0	18	0	0	0	0	0
Nephthys assimilis	8	0	0	0	14	0	0	0	0	0
Nicomache sp.	0	0	0	0	0	0	6	0	0	0
Ninoe lagosiana	24	17	20	14	0	5	0	0	0	0

Notomastus sp.	0	0	3	0	0	0	3	3	0	0
Notomastus aberans	6	5	2	0	8	10	1	1	0	2
Notomastus latericeus	2	0	0	0	0	2	0	0	0	0
Paracapitella pettiboneae	3	0	0	0	0	4	0	0	0	0
Paraonis fulgens	0	2	0	0	0	0	0	0	0	0
Paraonis pygoenigmatica	2	0	0	0	0	0	0	0	0	0
Paraonis sp.	0	0	0	0	0	0	1	0	0	0
Pectinaria korenii	0	0	3	0	0	0	0	2	0	0
Polydora sp.	0	0	0	1	0	0	2	0	0	0
Prinospio sp.	0	0	0	1	0	0	0	0	0	0
Sabillides sp.	0	0	0	0	0	0	4	1	0	0
Scoloplos (Scoloplos) armiger	50	3	0	0	1	16	0	0	0	0
Sigalion opalinum	0	0	1	0	0	2	0	0	0	0
Sigambra tentaculata	1	1	0	0	2	0	0	0	0	0
Simplisetia erythraeensis	9	0	0	0	0	0	0	0	0	0
Sphaerodoropsis sp.	0	1	0	0	0	0	0	0	0	0
Sternapsis scutata	13	5	0	5	0	15	18	0	0	0
Stygocapitella sp.	0	1	0	0	0	0	0	0	0	0
Tharynx dorsobranchialis	8	0	0	9	0	0	11	3	0	0
Travisia sp.	0	1	0	0	0	0	0	0	0	0

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