Density Composition and Feeding Guild of the Dominant Polychaetous Community in Shallow Muddy Bottom in Tomioka Bay, Amakusa, Japan

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Polychaetous community survey in Tomioka Bay was carried out 5 times seasonally from May 1991 to March 1992 by quantitative grab sampling ($0.05m^2$) at 11 stations. Based on the granulometric composition and environmental factors, a homogeneous soft bottom was found in St.5~10. The species of the polychaete were classified into three feeding groups using the Fauchald and Jumars' feeding guild system. According to polychaetous community composition data, deposit feeders predominate in sandy silt area where the silt-clay content is 60~69.3%. These deposit feeders were subdivided into surface deposit feeders and subsurface deposit feeders by their living position and mode. Also, suspension feeding group comes as the third dominant group. Seasonal changes of each feeding group were described in terms of numerical density and biomass. Feeding layer and types of dominant species (*Lumbrineris longifolia:* surface deposit feeder; *Praxillella pacifica:* subsurface deposit feeder; *Chone duneri:* suspension filter feeder, etc.) were examined in the intact sediment core samples. Also, longterm density change among the three dominant species during 10 years was disussed.

Key words : polychaetous community, feeding guild, Tomioka Bay, Japan

Introduction

Since the beginning of this century, many researchers have reported the benthic fauna of some definite sea region may be classified into a few number of benthic community types. The spatial distribution range of such "communities" often coincided with those of depth or sediment types (cf. review of Thorson, 1957). Sanders (1958) introduced a new aspect concerning hydrodynamics and available food resource into this classical animal-sediment relationship. In sedimentology, it is well known that the granulometric characters of surface sediment is determined by hydrodynamic forces of overlying water. They primarily determine whether the particulate organic matter (potential food of benthos) exists as near bottom suspension or settled on the sediment at the same forces. On the other hand, suspension feeders which ingest suspended organic particles and deposit feeders which ingest organic particles and organic materials on or in the sediment are two major trophic groups in the marine benthos. Sanders (1958) suggested that the best avalability for infaunal suspension feeder may be fine sand bottom (Md=0.18 mm) because hydrodynamic condition producing such sediment condition offers the highest concentration of organic suspension flowing immediately above the bottom surface. Under more calm hydrodynamic condition even the finest organic particle may sink down to the bottom where deposit feeders dominate community develops.

Russian researchers (Turpaeva, 1959; Savilov,1959) reached similar conclusion through large scale regional studies, and Pearson (1971) demonstrated good example of this relationship in his benthos study in Scotish fjord. Thus the view point explaining animal-sediment type relationship from the link of hydrodynamic condition and suspension/deposition of organic particles and potential food availabilty of benthos, is still effective in benthic community's wide scale arrangement.

Accompanying with advances of ecological theory on niche divergence and resource partitioning, inter-and intra-feeding type group relations were discussed by some authors (Woodin, 1974, 1976; Peterson, 1979; Levin 1982, etc.). In his essay on stability and trophic structure in deposit-feeding and suspension feeding communities, Levinton (1972) stated that deposit feeders exploit predictable food supply and living in relatively stable habitats. With such stability, one can expect that food and specialization of feeding depth or different grain size fractions will be evolved due to these interactions.

In macrobenthic community of Tomioka Bay, especially polychaetous community was studied widely by Shibata (1980), and Yun and Kikuchi (1989). Based on their results, we focused on muddy bottom where high proportion occurrence of deposit feeders was expected. Quantitative grab sampling was made seasonally, member of polychaetes were classified by feeding types and living mode. Also, density and biomass of each feeding type were measured and their seasonal variatious were investigated. Possibility of food differenciation by feeding type and feeding layer among higher rank species was examined by feeding guild analysis by mouth part morphology and systematic group. (Fauchald and Jumars, 1979). Direct measurement of feeding layer of polychaetes in the intact core samples was also performed. And density change of dominant species during 10 years was discussed based on our data and other reports.

Material and Methods

A. Study Area

Tomioka Bay is located at the northwest corner of Shimoshima Island, West Kyushu in Japan (32°31'N, 130 02'E). This small bay is widely opened to north, with the mean depth of less than 10 m, and the depth increases gradually to the bay mouth rather steeply up to 30 m. There is a narrow sand spit encircling inner part of the bay forming a very calm cove named Tomoe Cove where soft muddy bottom was developed. Relationship between bottom sediment characters and macrobenthos community of Tomioka Bay was previously investigated by Shibata (1980). The sediment component of the main area of Tomioka Bay is sandy or shell/sand bottom. However a muddy or sandy mud zone exist near the mouth of Tomoe Cove and the adjacent zone or especially at a groove as if topography parallel with the arm of sand spit.

Eleven sampling stations were chosen for the study of polychaetous community (Fig. 1), and homogeneous muddy sites were selected for the ecological survey of the dominant species.

Air and bottom seawater temperature were measured by monthly basis throughout the year, and the surface sediment and bottom seawater temperature was measured at St. 6 (Fig. 2).

B. Field Survey

1. Study of Community Structure and Seasonal Variation of Density

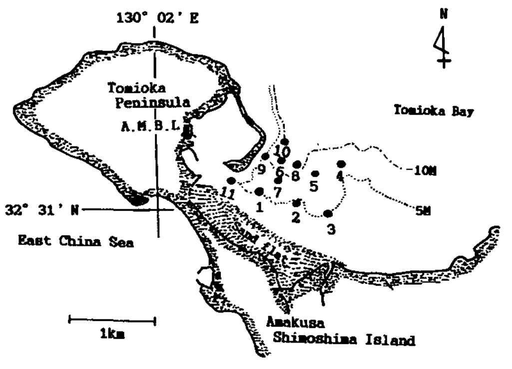

Fig. 1. The map of Tomioka Bay showing sampling stations. Sampling with 2.5 month interval was carried out seasonally at eleven stations.

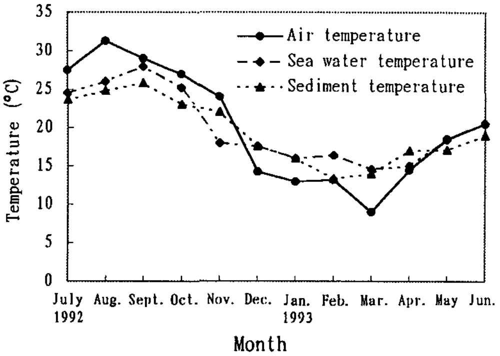

Fig. 2. Monthly changes in air, bottom seawater and sediment temperature.

Eleven sampling stations were settled in the western half of main area of Tomioka Bay, which is covered with muddy bottom. Quantitative sampling was done 5 times from May 1991 to March 1992 (May, July, October, January and March) with approximately 2.5 month interval. Duplicate sediment samples were taken at each station using a Smith-McIntyre grab samper (0.05 m^2), sediment samples were sieved with a 0.5 mm sieve on board of the reasearch boat, and the retained materials were fixed with 10% seawater formalin solution. In the laboratory, materials were stained by Rose Bengal and sieved again with 1 mm mesh. Macrobenthos were sorted out and fixed in 10 % seawater formalin solution and then kept in 75% ethyl alcohol. Of the benthic animals, only the polychaetous components were used for community study. These polychaetes were identified and counted. For identification of species, monographs of Day (1967), Fauchald (1977), and articles of Imajima and Hartman (1964), Imajima (1973), Imajima and Higuchi (19 75), Imajima and Shiraki (1982) and Imajima (1984~1985) were refered. Based on the species composition data which summed up 5 seasonal samples, cluster analysis among 11 stations was carried out using Kimoto's similarity index $C\pi$ (Kimoto, 1970) and a dendrogram was made using centroid method. For the measurement of community diversity, number of species, Shannon's H' index and Pielou's index J'=H'/H' max were calculated for seasonal samples. A feeding type of polychaetes was classified by Fauchald and Jumars (1979). Community samples were classified by feeding type groups and dominant species of each feeding type (dry flesh weight) were examined in numerical density and biomass.

2. Measurement of Living Position of Polychaetes

In August 1993, vertical sediment cores were taken at St.6 using a diver-operating hand corer (10 cm diameter, 30 cm long), and both ends of the corer were closed by rubber plugs. Thirty core samples were taken and kept uplight position in a tank supplying running seawater in the laboratory. After 12 hours, the sediment core was kept outside of the tank vertically, and the bottom plug was removed. From the falling

Table 1. Mean depth and sediment characteristics

Item \ Station		1	2	3	4	5	6	7	8	9	10	11
Depth (m)		5.9	5.9	4.6	8.5	11.2	11.2	10.2	10.4	11.1	10.9	5.9
Grain size	Q1	3.32	2.32	-0.61	1.9	2.42	2.5	2.62	2.71	1.75	0.9	1.52
in ϕ	Md	3.56	2.79	0.22	2.12	3.4	3.7	3.57	3.76	3.12	2.36	2.12
	Q3	3.95	3.5	0.75	2.81	4.31	4.4	4.32	4.42	4.38	4.11	3.43
Coefficient of skewness		1.02	1.02	0	1.09	0.95	0.89	0.94	0.92	0.89	0.67	1.08
Sorting coefficient		0.91	0.81	0	0.82	0.74	0.75	0.78	0.78	0.63	0.47	0.66
Silt-clay %		89.8	31	1.2	1.9	60	66.8	66.8	69.3	47	50	37
Sediment types		Silt-clay	Silty sand	Sand		Sandy silt				Silty sand		

mud the segment of the core was cut in 5 cm interval, the mud was observed carefully, and head position of all polychaetes were recorded. Direct observation of life mode or feeding position of the dominant species were done in the labolatory. In a shallow aquarium (14 cmL×20 cmH×1 cmW) defaunated mud was filled in 10 cm depth and seawater was gently irrigated.

Result

A. Environmental Factors

The water depth and sediment characteristics of 11 sampling stations are shown in Table 1.

Temperature was taken monthly at St.6 from July 1992 to June 1993. Sediment temperature was minimum 13.7° in February and maximum 26° in September (Fig. 2). The result of granulometric analysis of surface sediment of the stations is also plotted on Shepard's triangular diagram (Fig. 3). As gravel component is complemently lack in the surveyed area, plots spred on one-dimension.

From the sand bottom of St.3 and St.4, the Mdϕ values were 0.22 and 2.12, silt-clay contents were 1.2 and 1.9%, respectively. St.5~8 which are located at the near of cove mouth, silt-clay contents were 60~69.3% and Mdϕ values were 3.4~3.76, respectively. Sediment type of these stations was sandy silt sediment. St.2 which is located at inner bay and St.9~11 have 37~50% of silt-clay contents. These stations had silty sand sediment. St.1 in the inner of Tomioka Bay has a Mdϕ value 3.56 and 89.8% silt-clay content.

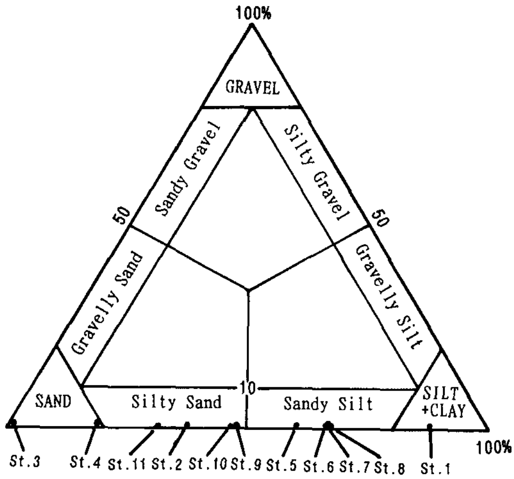

Fig. 3. Sediment types of the sampling stations plotted on Shepard's triangular diagram.

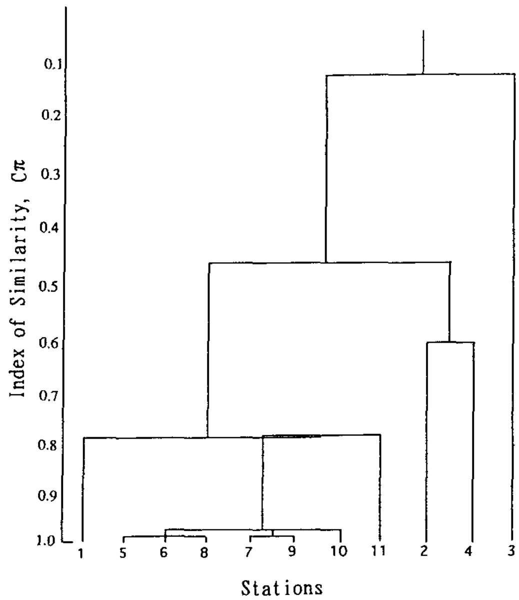

Fig. 4. Dendrogram shows the result of clustering of Kimoto's similarity index, Cπ values of polychaetous community composition among sampling stations.

B. Polychaetous Community Composition

B.1. Community Study of Each Station: We calulated similarity index Cπ among community composition of each station and the result is illustrated as dendrogram (Fig. 4).

The stations were divided into one homogeneous area covering St.1 and St.5~11, and three less similar stations (St.2~4). In the former homogeneous area, St.1 and St.11 have a little lower similarity value than others. This grouping of stations is almost coincided with granulomertric characters of sediment. Actual species composition of dominant rank species in those ststions is shown in Table 2 and 3.

Table 2. Dominant polychaetes species at St.1~4 and 11. Each station data as the sum of 5 months seasonal samples (May, July, October, January and March)

Stations	Species		Numbers	%
Station 1	*Praxillella pacifica*	1)	369	14.4
	Lumbrineris longifolia	2)	330	12.9
	Scoloplos armiger	1)/2)	324	12.6
	Paraonides lyra lyra	2)	132	5.2
	Magelona japonica	1)/2)	127	5.0
Station 2	*Praxillella pacifica*	1)	396	28.7
	Polydora sp.	2)	136	9.9
	Paraonides lyra lyra	1)	99	7.2
	Prionospio sp.1	2)	93	6.7
	Prionospio sp.2	2)	61	4.4
Station 3	*Euchone* sp.	3)	225	30.4
	Pista cristata	3)	88	11.9
	Pseudopolydora sp.	2)	58	7.8
	Chone duneri	3)	48	6.5
	Syllis spongicola	4)	25	3.4
Station 4	*Syllis* sp.	4)	137	13.9
	Praxillella pacifica	1)	90	9.1
	Chone duneri	3)	60	6.1
	Chaetozone setosa	2)	53	5.3
	Armandia sp.	2)	35	3.5
Station 11	*Lumbrineris longifolia*	2)	567	19.5
	Chaetozone setosa	2)	456	15.7
	Scoloplos armiger	1)/2)	320	11.0
	Prionospio sp.	2)	196	6.7
	Praxillella pacifica	1)	181	6.2

* 1): Subsurface deposit feeder, 2): Surface deposit feeder, 3): Suspension feeder, 4): Herbivore.

In Table 2, species composition of St.3 is not overlapped with other stations. The difference may be reflected by the unique sediment type. *Praxillella pacifica* appeared at 4 stations (St. 1, 2, 4, 10) except St.3 but *Lumbrineris longifolia, Scoloplos armiger, Paraonides lyra lyra* and *Chaetozone setosa* appeared at two stations, St.1 and St.11. *Chone duneri* appeared at St.4. These slight discrepancies and differences of dominance rank are the reason for the rather low similarity values.

On the other hand, the dominant species at St.5~10 are almost the identical forms (Table 3). It is well known that feeding types of marine benthos are classified into 4 categories; suspension feeder, deposit feeder, herbivore and canivore. The deposit feeder is subdivided into, surface and subsurface deposit feeders. The fact that suspension feeders and deposit feeders are microphagy and processing the suspended organic particles or microorganisms on or in the sediment is important. Based on the feeding guild sys-

Table 3. Polychaetous community composition at the intensive study area. Data is based on the average of six sampling stations. Each station data is the sum of 5 month (May, July, October, January and March) seasonal samples.

					Stations				Cumulative	Feeding	Guild
Rank	Species	5	6	7	8	9	10	mean	Percentage	Types	Types
1.	*Lumbrineris longifolia*	736	803	779	785	755	822	780	31.11%	SD	BMJ
2.	*Scoloplos armiger*	339	281	292	339	299	436	331	43.31	SD/SubD	BMX
3.	*Praxillella pacifica*	181	263	255	186	285	288	243	54.00	SubD	BSX
4.	*Polydora* sp.	81	156	148	103	72	288	141	59.63	SS/SD	FST/SDT
5.	*Chone duneri*	60	87	216	76	210	123	129	64.78	SS	FST
6.	*Nephtys oligobranchia*	148	68	103	65	99	99	97	68.65	SD	BMJ
7.	*Mediomastus capensis*	50	70	63	40	57	57	56	70.88	SubD	BMX
8.	*Prionospio sexoculata*	37	59	52	42	51	56	50	72.87	SD	SDT
9.	*Euchone* sp.	29	32	60	46	52	63	47	74.87	SS	FST
10.	*Prionospio pulchra*	28	60	41	41	38	32	40	76.47	SD	SDT
10.	*Madanella* sp.	54	60	49	30	17	30	40	78.06	Subd	BSX
12.	*Prionospio ehlersi*	31	40	43	27	34	42	36	79.40	SD	BSX
13.	*Notomastus latericeus*	16	22	39	27	22	35	27	80.57	SubD	BMX
14.	*Mediomastus* sp.	39	12	39	5	10	33	23	81.47	SubD	BMX
15.	*Paraonis gracilis*	13	26	21	26	26	22	22	82.37	SD	SMX
16.	*Boccardia* sp.	14	27	5	25	24	30	21	83.21	SD	SDT
17.	*Maldanid* sp.1	19	20	21	9	21	15	10	83.96	SubD	BSX
17.	*Maldanid* sp.2	12	21	39	15	20	6	19	84.72	SubD	BSX
19.	*Pseudopolydora* sp.	10	9	23	35	19	11	18	85.44	SS/SD	FST/SDT
20.	*Haproscoloplos elongata*	3	6	15	11	34	15	14	86.00	SD	BMX
20.	*Sigambra tentaculata*	20	11	11	17	8	16	14	86.55	SD	BMX
22.	*Glycera capitata*	6	13	15	11	18	10	12	87.04	C	CMJ
22.	*Prionospio* sp.	10	16	3	14	15	14	12	87.51	SD	SDT
24.	*Capitella* sp.1	20	10	0	17	13	7	11	87.95	SubD	BMX
24.	*Syllis* sp.	59	2	0	1	0	0	11	88.39	Herb	SMX
	Total Number of individuals	2629	2284	2865	2174	2395	2697	2507	100%		

1) SS: suspension feeder, SD: surface deposit feeder, SS/SD: facultative suspension & surface deposit feeder, Subd: subsurface deposit feeder, C: carnivore, Herb: herbivore.
2) Trophic guild types of Polychaeta proposed by Fauchald and Jumars (1970) defined by combination of feeding mode, mobility mode and structure of feeding organ. BMJ: burrowing, motile, jawed, BMX: burrowing, motile, non-jawed, BSX: burrowing, sessile, non-jawed, FST: filter-feeding, sessile, tentaculate, SDT: surface, deposit-feeding, discretely motile, tentaculate, SMX: surface deposit-feeding,motile, non-jawed, CMJ: carnivore, discretely motile, non-jawed.

tem of Fauchald and Jumars (1979), feeding types of each polychaete species is written in Table 2. In St.3, *Euchone* sp. and *Chone duneri* among the 5 dominant species are the gill crown suspension feeder and the *Pseudopolydora* sp. which has a pair of long antennae is known as facultative surface deposit feeder/suspension feeder. The predominance of suspension feeder in the sand bottom of St.3 is easily agreed with the animal-sediment relationship. In other stations most of species belongs to the deposit feeder, and the suspension feeder is represented by two species of Sabellidae (*C. duneri* and *Euchone* sp.). Carnivore are represented by a few species of Glyceridae (*Glycera capensis*), Aphroditidae, Polynoidae and Phyllodocidae. And herbivores are represented by Syllidae (*Syllis* sp. and *S. spongicola*). Among the deposit feeders, the tentaculated spionids and the gill filament spreading Terebellidae (*Pista cristata*) are typical surface deposit feeders, the Paraonidae (*Paraonis gracillis* and *Paraonides lyra lyra*) and Orbinidae (*Armandia* sp.) are also surface deposit feeders. Though real feeding depth and feeding behavior are unknown, *Lumbrineris longifolia* is regarded as a surface deposit feeder by Fauchald and Jummars (1979). *Nephtys oligobranchia* and *N. polybranchia* are also included in surface deposit feeder, in this study ingested sediment was observed in the digestive tract. Subsurface deposit feeder is represented mainly by Maldanidae (especially *Praxillella pacifica*). Species of Capitellidae (*Mediomastus* sp. and *Notomastus* sp.) also seems to be the subsurface deposit feeder but exact feeding layer was not determined. Therefore, we focused our study on living positions of polychaetes on homogeneous community in the St.5~10. St.1 and St.11 are also similar to those stations but these two stations are not included for the differences of the order of higher rank species and sediment characters.

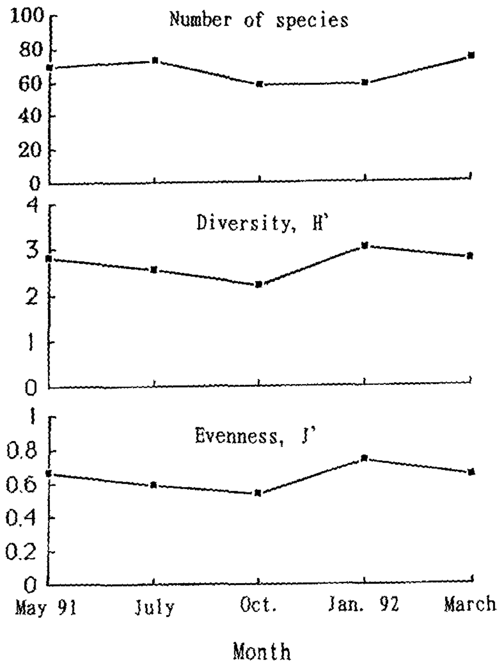

Fig. 5. Seasonal variations of the number of species, Shannon's diversity index H' and the index of evenness (Pielou's J' index=H'/H'max) values of the polychaetous community in St.5~10.

B.2. Community Structure Values in St.5~10

Based on the grab samples in the homogeneous muddy bottom community, seasonal variations of the number of species, Shannon's diversity index H', Pielou's evenness index J' were calculated (Fig. 5). Number of polychaete species of this area were averaged as 71 species. Number of species, H' and J' values were very stable and fluctuated within a narrow range.

B.3. Relative Dominance of Feeding Groups

Fig. 6 shows seasonal change of the relative abundance of feeding groups in the St.5~10. In May, deposit feeding group occupied 86% in density and 70% in biomass. Of the deposit feeding groups, the subsurface deposit feeders occupied 46% in number and 34% in biomass, and the surface deposit feeders occupied 40% in number and 36% in biomass. Suspension feeders occupied 11% in number and 8% in biomass. Carnivores are only a few in number, it was negligible in number but 18% in biomass for their large body size. In July and October, the portion of suspension feeder was decreased and more than 90% in number was occupied by a deposit feeder group, and division of two subgroups were almost unchanged. In biomass of January, subsurface deposit feeders reduced less than 18% by reduction of *Praxillella pacifica*. In biomass, seasonal trends of percentage share of each feeding group is not so different. The surface deposit feeder group is predominant in this community and rather stable for constant presence of the

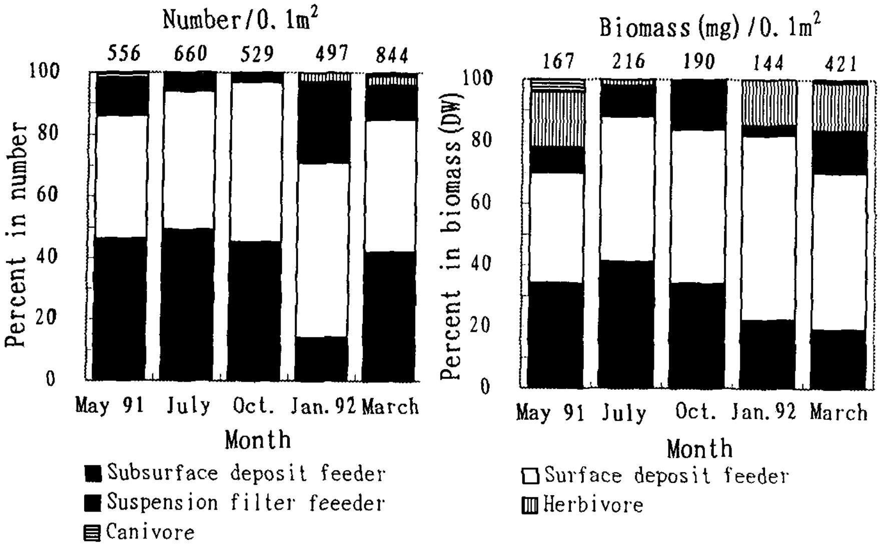

Fig. 6. Seasonal change of the polychaetous feeding groups in density and biomass (dry body weight). The data based on the sum of seasonal samples at St.5~10.

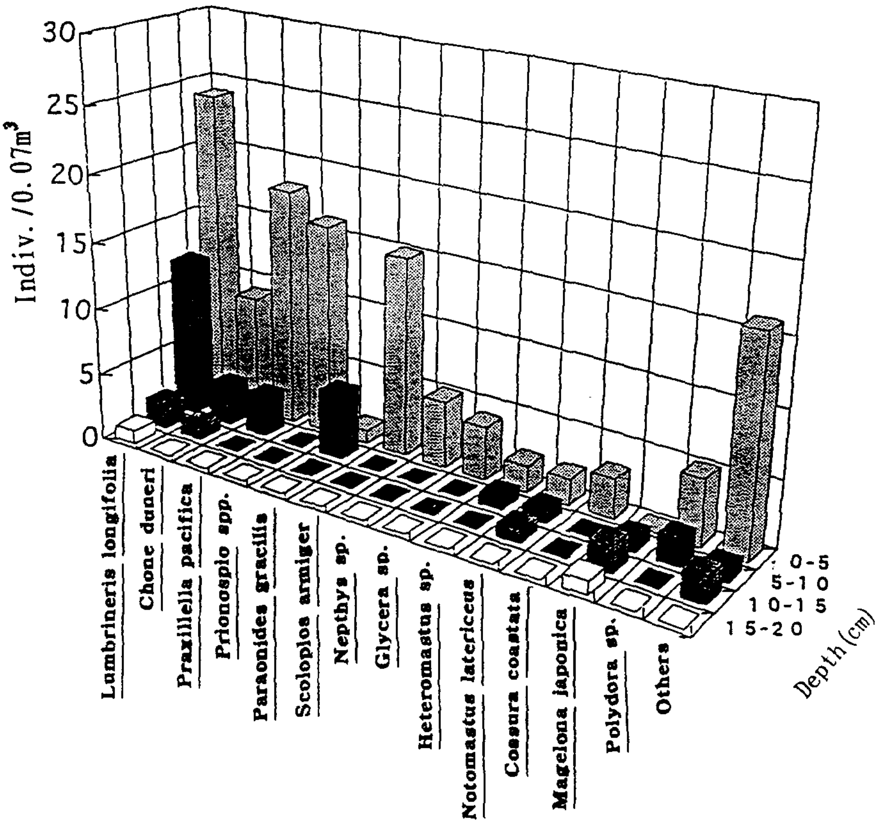

Fig. 7. Vertical distribution of the dominant polychaete species in sediment. Life position of each species was determined by analysis of core samples obtained by underwater sampling at St.5~10.

dominant species, *Lumbrineris longifolia* and many species with considerably large numbers. On the contrary, the suspension feeder group was represented mainly by *Chone duneri* alone, it occupied 60% of suspension feeder group in number and 89% number in May. The subsurface deposit feeder was represented mainly by *Praxillella pacifica.*

C. Measurement of Living Position and Feeding Depth

Fig. 7 shows the results of vertical depth measurement of each species in plastic cores. If the burrowing depths of individuals are primarily determined by feeding layer, all the suspension feeders and surface deposit feeder should be found in shallow layer near surface, and only the subsurface deposit feeder will be found in the deep layer in the sediment.

However, some of polychaetes have solid nest tubes longer than their whole bodies, or they make vertical shafts or mucus-lining slant pits and quickly move in such shafts or pits, and they also displace from normal feeding layer. In this study, the occurence of small Spionids (*Prionospio* spp., *Polydora* sp.), *Nephtys* sp., *Cossura coastata* (surface deposit feeder), *Glycera* sp. (carnivore catching prey at bottom surface) are limited at the upper 0~5 cm. And two subsurface deposit feeders, *Notomastus latericeus* occurred from 0~15 cm layer, but *Paraonides gracilis* occurrs at 5~10 cm layer and occurred rather evenly in *N. latericeus.* These results are well agreed with expectation from their feeding habit. *Lumbrineris longifolia* is a free burrower making slant pit in any direction and occurred in 0~5 cm layer. *Chone duneri,* a gill crown suspension feeder, also occurred from surface to 15 cm, more than 60% occurrs in 0~5 cm layer but nearly 40% occurred 5~15 cm layer. *Magelona japonica* is known as a surface deposit feeder with long antennae, but it appeared in 5~20 cm layer and not found in 0~5 cm layer. *Praxillella pacifica* is a solid vertical tube builder and seems to feeds in the lower end of mud tube. It occurred in both 0~5 cm layer (85%) and 5~10 cm layer (15%). In this case, rather small body size and short tube length limited the feeding layer of this species.

Discussion

Various types of sediment, from silt-clay area to sand bottom area, are distributed at 11 sampling stations in Tomioka Bay. These stations are classified into 4 subareas: sand bottom area, silty sand area, sandy silt area and silt-clay area. The suspension feeding group and deposit feeding group predominated in the sand bottom area (silt-clay content 1.2~1.9%) and the soft mud bottom area. Deposit feeding group could be divided into surface deposit feeders which distributed at silt-clay 31~66.8% areas and subsurface deposit feeder which distributed at silt-clay 60~69.8% areas, respectively. The abundance of subsurface deposit feeding polychaetes was increased with the increment of concent, whereas the abundance of suspension feeders were decreased. For relation of animal-sediment types, suspension feeding group is predominant between coarse sand and find sand, deposit feeding group animals are predominant in muddy bottom. Subsurface deposit feeders are predominant in well oxygenated organic area (Sanders, 1958; Savilov, 1959). Many authors had been reaching the same conclusion that animal's abudance has a very close relationship with feeding guilds and silt-clay contents (Rhoads and Young, 1970; Pearson, 1971; Gray, 1974; Kikuchi, 1977; Tamaki, 1984a, b; Yun and Kikuchi, 1989). Turpaeva (1959) studied that various feeding types were co-existing in intermediate area of sandy mud and muddy sand area, and each different feeding type species are top abundance rank, complementary each other. We found there are three feeding groups in sampling stations where silt-clay contents are ranged from 37% to 66.8% (St.5~10) in Tomioka Bay. These areas of the cove mouth toward open sea have flowing water current and soft muddy bottom.

Table 4. Comparison of density change in the three species (/1 m^2) during 1980~1992 and sediment composition in Tomioka Bay

References	Species	1	2	3	4	5	6	7	8	9	10	11	Total No.
Shibata (1980)	*Chone duneri*	1,438	569	369	63	892	1,196	0	324	8	-	15	4,859
	Maldanidae spp.	55	99	12	43	24	87	55	5	34	-	12	528
	L. longifolia	124	169	0	0	0	125	129	18	171	-	229	736
Kikuchi (unpublished) (1984)	*Chone duneri*	2,024	-	-	-	500	-	-	52	156	-	48	2,780
	Maldanidae spp.	0	-	-	-	824	-	-	308	544	-	0	1,676
	L. longifolia	72	-	-	-	232	-	-	1,180	1,244	-	656	3,384
Yun and kikuchi (1989)	*Chone duneri*	2,665	930	70	2,390	-	15	1,785	-	-	10	80	7,945
	Maldanidae spp.	555	265	10	325	-	320	510	-	-	165	375	2,525
	L. longifolia	915	15	0	45	-	1,165	1,390	-	-	910	890	5,330
The Present study (1991.5~1992.3)	*Chone duneri*	324	84	192	104	240	348	864	304	840	492	376	4,168
	Maldanidae spp.	2,144	2,216	72	592	1,064	1,492	1,456	960	1,372	1,356	896	13,620
	L. longifolia	1,320	12	16	0	2,944	3,212	3,116	3,140	3,020	3,288	2,268	22,336

Silt-clay content	1980	49.4	52.2	13.1	4.5	6.6	25.3	62.2	27.1	50.1	-	61.85	-
	1981	14.8	-	-	-	4.2	-	-	49.3	55.1	-	59.20	-
	1984	20.6	14.6	0.9	1.5	-	44.4	36.7	-	-	50.9	39.00	-
	1992	89.8	31.0	1.2	1.9	60.0	66.8	66.8	69.3	47.0	50.0	37.00	-
Mdϕ	1980	4.04	3.94	2.94	-1.26	2.25	2.47	4.38	2.56	3.88	-	4.18	-
	1984	3.53	3.51	-0.16	-2.00	-	3.85	3.71	-	-	4.02	3.69	-
	1992	3.56	2.79	0.22	2.12	3.40	3.70	3.57	3.76	3.12	2.36	2.12	-

The dominant feeding group has the surface and subsurface deposit feeding groups. And suspension feeding group was shown as the next dominant feeding group (Fig. 6). The living position of suspension feeders and other feeders in St.5~10 was shown in Fig. 7. Living layers in sediment are related to their feeding types and life forms. And dominant three species have different feeding layers. Generally, suspension-feeding benthic organisms feed by straining particles from the overlying water. Deposit feeders feed by ingesting bottom sediments. In this muddy bottom, herbivores which are *Syllis* sp. and *Micropodak dubia* show very low density and low biomass. The canivore has very low density but individual level of biomass was high. So these two feeding groups have a very low effect to polychaetes community composition in this area. Deposit feeders and suspension feeders of the dominant feeding groups in this area may have direct and indirect effects for polychaetes community composition. Expecially, these feeding groups are coexisting in the intermediate area of soft muddy bottom. Deposit-feeding organisms are strongly related to food parameters, such as texture of sediment. Silt-clay content of the sediment is an excellent index of the abundance of deposit feeders in St.5~10 of Tomioka Bay. Suspension feeding group is feeding on a passing current of water. The polychaetous community composition of Tomioka Bay was surveyed by Shibata (1980), Yun and Kikuchi (1989) and the present study (Table 4). *Chone* sp., one of the suspension feeder was emphasized as a dominant species by Shibata (1980). In the report, *C. duneri* distributed widely in 6.6~52.2% silt-clay contents, and Maldanidae spp. was indicated as small individual numbers. *L. longifolia* shows its abundance of individual numbers in 49.4~61.85% silt-clay contents. After four year, Yun and Kikuchi (1989) reported *C. duneri* was shown as numerous individual numbers at 1.5~20.6% silt-clay content, but Maldanidae spp. distributed widely at 1.5~50.9% silt-clay contents. Also, *L. longifolia* indicated abundance of individual number in 20.6~50.9% silt-clay contents in soft muddy bottom. In our study, *C. duneri* showed its distribution of individual numbers at 47~89.8% silt-clay contents and Maldanidae spp. (*Praxillella pacifica*) was dominated at 1.9~89.8% silt-clay contents. *L. longifolia* was shown as a main dominant species at 47~89.8% silt-clay content in soft muddy bottom. In this study, the three species was co-existing at 47~89.8% silt-clay contents and *L. longifolia* was described as the first dominant species. Maldanidae spp. (*P. pacifica*) was shown as the second dominant species. The increment of *L. longifolia* and *P. pacifica* may be influenced by the exchange of sediment granulometric composition. Also *C. duneri*, *P. pacifica* and *L.longipolia* which were co-existing in homogenous muddy bottom, are characterized in polychaetous community because of their numerical density and biomass. For this new distribution, there may have problems of resource (food and space) and adaptation for new distribution (reproduction, growth period, wegith and interaction between three species) in this area. Tamaki (1988) surveyed the distribution of ghost shrimp (*Callianassa japonica*) in sand bottom area. This species was distributed with high abundance in wide area. *Chone duneri* was distributed high abundance in wide area previously.

Even if evidence of this study is not so sufficient, we can guess with the next outcome. According to the bioturbating activity and individual number of increment of the ghost shrimp (*Callianassa japonica*) existing widely in sand bottom area, *C. duneri* which dominated this area previously may be excluded from the area as a result of competition (Tamaki, 1987, 1992, 1993). Also, as *C. duneri* have the favorable into environmental adaptation ability by the flow of water, it might move at the soft muddy bottom. Especially, we can guess that *C. duneri* coexist with *L. longifolia* and *P. pacifica* at the area of 47~66.8% silt-clay contents.

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