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Pollution Effects on Benthic Infaunal Community of the Song-Do Intertidal Flat on the West Coast of Korea

한국 서해안 송도조간대 연성저질 저서동물군집에 대한 오염의 영향

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제 출 문

해양연구소장 귀하

본 보고서를 "한국 서해안 송도조간대 연성저질 저서동물군집에 대한 오염의 영향"의 최종보고서로 제출합니다.

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연구책임자 : 안 인영
최 진우

연구원 : 심 정희
강 천윤
양 영선
이 종수
신 상호
모 근수

요 약

한국 서해안 송도 사질조간대 펄에 서식하는 저서동물군집에 대한 인간활동의 영향을 조사하였다. 이 곳 조간대의 표층퇴적물입자는 여름에는 미세해졌다가 나머지 계절에는 조립해지는 경향을 보였다. 표층퇴적물의 중금속 함량도 mud함량에 따라 높아지는 여름에 높게 측정되었으나, 전반적으로 퇴적물의 중금속 함량은 매우 낮았다. 이는 퇴적물의 mud 함량이 40% 미만으로 매우 낮고, 또한 겨울철에 표층퇴적물 중 중금속이 많이 흡착되어 있는 미세입자가 씻겨 나가기 때문인 것으로 사려된다. 저서동물군집은 여과식자 (filter feeders)인 이매패류와 퇴적물식자 (deposit feeders)인 갯지렁이류에 의해 우점되고 있었으며, 군집구조의 계절변화와 연간변화가 큰 것으로 나타났다. 인간활동에 의한 군집구조 변화를 알아보기 위해 Rank species abundance curves를 그려보았다. 우점종의 하나인 이매패 *Mactra veneriformis*의 가입(recruitment)량의 연간 변화가 매우 심해, 연구기간(1994년 7월 - 1996년 11월)동안 Rank species abundance curve가 과거에 보고된 계절변화 범위를 벗어난 경우도 있었으나, 대부분의 경우 계절변화의 범위내에 있는 것으로 판단되어, 인간활동에 의한 군집구조의 뚜렷한 변화는 일어나지 않은 것으로 사료되었다. 본 연구결과로 볼 때 송도조간대와 같은 사질조간대의 경우, 표층미세퇴적물의 퇴적 및 이동 등과 관련된 자연적 물리적 교란이 저서군집구조에 큰 영향을 주고 있으며, 계절적, 연간 변화 또한 심하기 때문에 제방건설, 갯벌매립, 오염물질 유출 등의 다양한 인위적 교란이 있음에도 불구하고 그 영향을 감지하기가 매우 어려운 것으로 사료된다. 따라서 인위적 영향을 자연

적 변화로부터 구별해내기 위해서는 물리적 환경이 비교적 안정된 펄조간대에서보다 더 오랜 모니터링기간을 계획하는 등 다른 모니터링 체계를 필요로 할 것으로 사료된다.

ABSTRACT

Impacts of industrial effluents and man-made physical perturbations on benthic infaunal communities were assessed in an intertidal sand flat near a harbour city on the west coast of Korea. Surface sediment in the sand flat tends to be finer in summer and fall, and coarser throughout winter and spring, which reflects an alternative pattern of sediment deposition and erosion. Heavy metal contents in the surface sediment were elevated in summer with the accumulation of mud, but no traces of heavy metal contamination were detected in both sediment and animals, apparently due to overall low percentages of mud content and also as a result of surface sediment erosion in winter. The sand flat benthic communities were dominated by filter-feeding bivalves and deposit-feeding polychaetes. Benthic community structure varied widely with season and apparently interannually, and no significant changes due to anthropogenic impacts were detected despite the ongoing anthropogenic perturbations in this region. Most of the rank species abundance curves, which were used in detecting changes of community structure, were well within the range of seasonal variability reported from a previous study. A radical change occurred in one season was due to the high occurrence of a dominant bivalve sp. *Mactra veneriformis*, the recruitment of which highly fluctuates year to year. The present study indicates that the sand flat

benthic communities in this area are still largely influenced by natural physical processes and display a wide range of natural variability which is more significant than seasonality. Distinguishing man-made impacts from natural variabilities, therefore, seems very tricky, requiring a longer period as compared with low-energy environment such as mud flat.

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1. INTRODUCTION

Tidal flats are well developed on the west coast of Korea. In many places the intertidal flats are several km wide (Frey et al., 1987; Park & Khim, 1992). These tidal flats are highly productive, and habitats or breeding grounds for many commercially valuable fishes and invertebrates. Tidal flats, under favorable conditions, remove organic and inorganic nutrients and toxic substances from water that flows across them, thereby mitigating water pollution (Mitsch & Gosselink, 1993).

Songdo area (37°24'N, 126°37'E) is part of the Kyeonggi Bay, a large embayment of the eastern Yellow Sea. This area is relatively exposed to open sea, and sediments consist principally of fine-grained sand (Lee et al., 1985). Tides are semidiurnal with a mean spring tidal range of 8 m. Tidal current velocity has a range of 46 cm s^{-1} at neap tide and 110 cm s^{-1} at spring tide (Lee et al., 1985). Due to the gentle slope, most of tidal flat is subaerially exposed during ebb tide, being as wide as 6 km. This tidal flat has been a habitat for many marine organisms including a commercially valuable bivalve species, *Mactra veneriformis*.

Songdo area has been heavily industrialized since 1960's. Many tidal flats and natural coastal lines have been disappeared by sea-wall construction, reclamation and accompanying physical perturbations. In addition, effluents from the nearby industrial complexes directly have discharged onto the tidal. Moreover this area is adjacent to the mouth of the Han River, and has been receiving all sorts of domestic and industrial sewages via the river from the neighbouring big cities, Incheon and Seoul. Even in recent years, the environment in these areas has been considerably changing. A seawall connecting a mainland road to a LNG Base in the tidal flat was under construction while we were working in this area. Thus, anthropogenic impacts on the environment and associated biological system in the Songdo tidal flat seem highly complicate.

The present study was conducted as part of an environmental monitoring program which was initiated in 1989 (Park, 1991). A major purpose of this study is to assess potential changes in benthic communities caused by anthropogenic impacts such as pollution and sea wall construction. Benthic animals were sampled at different seasons for about two years in order to separate the changes due to anthropogenic impacts from those due to natural variability, and benthic community structures were compared with those of previous years. Physico-chemical properties and heavy metal concentrations of sediment were measured. Dominant species were also collected for the determination of bioaccumulation of the metals. Changes in faunal composition and density were discussed in relation to environmental characteristics.

2. MATERIALS AND METHODS

2.1. Sample Collection

Sampling site was ca. 2 km away from the shoreline and located within the bivalve zone classified by Frei et al. (1987). Sampling was conducted every four to five months from July of 1994 through September of 1995, and thereafter in July and October of 1996. Animals were collected by a 18x24 cm can corer which sampled sediment to a depth of 30 cm. Four to Five cores were taken randomly at each time. Animals were retrieved from each sediment core by wet sieving (0.5-mm mesh). After determining wet weight, the sampled animals were preserved with 10% buffered formalin for later identification of species. Animal specimens for the analysis of heavy metals were hand-collected directly in field and depurated overnight in aerated filtered seawater.

During the initial months, sediment cores were taken using a hand-held PVC corer (3 inch in dia., 30 cm in H) to determine the geochemical background of this region and also to see if there were any signs of anthropogenic input of heavy metals, viz. *a consistent increase towards the surface layer* (Förstner & Wittman, 1981). After taken, the cores were immediately transported to the laboratory, and sectioned at depths of 0.5, 1, 2, 5, 10, 20 and 30 cm. Subsamples were taken from each core section for grain-size analysis, and oven-dried at 60° C for later analysis of organic carbon and metals. In the later months, only the top 2 cm sediments were collected using hand-held spade for the determination of mud, organic carbon, and heavy metal contents. Sediment samples for chlorophyll *a* (Chl. *a*) and phaeopigment measurement were taken using a plastic syringe (6.15 cm^2, n=4) directly from the uppermost 0.5 cm layer in the field, and kept in an ice box until it was transported to the lab.

2.2. Analytical procedures

Chlorophyll *a* in the surface sediment was determined using a fluorometer (Turner Designs, 10-AU) after overnight extraction with 90% acetone in refrigerator. Organic carbon content was determined using a Carlo Erba NA-1500 Elemental Analyzer after removing calcium carbonate with 8% sulfurous acid (Verardo et al., 1990). Sediment grain size was analyzed using a Ro-Tap sieve shaker for sediment particles larger than 4 *phi* and using Sedigraph 5000D for those smaller than 4 *phi* after removing organic matter by soaking in 30% H_2O_2 and by rinsing with distilled water. Heavy metal concentrations in sediments and animals were determined using the methods by Ahn et al. (1996).

3. RESULTS

3.1. Physico-chemical properties of sediment

Sediments collected were fine-grained sand with mud contents of 16 to 43%. In July 1994, mud contents varied significantly with the core depth, ranging from 23% in the deepest to 43% in the uppermost 0.5 cm layer (Friedman's test: X^2 =16.11 with degree of freedom = 7, p<0.025) (Figs. 2 & 3a). Organic carbon contents were generally very low (<0.2%), and varied also vertically from 0.07 to 0.17% (Fig. 3), being positively correlated with the mud contents (Fig. 4). Vertical profiles in November 1994, however, showed no specific patterns with relatively small variations in mud (16 to 27%) and organic carbon (0.08 to 0.14%) contents (Figs. 2 & 5a). Analysis showed that mud contents within the sediment cores tended to vary only in the top 2 cm, increasing up to 36% in July 1994 and 37% in September 1995, and decreasing down to 17% in November 1994 and 22% in April 1995 (Table I). An additional sediment sampling in July of 1996 also showed that mud content tended to increase in summer (Fig. 6). In deeper sediments (>2 cm) were much smaller variations in mud contents (18 to 27%). In the top sediments were no significant variations detected in organic carbon content among different seasons.

Total chlorophylls were significantly higher in April than in any other months, but Chl.*a* concentrations were similar in the sediments collected in July 1994, and April and September 1995 (Table I).

3.2. Metal concentrations in the sediment

Metal concentrations in the sediment cores collected in July and November 1994 are shown in Fig. 3 and Fig. 5, respectively. In the sediments collected in July 1994, Mn, Co, Ni, and Pb concentrations were significantly correlated with the mud contents (Fig. 7). In particular, Mn concentrations notably increased towards the sediment surface. In the top sediments were significant seasonal variations in Co and Mn concentrations. Pb, Zn and Cr also tended to vary seasonally. Heavy metal concentrations in sediment are shown in Table I. The overall values are well below the ranges reported for other coastal sediments.

3.3. Metal concentrations in the bivalve *Mactra veneriformis*

Metal concentrations in the tissue of the bivalve *Mactra veneriformis* are shown in Table II. Most of values are well within the ranges reported for mussels and oysters, the representative bivalve species in temperate waters. Mn concentrations, however, were higher in *M. veneriformis* than in the mussels and oysters.

3.4. Species composition and abundance of the benthic infaunal communities

Species composition and abundance are listed in Table III. Filter-feeding bivalves and deposit-feeding polychaetes dominated the sand flat benthic community (Figs. 8 & 9). Filter-feeding bivalves *Mactra veneriformis* and *Solen strictus* were predominant, constituting 55 to 73% of total counted number during the period of July 1994 to April 1995. However, deposit-feeding polychaetes *Mediomastus* sp. and scavenging gastropods *Recticunassa festiva* were predominant in the period of September 1995, and from July through October 1996 (Table III & Fig. 10).

3.5. Changes in benthic community structure

Fig.11 shows rank species abundance curves, which are frequently used in analyzing data on community structure based on a ranking of species in decreasing order of their abundance. In these curves, the ranked abundances of the species expressed as cumulative percentages are plotted against the relevant species ranks. The rank species abundance curve has been recognized generally more sensitive than a single summary statistic, such as a diversity index in detecting changing community structure. If one curve fall far away above or below the others, the community structure from one sample would be considered as being different from those of the other samples. In 1989/1990, there were only a small differences among the curves. In 1994/1996, except the July 1994 curve, the other curves fall well within the range seen in the 1989/1990 years.

4. DISCUSSION

4.1. Seasonal variations in geochemical properties of sediment

In the sediment cores, mud contents significantly increased in the uppermost 2 cm layer in July 1994, while no variations with depth were detected in November 1994 and April 1995.The sediments sampled from the uppermost 2 cm layer in July and October of 1996 also showed that mud content tended to increase in summer (Fig. 6). This trend in this area was already reported in the previous study (Park, 1991). Thus, the results of the present study along with the previous finding strongly suggest that the fine-grained sediments accumulate on the sand flat in summer and be transported away in other seasons.

Heavy metal contents tend to vary with changes in mud content, being elevated in summer in the surface sediment. Overall concentrations in sediment, however, are very low, and no traces of heavy metal contamination were detected in spite of the apparent input of the pollutants to this area. This is probably due to relatively low percentages of mud content in sediment. In addition, the alternate pattern of sediment deposition and erosion in this tidal flat seems to play a role in alleviating accumulation of pollutants in the sand flats.

4.2. Temporal variations in benthic community structure

As shown in the rank species abundance curves (Fig. 11), no dramatic changes were detected during the period of November 1994 through October 1996 in the Songdo intertidal community as compared with the previous period of May 1989 through July 1990. The abundance curves were within the range of seasonal variability shown in the 1989/1990 period. A radical change detected in July 1994, being more significant than seasonality, was related to the high occurrence of the bivalve *Mactra veneriformis,* the abundance of which varied interannually to a considerable degree (Fig. 10).

Apart from the seasonal variability, were there also considerable interannual variations in community structure. The rank species abundance curves in July were somewhat variable among 1989, 1990, 1994 and 1996 (Fig. 12). Trophic composition was also highly variable year to year. Filter-feeding bivalves were predominant in July of 1994, and persistently abundant through April 1995, but they were replaced by deposit-feeding polychaetes and scavenging gastropods in the period of July through October 1996 (Figs. 8 & 9). However, this interannual variation is likely natural rather than anthropogenic, because similar interannual variations were already reported in the 1989-1990 (Fig. 7). The direct cause of interannual variations in the trophic compositions is the interannual variability of dominant species particularly the bivalve *Mactra veneriformis* (Fig. 10).

4.3. Anthropogenic impacts on the sand flat benthic communities

Human impacts on the intertidal sand flat communities seem not easily detected. Man-made physical disturbances such as sea wall construction, reclamation do not appear decisively detrimental to the sand flat populations which have coped with naturally strong physical disturbances. Analysis on the community structure suggests that benthic community structure in high energy environment like Songdo tidal flat is still controlled primarily by natural processes and highly resilient in spite of considerable man-made influences. Seawall construction and accompanying perturbations likely cause indirect and long-term impacts on sand flat benthic communities (dominated by filter-feeders) by altering hydrodynamics and thereby changing sediment properties such as grain size. However, due to the high seasonal and (possibly interannual) variabilities in geochemical properties of the habitat sediments and community structure, a long-term monitoring should be required to distinguish man-made impacts from the natural variabilities.

Apart from the (natural physical disturbances occurring alternatively with season) environmental characteristics, considerable interannual variations in the recruitment of dominant species such as *Mactra veneriformis* seem to be another hindrance in assessing potential impacts on the sand flat benthic communities. Thus, the results of the present study suggest assessment on sand flat benthic communities needs different monitoring schemes from those used for mud flat communities, which live relatively low-energy environment, and probable needs longer time period in assessing impacts and more caution in interpreting data.

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Table I. Geochemical composition in the surface (top 2 cm) sediment of the Songdo intertidal sand flat at different seasons. (See Appendices II, III & VII for the data.)

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Songdo Project (94-95)-Chemical composition in 0-2 cm(D-integrated)

	July 94			Nov 94			Apr 95			Sep 95				
	avg	Std	n	avg	Std	n	avg	Std	n	avg	Std	n	Kruskal-Wallis statistic (H)	
%mud	36.2	2.554	3	17.4	0.907	3	22.1	22.08	1	37.2	4.95	2	6.511	($p<0.1$)
%OC	0.116	0.026	3	0.093	0.023	3	0.115		1	0.133	0.013	3	4.418	
Total Chl	3.767	0.312	4	2.273	0.971	4	8.1	0.616	3	3.29	0.417	4	10.07	($0.01<p<0.05$)
Chl.a	1.28	0.152	4	0.768	0.16	4	1.3	0.28	4	1.07	0.426	4	6.838	($p<0.1$)
Phaeo	2.49	0.161	4	1.5	0.923	4	6.68	0.516	3	2.22	0.455	4		
Chl/Phaeo	0.514	0.028	4	0.688	0.451	4	0.212	0.028	3	0.51	0.252	4		
Co	7.63	0.483	3	6.75	0.063	3	4.84		1	6	0.301	3	8.345	($0.01<p<0.05$)
Mn	428	56.4	3	236	21.1	3	254		1	285	8.31	3	8.054	($0.01<p<0.05$)
Pb	10.85	0.507	3	9.85	0.834	3	11		1	12.8	0.783	3	7.327	($p<0.1$)
Zn	35.1	0.217	3	31	1.45	3	25.5		1	35.9	2.58	3	7.036	($p<0.1$)
Cr	16.5	1.44	3	15.3	1.51	3	13.4		1	21.1	3.21	3	6.745	($p<0.1$)
Ni	12.5	0.42	3	11.1	0.838	3	8.2		1	11.7	1.11	3	5.0727	
Cu	4.58	0.414	3	4.01	0.554	3	3.07		1	5.17	0.735	3	4.902	
Cd	0.0088	0.002	3	0.0178	0.003	3								
Fe(%)	1.67	0.162	3	1.5	0.113	3								
As							3.52		1	5.1	0.524	3		

Table II. Metal concentrations in the tissues of the filter-feeding clam *Mactra veneriformis*.

A

SongDo Clam - Heavy Metal Analysis
File name : HM-CLAM.WQ1(\corel\office\q-pro7\songdo96)

Rdg: Reading

GoJan 9407

		Shell		Tissue		Digestio	Cd		Co		Cr		Ni		Pb		Fe		Zn		Cu		Mn	
Bottle#	Clam#	Wt(g)	L(mm)	W W.(g)	DW(g)	DW(g)	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm
1	7	6.10	38.2	4.18	0.50	0.3968	4.3	0.65	26.5	2.67	10.4	1.57	59.0	5.95	16.1	1.62	18.0	907.3	1.41	71.1	0.13	6.55	3.6	181.5
2	2	5.98	35.9	7.52	0.68	0.4814	5.4	0.67	33.3	2.77	7.6	0.95	58.6	4.87	10.6	0.88	16.1	668.9	1.32	54.8	0.12	4.99	4.2	174.5
3	36	5.88	36.0	2.78	0.49	0.3151	3.5	0.67	22.2	2.82	14.2	2.70	28.8	3.66	11.9	1.51	30.2	1916.9	1.05	66.6	0.12	7.62	1.5	95.2
4	80	5.91	36.0	6.54	0.57	0.4217	5.2	0.74	35.8	3.40	12.1	1.72	50.5	4.79	16.7	1.58	26.6	1261.6	1.23	58.3	0.12	5.69	4.9	232.4
5	8	5.69	36.4	6.39	0.58	0.3467	7.5	1.30	26.5	3.06	8.0	1.38	43.9	5.06	23.6	2.72	17.9	1032.6	1.09	62.9	0.08	4.61	4.5	259.6
6	15	5.95	37.4	5.53	0.61	0.4525	6.2	0.82	25.4	2.25	8.5	1.13	34.0	3.01	14.6	1.29	18.4	813.3	1.33	58.8	0.12	5.30	5.0	221.0
7	35	5.69	36.6	5.20	0.52	0.3448	4.2	0.73	28.2	3.27	6.2	1.08	26.2	3.04	9.4	1.09	15.3	887.5	0.79	45.8	0.08	4.64	3.4	197.2
8	1	8.57	38.6	5.08	0.62	0.4254	7.7	1.09	35.7	3.36	12.5	1.76	42.5	4.00	44.3	4.17	23.5	1104.8	1.82	85.6	0.11	5.17	7.8	366.7
9	50	5.52	36.6	6.49	0.58	0.4630	6.9	0.89	22.6	1.95	6.2	0.80	24.9	2.15	24.4	2.11	17.9	773.2	1.42	61.3	0.11	4.75	5.5	237.6
10	25	5.41	35.1	3.76	0.41	0.2362	2.3	0.58	12.8	2.17	5.2	1.32	19.7	3.34	7.2	1.22	14.0	1185.4	0.69	58.4	0.05	4.23	1.0	84.7
11	62	6.49	37.2	6.11	0.65	0.4549	5.0	0.66	34.0	2.99	7.3	0.96	59.7	5.25	21.4	1.88	14.6	641.9	1.59	69.9	0.14	6.16	3.9	171.5
12	40	6.57	37.1	4.60	0.60	0.3670	4.8	0.78	13.5	1.47	7.0	1.14	16.6	1.81	10.4	1.13	20.0	1089.9	1.20	65.4	0.08	4.36	3.7	201.6
13	3	6.08	37.5	3.79	0.54	0.3919	7.9	1.21	29.1	2.97	14.6	2.24	39.0	3.98	19.3	1.97	28.8	1469.8	1.49	76.0	0.13	6.63	4.3	219.4
14	66	6.21	37.2	3.26	0.59	0.4409	4.4	0.60	21.1	1.91	34.2	4.65	40.4	3.67	15.5	1.41	24.6	1115.9	1.79	81.2	0.11	4.99	9.5	430.9
15	14	6.05	36.4	5.29	0.63	0.4303	5.0	0.70	21.2	1.97	14.4	2.01	35.5	3.30	12.7	1.18	14.8	687.9	1.34	62.3	0.09	4.18	2.1	97.6
16	5	5.01	35.0	4.34	0.43	0.3241	5.0	0.93	22.8	2.81	3.7	0.68	28.4	3.51	7.0	0.86	10.2	629.4	0.97	59.9	0.08	4.94	1.9	117.2
17	68	5.50	36.4	4.33	0.51	0.3949	5.2	0.79	29.8	3.02	4.5	0.68	47.4	4.80	16.7	1.69	9.8	496.3	1.18	59.8	0.09	4.56	4.5	227.9
18	13	5.05	35.0	2.83	0.32	0.2455	4.9	1.20	14.2	2.31	5.7	1.39	17.5	2.85	10.7	1.74	16.1	1311.6	0.75	61.1	0.06	4.89	1.7	138.5
19	14	5.13	34.5	4.30	0.46	0.2755	4.9	1.07	24.2	3.51	5.3	1.15	36.2	5.26	10.2	1.48	10.6	769.5	0.82	59.5	0.11	7.99	1.4	101.6
20																								
	Avg	5.94	36.48	4.86	0.54	0.38	5.28	0.85	25.21	2.67	9.87	1.54	37.31	3.91	15.93	1.66	18.28	987.56	1.23	64.15	0.10	5.38	3.92	197.72
	Std	0.76	1.07	1.30	0.09	0.07	1.39	0.22	6.81	0.57	6.67	0.90	13.30	1.10	8.35	0.74	5.85	338.64	0.32	9.12	0.02	1.08	2.12	87.52

Table II. (continued)

B

SongDo Clam - Heavy Metal Analysis
File name : HM-CLAM.WQ1(\corel\office\q-pro7\songdo96)
Rdg: Reading

SongDo 9407

		Shell		Tissue		Digestio	Cd		Co		Cr		Ni		Pb		Fe		Zn		Cu		Mn	
Bottle#	Clam#	W(g)	L(mm)	WW(g)	DW(g)	DW(g)	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm	Rdg	ppm
21	50	9.75	41.9	11.14	1.49	0.5018	5.7	0.68	34.3	2.73	8.6	1.03	38.6	3.08	9.7	0.77	18.7	745.3	1.34	53.4	0.15	5.98	2.2	87.7
22	61	6.11	37.6	8.52	0.90																			
23	65	6.47	37.3	8.00	0.94	0.5023	4.3	0.51	22.4	1.78	12.2	1.46	28.6	2.28	7.8	0.62	9.1	362.3	1.41	56.1	0.13	5.18	2.6	103.5
24	73	6.69	37.8	9.51	0.99	0.5010	4.1	0.49	41.9	3.35	2.8	0.34	29.6	2.36	6.9	0.55	6.8	271.5	1.12	44.7	0.19	7.58	1.0	39.9
25	60	6.25	37.6	8.55	0.91	0.5052	3.4	0.40	25.8	2.04	3.4	0.40	29.6	2.34	9.5	0.75	8.2	324.6	1.43	56.6	0.13	5.15	3.4	134.6
26	46	6.71	38.1	6.73	0.91	0.5016	4.7	0.56	24.4	1.95	2.0	0.24	15.3	1.22	5.8	0.46	3.4	135.6	1.16	46.3	0.13	5.18	1.2	47.8
27	51	6.67	37.3	5.38	0.89	0.4968	5.0	0.60	22.4	1.80	4.0	0.48	24.5	1.97	7.9	0.64	9.9	398.6	1.17	47.1	0.16	6.44	0.9	36.2
28	78	6.22	36.4	6.51	0.82	0.4908	8.9	1.09	25.5	2.08	12.4	1.52	29.4	2.40	14.2	1.16	24.5	998.4	1.62	66.0	0.13	5.30	1.9	77.4
29	44	7.36	39.1	8.29	1.18	0.5068	4.5	0.53	30.5	2.41	6.6	0.78	32.5	2.57	8.3	0.66	12.9	509.1	1.20	47.4	0.13	5.13	1.1	43.4
30	13	6.14	36.9	5.73	0.79	0.4978	4.4	0.53	14.1	1.13	4.3	0.52	14.6	1.17	6.4	0.51	9.6	385.7	1.29	51.8	0.13	5.22	0.8	32.1
31	66	7.24	38.9	9.11	1.10	0.5024	5.6	0.67	38.4	3.06	11.8	1.41	56.7	4.51	11.3	0.90	12.2	485.7	1.32	52.5	0.19	7.56	2.7	107.5
32	43	7.96	39.8	10.29	1.21	0.4978	3.8	0.46	16.2	1.30	1.9	0.23	36.3	2.92	5.7	0.46	4.5	180.8	1.45	58.3	0.12	4.82	0.7	28.1
33	16	6.54	37.5	6.87	0.90	0.5008	3.9	0.47	31.0	2.48	4.8	0.58	26.2	2.09	3.3	0.26	5.7	227.6	1.17	46.7	0.17	6.79	0.5	20.0
34	4	5.57	36.4	7.39	0.90	0.5058	4.8	0.57	21.4	1.69	3.4	0.40	18.0	1.42	4.9	0.39	6.1	241.2	1.14	45.1	0.14	5.54	1.0	39.5
35	20	7.04	38.1	6.68	1.04	0.5009	6.3	0.75	29.5	2.36	4.7	0.56	24.1	1.92	7.9	0.63	9.9	395.3	1.27	50.7	0.14	5.59	0.7	27.9
36	74	5.04	35.7	5.99	0.70	0.4812	4.6	0.57	32.9	2.73	3.4	0.42	32.9	2.73	4.4	0.37	7.3	303.4	1.20	49.9	0.13	5.40	1.3	54.0
37	21	7.44	39.5	8.55	1.03	0.4967	4.2	0.51	28.1	2.26	12.1	1.46	33.5	2.70	12.6	1.01	17.0	684.5	1.30	52.3	0.13	5.23	1.0	40.3
38	57	7.34	40.3	9.24	1.07	0.5061	3.5	0.41	21.8	1.72	4.6	0.55	20.7	1.64	8.0	0.63	9.5	375.4	1.23	48.6	0.12	4.74	1.8	71.1
39	8	7.31	38.4	8.03	0.97	0.5049	3.8	0.45	28.1	2.23	3.4	0.40	22.6	1.79	7.0	0.55	4.0	158.4	1.06	42.0	0.14	5.55	0.6	23.8
40	14	6.57	37.3	6.68	0.84	0.5077	4.9	0.58	19.2	1.51	3.5	0.41	21.3	1.68	5.7	0.45	6.6	260.0	1.33	52.4	0.15	5.91	1.7	67.0
	avg	6.82	38.09	7.86	0.98	0.50	4.76	0.54	26.73	2.03	5.78	0.66	28.16	2.14	7.75	0.59	9.78	372.17	1.27	48.40	0.14	5.41	1.43	54.10
	Std	0.95	1.44	1.51	0.17	0.01	1.22	0.19	7.00	0.72	3.59	0.45	9.42	0.89	2.71	0.25	5.25	224.35	0.13	12.34	0.02	1.47	0.79	33.04

Table II. (continued)

C

SongDo Clam - Heavy Metal Analysis
File name : HM-CLAM.WQ1(\corel\office\q-pro7\songdo96)
Rdg: Reading
CherkJem 9407

		Shell		Tissue		Digestio	Cd		Co		Cr		Ni		Pb		Fe		Zn		Cu		Mn	
Bottle	Clam	Wei.(g)	Len.(m	Wet Wei	Dry We	Wei.(g)	Read	ppm	Readin	ppm	Readi	ppm	Readin	ppm	Readi	ppm	Readin	ppm	Readi	ppm	Readi	ppm	Readi	ppm
41	41	8.87	37.0	9.45	1.15	0.5028	4.4	0.53	35.8	2.85	2.7	0.32	24.8	1.97	6.2	0.49	5.4	214.8	1.29	51.3	0.18	7.16	1.2	47.7
42	16	7.25	39.3	6.42	0.94	0.4936	4.9	0.60	26.2	2.12	8.7	1.06	26.2	2.12	4.2	0.34	11.8	478.1	1.07	43.4	0.14	5.67	1.8	72.9
43	2	5.36	36.3	5.17	0.69	0.4933	5.9	0.72	17.1	1.39	5.9	0.72	28.6	2.32	7.9	0.64	14.2	575.7	1.35	54.7	0.13	5.27	1.8	73.0
44	17	6.99	39.2	8.85	1.02																			
45	28	6.88	39.2	7.50	0.94	0.4912	6.1	0.75	31.2	2.54	5.8	0.71	27.6	2.25	11.3	0.92	13.1	533.4	1.28	52.1	0.11	4.48	2.1	85.5
46	24	8.46	40.1	7.24	1.08	0.4977	2.8	0.34	24.4	1.96	10.4	1.25	45.4	3.65	6.2	0.50	5.4	217.0	1.33	53.4	0.13	5.22	1.3	52.2
47	49	5.12	37.2	4.80	0.74	0.5066	6.6	0.78	25.8	2.04	14.6	1.73	43.2	3.41	10.4	0.82	16.1	635.6	1.38	54.5	0.14	5.53	2.2	86.9
48	23	6.71	37.8	8.35	0.98	0.5037	4.6	0.55	34.9	2.77	3.8	0.45	24.8	1.97	7.5	0.60	9.3	369.3	1.21	48.0	0.16	6.35	1.7	67.5
49	3	7.77	39.8	10.07	1.44	0.5088	3.9	0.46	23.4	1.84	2.8	0.33	11.6	0.91	5.2	0.41	7.1	279.1	1.16	45.6	0.14	5.50	0.9	35.4
50	55	7.32	37.1	5.46	0.78	0.5032	8.8	1.05	25.4	2.02	15.5	1.85	37.1	2.95	13.7	1.09	28.8	1144.7	1.47	58.4	0.17	6.76	2.7	107.3
51	27	6.19	39.3	7.39	0.93	0.5050	5.1	0.61	18.6	1.47	11.6	1.38	35.7	2.83	5.7	0.45	10.6	419.8	1.33	52.7	0.15	5.94	1.1	43.6
52	18	7.34	39.4	9.50	1.16	0.4873	4.0	0.49	41.7	3.42	23.1	2.84	55.5	4.56	6.8	0.56	6.7	275.0	1.30	53.4	0.12	4.93	2.2	90.3
53	11	6.97	39.8	11.10	1.10	0.5111	4.7	0.55	29.0	2.27	3.2	0.38	61.8	4.84	14.9	1.17	7.4	289.6	1.55	60.7	0.13	5.09	4.0	156.5
54	10	6.43	39.9	6.83	0.95	0.5045	5.7	0.68	26.1	2.07	2.8	0.33	23.7	1.88	5.5	0.44	5.0	198.2	1.31	51.9	0.16	6.34	0.7	27.8
55	45	7.89	39.0	5.78	0.77	0.4980	6.4	0.77	28.0	2.25	16.5	1.99	55.9	4.49	14.8	1.19	25.1	1008.0	1.46	58.6	0.17	6.83	5.9	236.9
56	34	7.31	38.3	5.77	0.76	0.5032	5.4	0.64	17.4	1.38	5.8	0.69	18.3	1.45	8.2	0.65	10.1	401.4	1.50	59.6	0.12	4.77	1.3	51.7
57	6	6.61	38.1	6.37	0.89	0.4971	5.4	0.65	27.1	2.18	11.4	1.38	45.8	3.69	17.2	1.38	18.7	752.4	1.40	56.3	0.18	7.24	3.7	148.9
58	47	4.86	36.5	5.31	0.78	0.4886	6.3	0.77	14.7	1.20	9.2	1.13	32.4	2.65	8.0	0.65	17.2	704.1	1.22	49.9	0.16	6.55	1.3	53.2
	avg	6.91	38.52	7.30	0.95	0.50	5.35	0.61	26.28	1.99	9.05	1.03	35.20	2.66	9.04	0.68	12.47	472.01	1.33	50.26	0.15	5.53	2.11	79.85
	Std	1.03	1.22	1.82	0.18	0.01	1.31	0.21	6.89	0.73	5.69	0.72	13.75	1.25	3.84	0.34	6.72	285.78	0.12	13.00	0.02	1.57	1.29	53.85
Bo.Liver						0.5182	3.6	0.42	1.8	0.14	1.6	0.19	3.1	0.24	3.5	0.14	5.5	212.3	2.88	111.2	3.52	135.85	0.2	7.7
								0.27		0.18						0.34		270.0		130.0		193.00		10.3

Table III(A-F). Species composition and abundance of the Songdo intertidal benthic community from July 1994 to Oct. 1996. (See Appendix VIII for the data.)

A

filename: txon9407.wb3

A. Composition of Taxonomic groups of Songdo Intertidal Benthic Community

1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

		core #					
species\station	FG	1-1	1-2	1-3	1-4	SUM	#/sq m
Polychaetes							
Glycera chirori	C			1		1	5.787
Glyera capitata	C				1	1	5.787
Lumbrineris heteropoda	C				1	1	5.787
Lumbrineris nipponica	C		1			1	5.787
Nephtys caeca	C	3	2	4	3	12	69.444
Leptochela gracilis	SDF	1				1	5.787
Spionidae unid.	SDF		1			1	5.787
Stenothyra edogawaensis	SDF						0
Tharyx sp.	SDF				1	1	5.787
Aricidea sp.	SSD	4	2		5	11	63.657
Mediomastus sp.	SSD	8				8	46.296
Scoloplos armiger	SSD	1				1	5.787
subtotal						**39**	225.693
%						20.9	
Bivalves							
Mactra veneriformis	FF	20	30	43	39	132	763.884
Phacosoma japonica	FF			1		1	5.787
Solen strictus	FF	2				2	11.574
subtotal						**135**	781.245
%						72.2	
Crustaceans							
Asthenognathus inaeguip	SDF				1	1	5.787
Monoculodes sp.	FF		1			1	5.787
subtotal						**2**	11.574
%						1.07	
Gastropods							
Reticunassa festiva	SC			4		4	23.148
Eulima sp.	SDF		1			1	5.787
Umbonium thomasi	SDF				1	1	5.787
subtotal						**6**	34.722
%						3.21	
Holothuroids							
Protankyra bidentata	SDF	3	2			5	28.935
subtotal						**5**	28.935
%						2.67	
Species No.		8	8	5	8	20	
Individual No		42	40	53	52	**187**	**1082.17**
					%	100	

Total No. of species collected from 4 cores: 20
Total No. of Inds. collected from 4 cores: 187
Total No. of Inds per square meter: 187 x (10000/432 x 4cores) = 1082 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	31	**16.6**
2. Filter feeders(FF)	136	**72.7**
3. Carnivores(C)	16	**8.56**
4. Scavenger (SC)	4	**2.14**
	187	100

Table Ⅲ. (continued)

B

filename: txch9411.wb3

ß. Composition of Taxonomic groups of Songdo Intertidal Benthic Community
(Area; Chukjun-considered as Songdo/ Date; 1994. 11)
1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

			core #					
species\station	FG	1-1	1-2	1-3	1-4	1-5	SUM	#/sq m
Polychaetes								
Glycera chirori	C	1		1	1	2	5	23.15
Glyera capitata	C	1					1	4.63
Nephtys oligobranchia	C		2	2			4	18.52
Sigumbra tentaculata	C		2		1		3	13.89
Spionidae unid.	SDF			1			1	4.63
Aricidea sp.	SSD		1		6		7	32.41
Mediomastus sp.	SSD		4	4	2		10	46.3
Scoloplos armiger	SSD	1		1	2		4	18.52
Anaitides koreana	C	1					1	4.63
Glycinde sp.	C	1	2	3			6	27.78
Loimia medusa	SDF					3	3	13.89
Nectoneanthess latipoda	SDF		1				1	4.63
Stenothyra edogawaensis	SDF				2		2	9.26
subtotal							**48**	222.24
%							25.3	
Bivalves								
Mactra veneriformis	FF	4	29	10	34	13	90	416.7
Solen strictus	FF	2	17	7	2	14	42	194.46
subtotal							**132**	611.16
%							69.5	
Crustaceans								
Macrophthalmus japonica	SDF		1				1	4.63
Tritodynamic rathburni	SDF				3		3	13.89
subtotal							**4**	18.52
%							2.11	
Gastropods								
Reticunassa festiva	SC		2				2	9.26
subtotal							**2**	9.26
%							1.05	
Holothuroids								
Protankyra bidentata	SDF					1	1	4.63
subtotal							**1**	4.63
%							0.53	
Others								
Nemertinea	C	1			1		2	9.26
Lingula sp.	FF				1		1	4.63
subtotal							**3**	13.89
%							~~0.16~~ 1.58	
Species No.		8	9	8	11	6	21	
Individual No		12	60	29	55	34	**190**	879.7
					%		~~98.6~~ 100	

Total No. of species collected from 4 cores: 21
Total No. of Inds. collected from 4 cores: 190
Total No. of Inds per square meter: 190 x (10000/(432 x 4cores)) = 879.6 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	33	**17.4**
2. Filter feeders(FF)	133	**70**
3. Carnivores(C)	22	**11.6**
4. Scavenger (SC)	2	**1.05**
	190	100

Table Ⅲ. (continued)

C

filename: txsd9504.wb3

C. Composition of Taxonomic groups of Songdo Intertidal Benthic Community

(Area; Songdo/ Date; 1995. 04)
1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

species\station	FG	1-1	core # 1-2	1-3	1-4	SUM	#/sq m
Polychaetes							
Glycera chirori	C	1	1	1	1	4	23.148
Glyera capitata	C	1				1	5.787
Nephtys oligobranchia	C	1		1	2	4	23.148
Sigumbra tentaculata	C	2	4	10	16	32	185.184
Mediomastus sp.	SSD				5	5	28.935
Scoloplos armiger	SSD		1			1	5.787
Anaitides koreana	C			1		0	0
Glycinde sp.	C	1	1	1	1	4	23.148
Pinnotheres sp.	SDF		1	1	2	4	23.148
subtotal						**55**	318.285
%						35	
Bivalves							
Mactra veneriformis	FF	18	14	13	15	60	347.22
Solen strictus	FF	6	6	6	9	27	156.249
subtotal						**87**	503.469
%						55.4	
Crustaceans							
Cumacea sp	SDF				1	1	5.787
Monoculodes sp	SDF		1			1	5.787
subtotal						**2**	
%						1.27	
Gastropods							
Reticunassa festiva	SC	3	1	1	2	7	40.509
subtotal						**7**	40.509
%						4.46	
Holothuroids							
Protankyra bidentata	SDF					0	0
subtotal						**0**	0
%						0	
Others							
Nemertinea	C	1	4		1	6	34.722
subtotal						**6**	
%						3.82	
Species No.		9	10	8	11	15	
Individual No		34	34	34	55	**157**	726.91
					%	100	

Total No. of species collected from 4 cores: 15
Total No. of Inds. collected from 4 cores: 157
Total No. of Inds per square meter: 157 x (10000/(432 x 5cores)) = 726.9 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	12	**7.64**
2. Filter feeders(FF)	87	**55.4**
3. Carnivores(C)	51	**32.5**
4. Scavenger (SC)	7	**4.46**
Total	157	100

Table Ⅲ. (continued)

D

filename: txsd9509.wb3

D. Composition of Taxonomic groups of Songdo Intertidal Benthic Community

(Area; Songdo/ Date; 1995. 09)
1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

species\station	FG	1-1	core # 1-2	1-3	1-4	1-5	SUM	#/sq m
Polychaetes								
Glycera chirori	C	1	1		2	3	7	32.41
Nephtys caeca	C			2		1	3	13.89
Nephtys oligobranchia	C		1			1	2	9.26
Sigumbra tentaculata	C	2	2	2	4	1	11	50.93
Aricidea sp.	SSDF	3	6	6	7	6	28	129.64
Mediomastus sp.	SSDF	3	10	5	9	9	36	166.68
Scoloplos armiger	SSDF	7	4	4	4	2	21	97.23
Anaitides koreana	C			2			2	9.26
Spiophanes bombyx	SDF			2		1	3	
Megalona sp.	SDF	1					1	
subtotal							114	527.82
%							53.8	
Bivalves								
Mactra veneriformis	FF	3	5	3	7	2	20	92.6
Solen strictus	FF	4	4	8	7	6	29	134.27
subtotal							49	226.87
%							23.1	
Crustaceans								
Macrophthalmus japonica	SDF	1					1	4.63
Asthenognathus inaeguipes	SDF				1		1	
Cumacea sp	SDF		1				1	
subtotal							3	13.89
%							1.42	
Gastropods								
Reticunassa festiva	SC	6	4	4	6	8	28	129.64
Eulima sp.	SDF		2		2	3	7	32.41
subtotal							35	162.05
%							16.5	
Holothuroids								
Protankyra bidentata	SDF	0	4	1	1		6	27.78
subtotal							6	27.78
%							2.83	
Others								
Nemertinea	C	1	1	1	1	1	5	23.15
subtotal							5	
%							2.36	
Species No.		11	13	12	12	13	19	
Individual No		32	45	40	51	44	212	981.56
					%		100	

Total No. of species collected from 4 cores: 19
Total No. of Inds. collected from 4 cores: 212
Total No. of Inds per square meter: 212 x (10000/(432 x 5cores)) = 981.5 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	105	**49.5**
2. Filter feeders(FF)	49	**23.1**
3. Carnivores(C)	30	**14.2**
4. Scavenger (SC)	28	**13.2**
Total	212	100

Table Ⅲ. (continued)

E

filename: txsd9607.wb3

E. Composition of Taxonomic groups of Songdo Intertidal Benthic Community
(Area; Songdo/ Date; 1996. 07)
1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

species\station	FG	1-1	1-2 (core #)	1-3	1-4	1-5	SUM	#/sq m
Polychaetes								
Glycera chirori	C						0	0
Glycera capitata	C						1	
Glycera subaenea	C						2	
Glycinde sp.	C						3	
Lumbrineris nipponica	C						1	
Nephtys caeca	C						3	13.89
Nephtys oligobranchia	C						2	9.26
Sigumbra tentaculata	C						2	9.26
Aricidea sp.	SSDF						15	69.45
Capitella capitata	SSDF						1	
Eteone longa	C						1	
Mediomastus sp.	SSDF						75	347.25
Scoloplos armiger	SSDF						2	9.26
Anaitides koreana	C						0	0
Prionospio japonicus	SDF						1	
Megalona sp.	SDF						1	
subtotal							110	509.3
%							71.4	
Bivalves								
Mactra veneriformis	FF						12	55.56
Solen strictus	FF						2	9.26
subtotal							14	64.82
%							9.09	
Crustaceans								
Macrophthalmus japonica	SDF						0	0
Asthenognathus inaeguipes	SDF						0	
Cumacea sp	SDF						0	
Brachyura	SDF						1	
subtotal							1	4.63
%							0.65	
Gastropods								
Reticunassa festiva	SC						4	18.52
Umbonium thomasi	SDF						15	69.45
Bullacta exarata	SDF						2	
subtotal							21	97.23
%							13.6	
Holothuroids								
Protankyra bidentata	SDF						6	27.78
subtotal							6	27.78
%							3.9	
Others								
Nemertinea	C						1	4.63
Ophiuroidea sp	SDF						1	
subtotal							2	
%							1.3	
Species No.							23	
Individual No							154	713.02
					%		100	

Total No. of species collected from 4 cores: 23
Total No. of Inds. collected from 4 cores: 154
Total No. of Inds per square meter: 154 x (10000/(432 x 5cores)) = 713 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	120	77.9
2. Filter feeders(FF)	14	9.09
3. Carnivores(C)	16	10.4
4. Scavenger (SC)	4	2.6
Total	154	100

Table Ⅲ. (continued)

F

filename: txsd9610.wb3

F. Composition of Taxonomic groups of Songdo Intertidal Benthic Community
(Area; Songdo/ Date; 1996. 10)
1 can core: 18x24 cm = 432 sq. cm
FG: feeding group

species\station	FG	1-1	core # 1-2	1-3	1-4	1-5	SUM	#/sq m
Polychaetes								
Glycera chirori	C						1	4.63
Glycera capitata	C						4	
Glycera subaenea	C						0	
Glycinde sp.	C						2	
Lumbrineris heteropoda	C						1	
Nephtys caeca	C						3	13.89
Nephtys oligobranchia	C						7	32.41
Sigumbra tentaculata	C						2	9.26
Aricidea sp.	SSDF						44	203.72
Scolelepis sp	SDF						1	
Nectoneanthes latipoda	SDF						1	
Mediomastus sp.	SSDF						13	60.19
Scoloplos armiger	SSDF						24	111.12
Anaitides koreana	C						5	23.15
Tharyx sp.	SDF						25	
Megalona sp.	SDF						2	
subtotal							135	625.05
%							27.4	
Bivalves								
Mactra veneriformis	FF						34	157.42
Solen strictus	FF						11	50.93
Tellina sp	SDF						3	
subtotal							48	222.24
%							9.74	
Crustaceans								
Macrophthalmus japonica	SDF						0	0
Balanus	FF						7	
Macrura	SDF						14	
Brachyura	SDF						11	
subtotal							32	148.16
%							6.49	
Gastropods								
Reticunassa festiva	SC						194	898.22
Umbonium thomasi	SDF						62	287.06
Bullacta exarata	SDF						12	
subtotal							268	1240.84
%							54.4	
Holothuroids								
Protankyra bidentata	SDF						4	18.52
subtotal							4	18.52
%							0.81	
Others								
Nemertinea	C						5	23.15
Lingula sp.	FF						1	
subtotal							6	
%							1.22	
Species No.							27	
Individual No							493	2282.59
					%		100	

Total No. of species collected from 4 cores: 27
Total No. of Inds. collected from 4 cores: 493
Total No. of Inds per square meter: 493 x (10000/(432 x 5cores)) = 2282 inds/sq. m

Feeding groups		%
1. Deposit feeders(SDF, SSDF)	216	43.8
2. Filter feeders(FF)	53	10.8
3. Carnivores(C)	30	6.09
4. Scavenger (SC)	194	39.4
Total	493	100

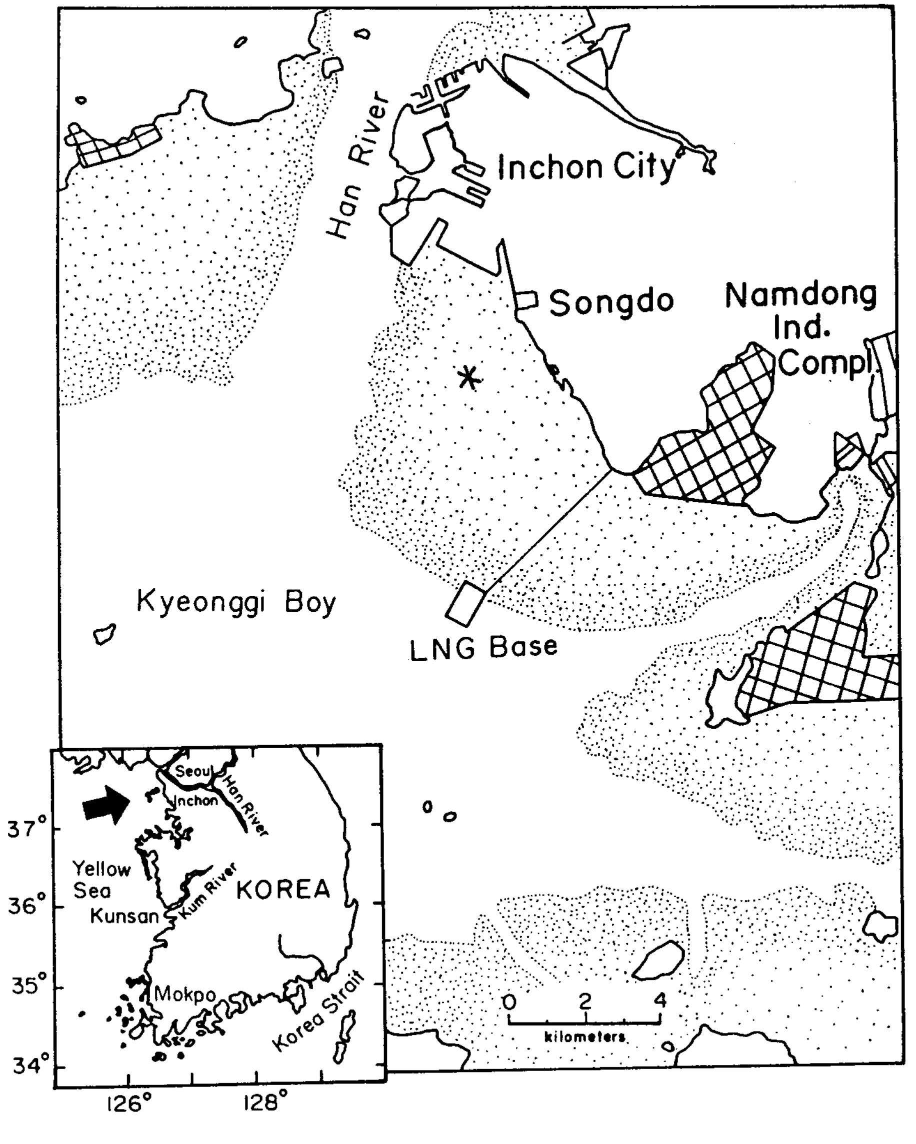

Fig. 1. Geographical location of Songdo area and the sampling site (*) in the intertidal sand flat. Dotted areas are intertidal flats.

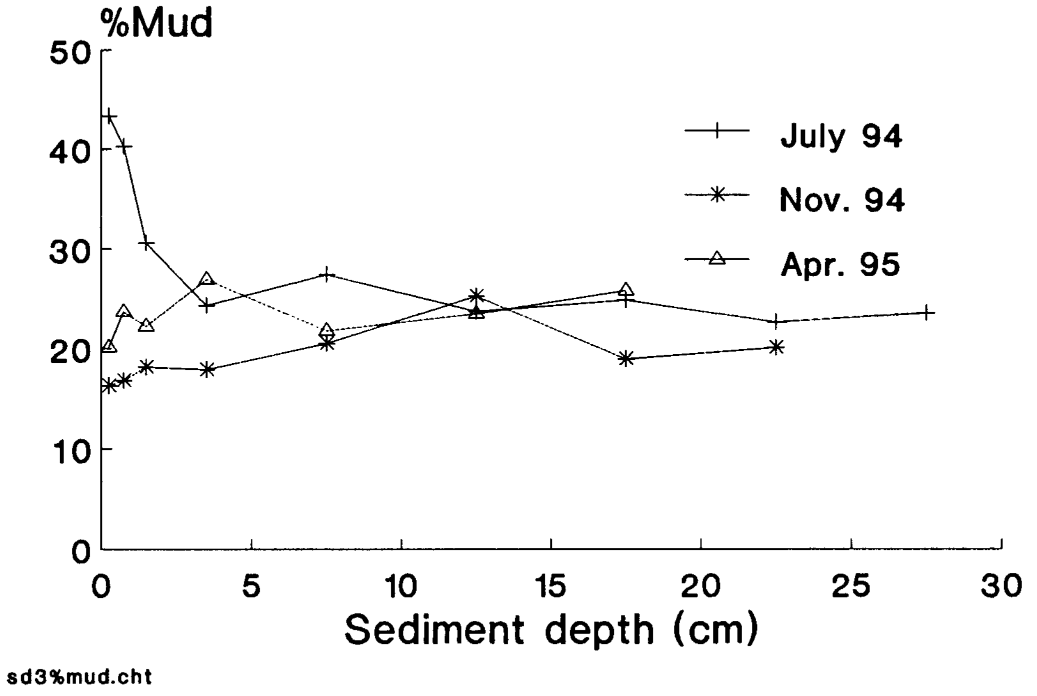

Fig. 2. Vertical variations of mud contents in the sediment cores collected at different seasons. Means are represented. (See Appendix I for the data.)

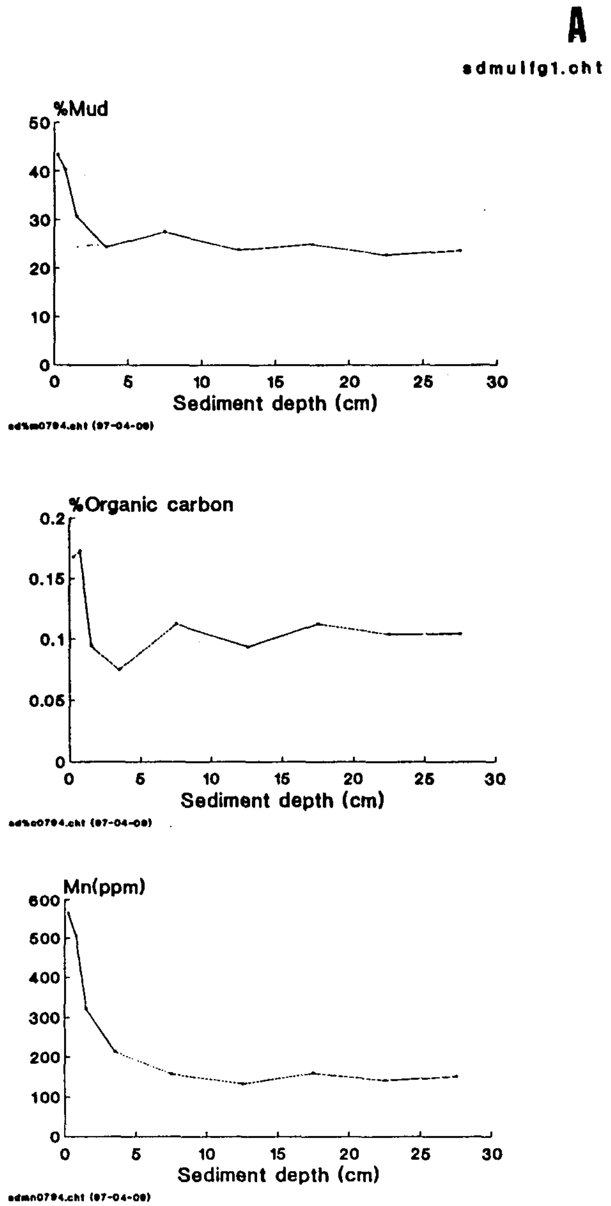

Fig. 3. Vertical variations of mud, organic carbon, and metal contents in the sediment cores collected in July 1994. (See Appendices I & II for the data.)

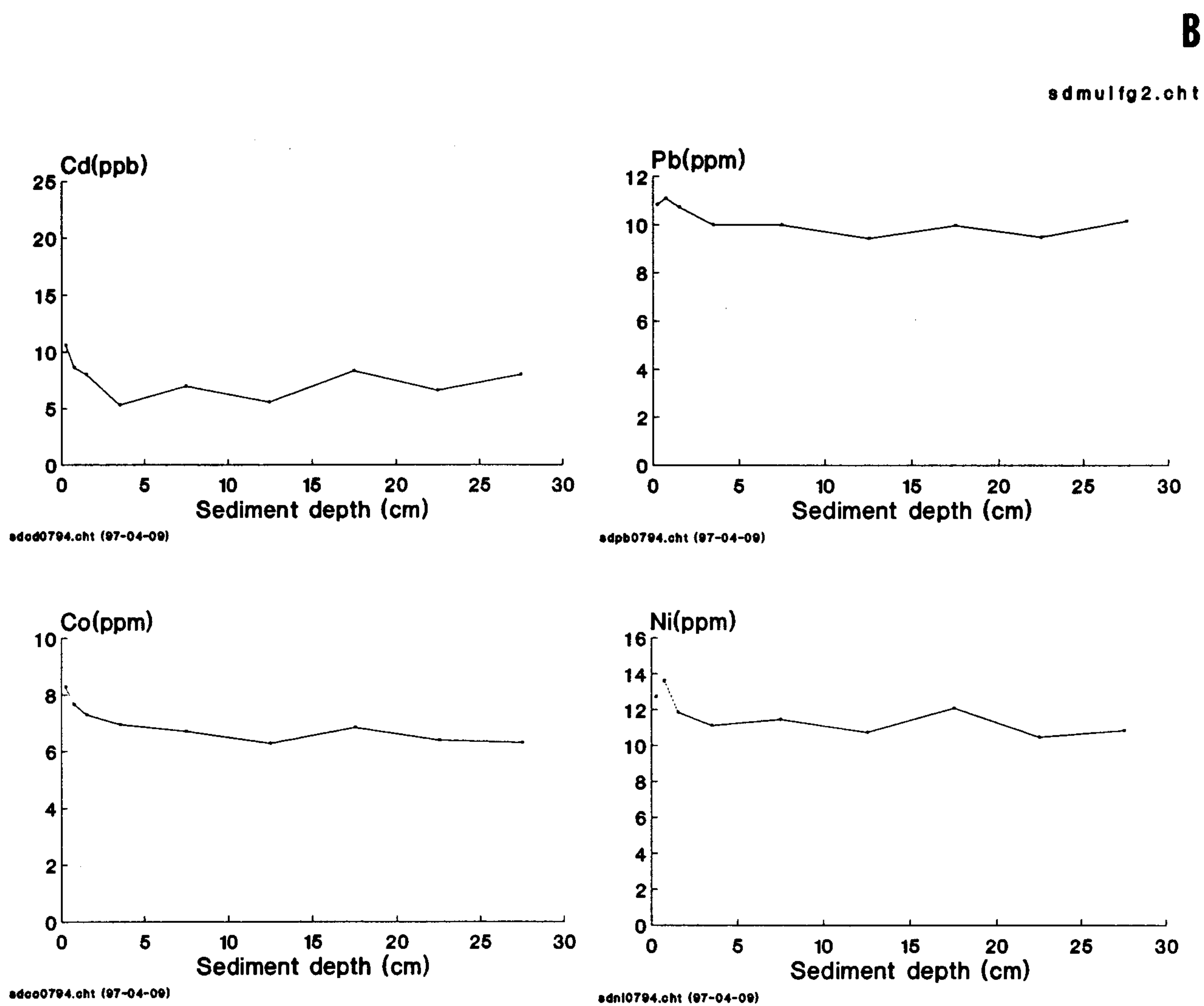

Fig. 3. (continued)

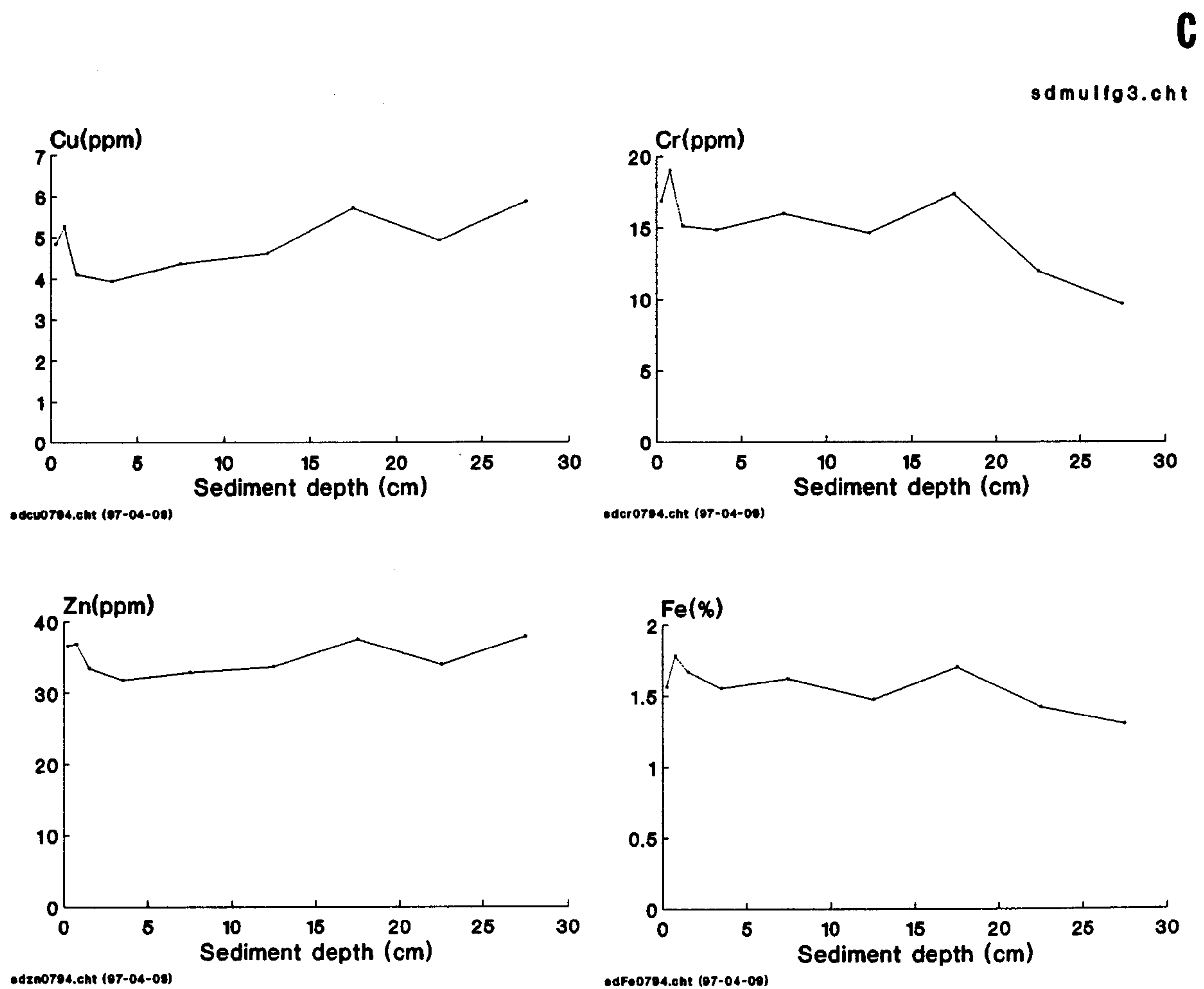

Fig. 3. (continued)

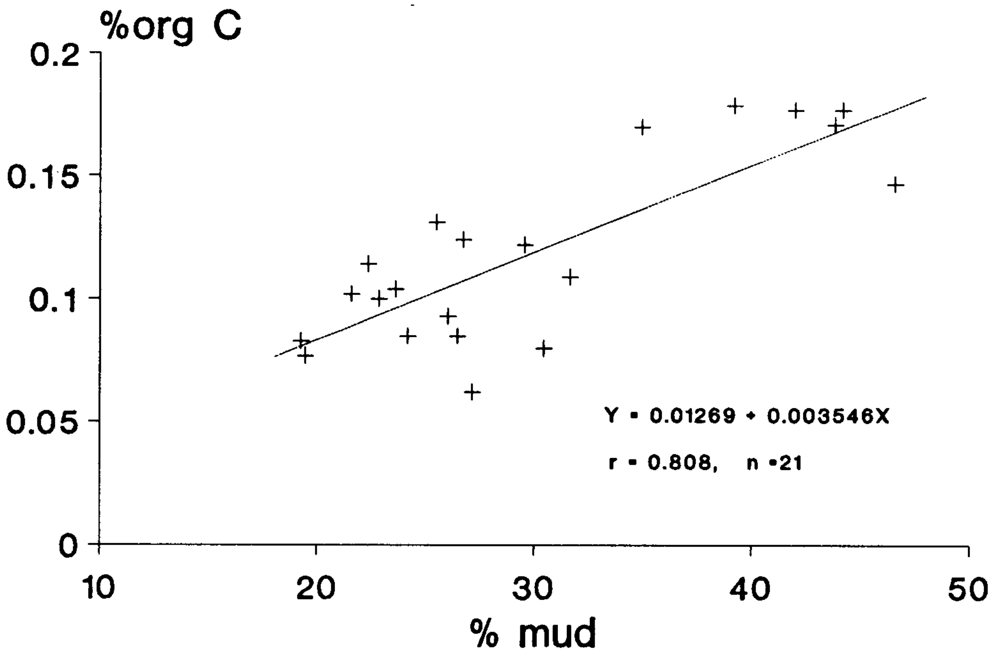

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Fig. 4. Positive correlation between mud and organic carbon contents of the sediments collected in July 1994. (See Appendix XI for the statistics)

A

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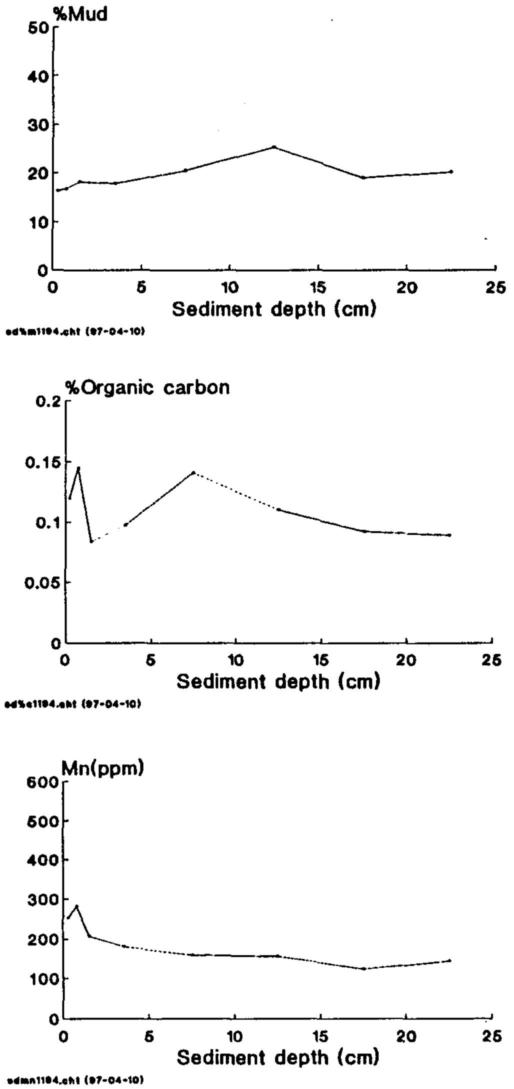


Fig. 5. Vertical variations of mud, organic carbon, and metal contents in the sediment cores collected in November 1994. (See Appendices I & II for the data.)

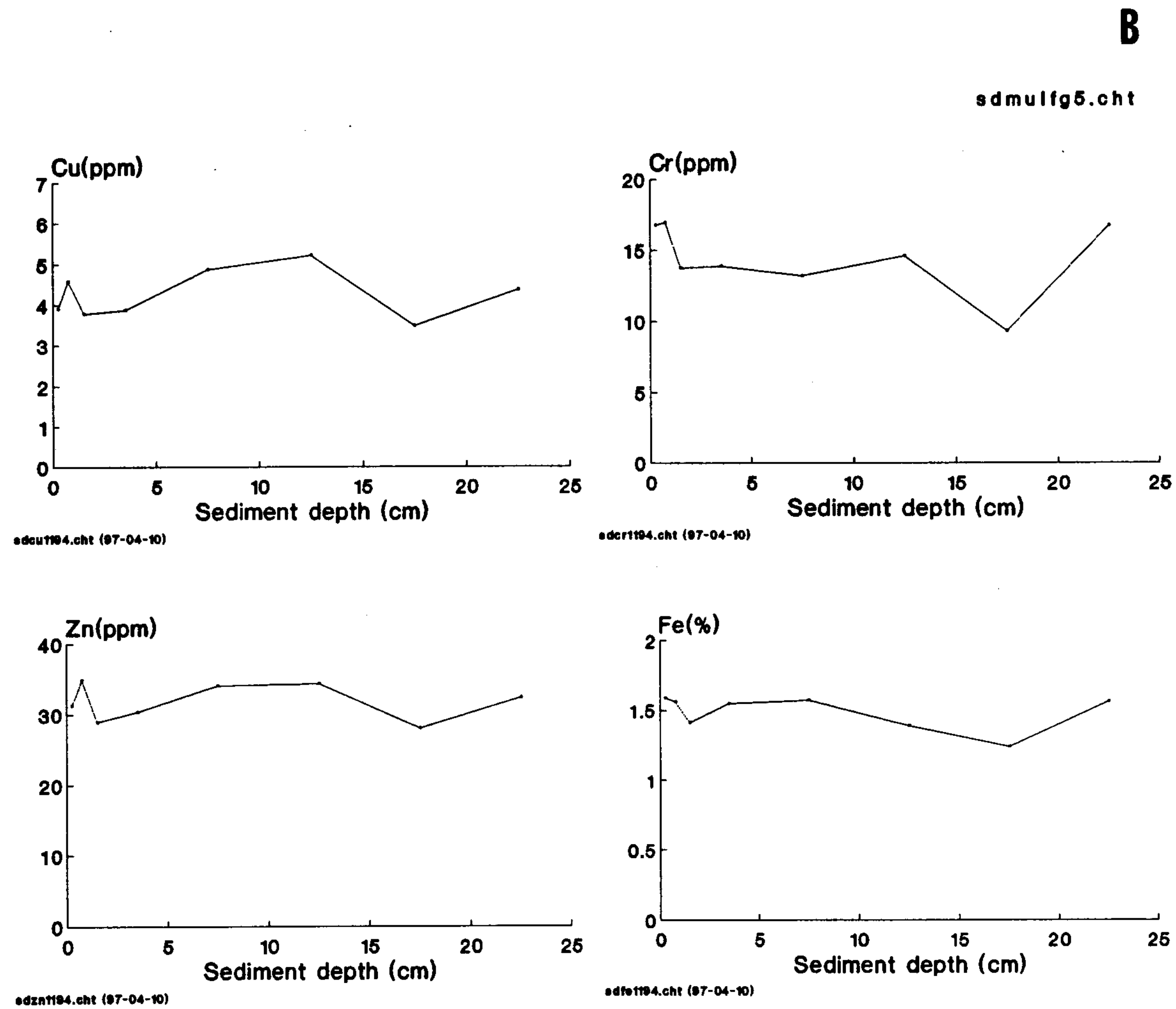


Fig. 5. (continued)

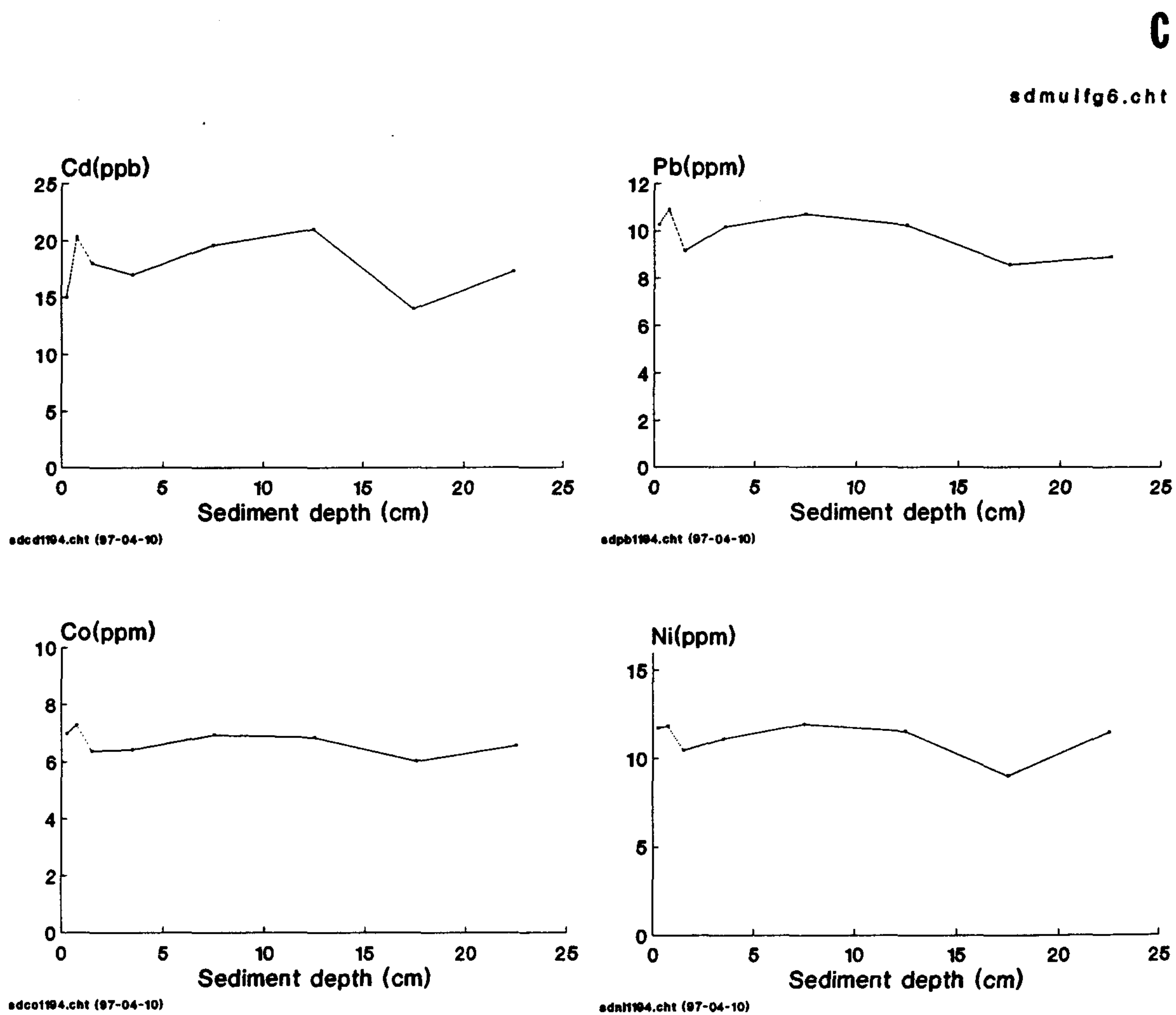


Fig. 5. (continued)

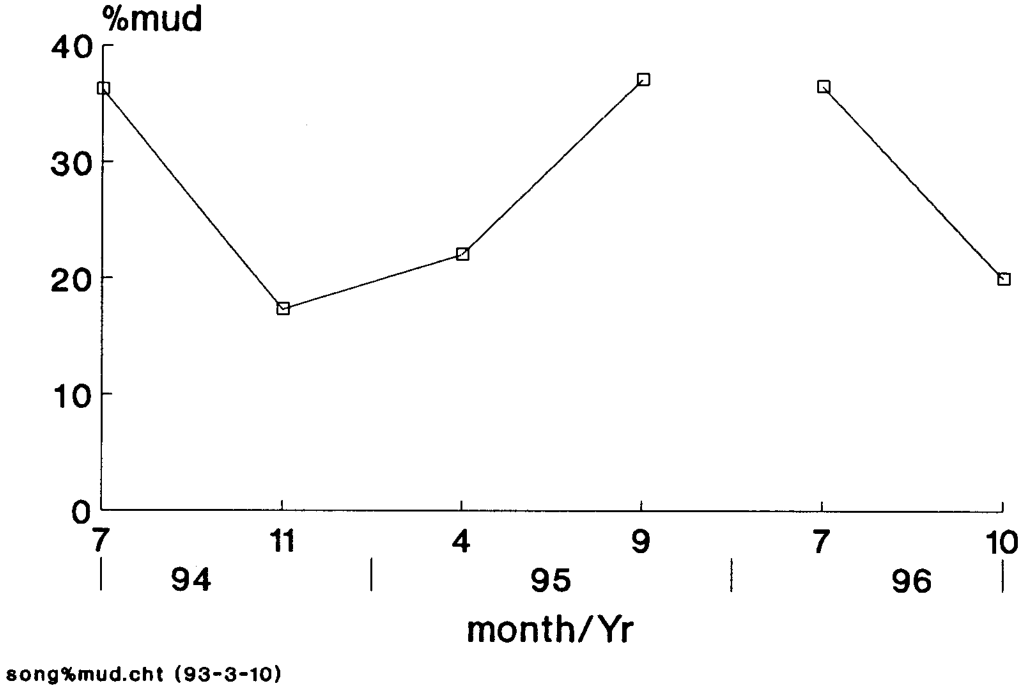


Fig. 6. Seasonal variations of mud contents in the surface (top 2 cm) sediment in the Songdo intertidal sand flat.

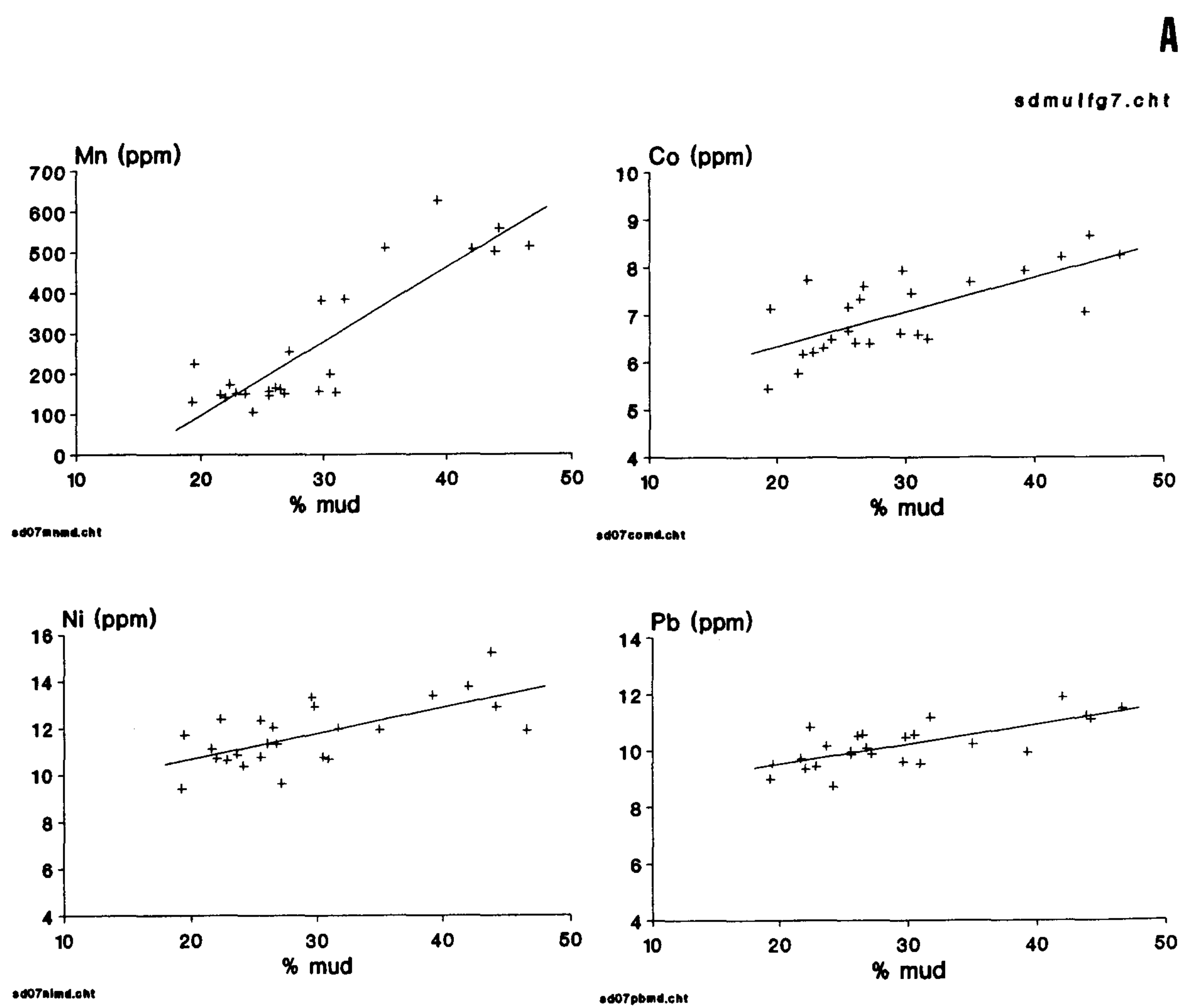


Fig. 7. Positive correlations of mud contents with Mn, Co, Ni, Pb(A). Cd, Cr, Zn, Fe and Cu do not show any correlation with mud contents(B). (See Appendix XI for the statistics)

Sdmulfg8. cht

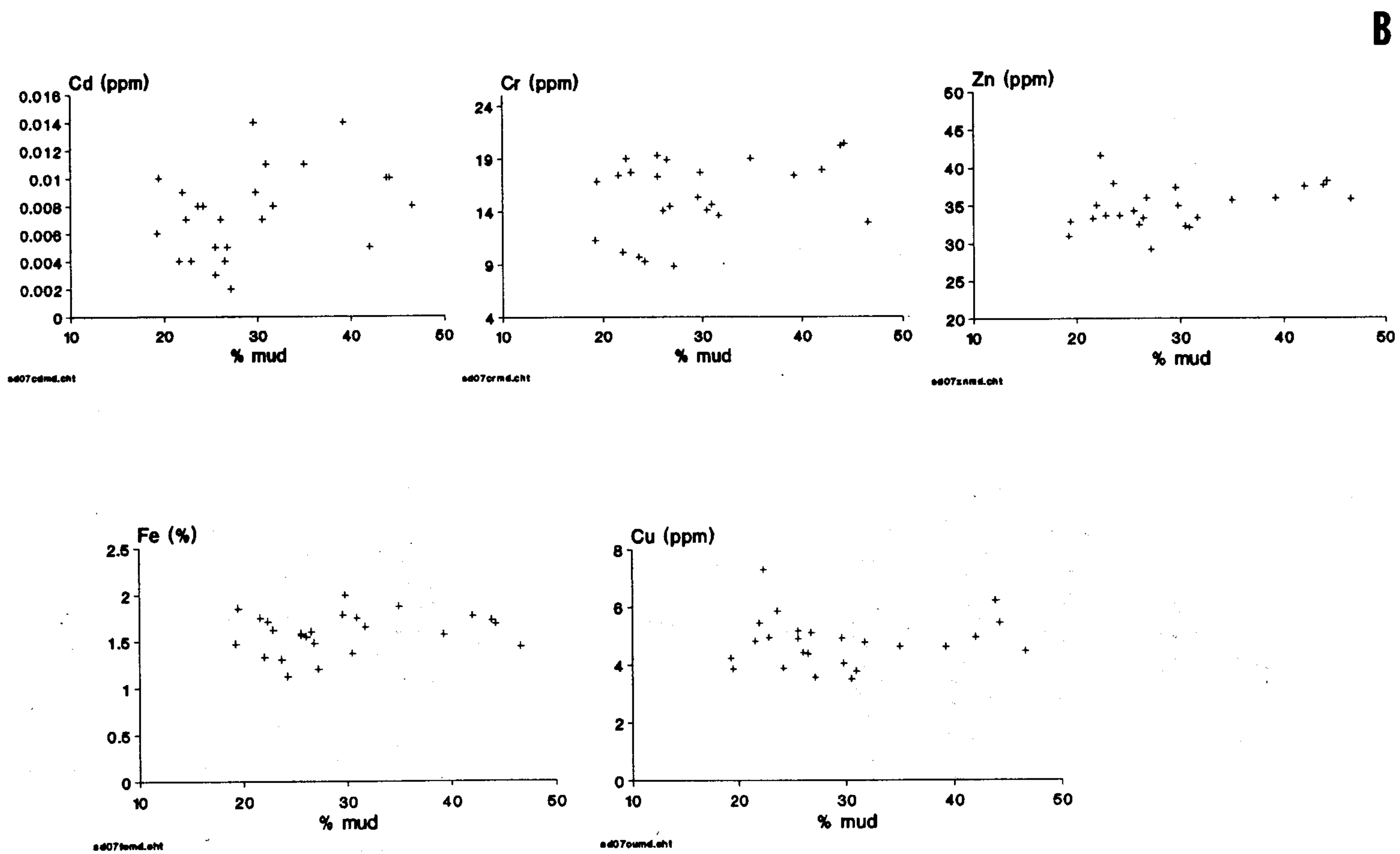


Fig. 7. (continued)

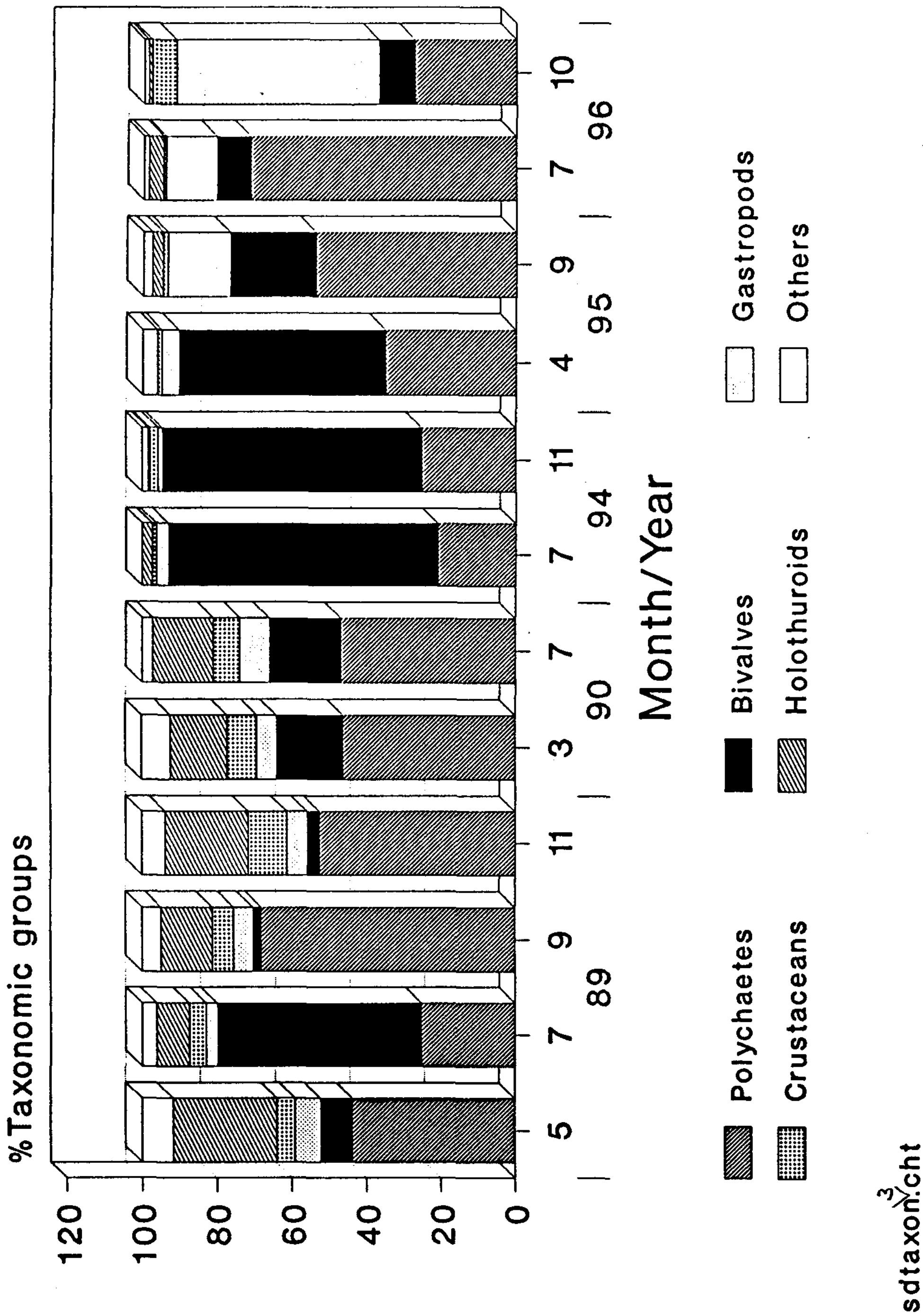


Fig. 8. Temporal variations in the composition of major taxonomic groups in the Songdo infaunal benthic communities. Data from May 1989 through July 1990 were compiled from Park (1991). (See Appendix IV for the data.)

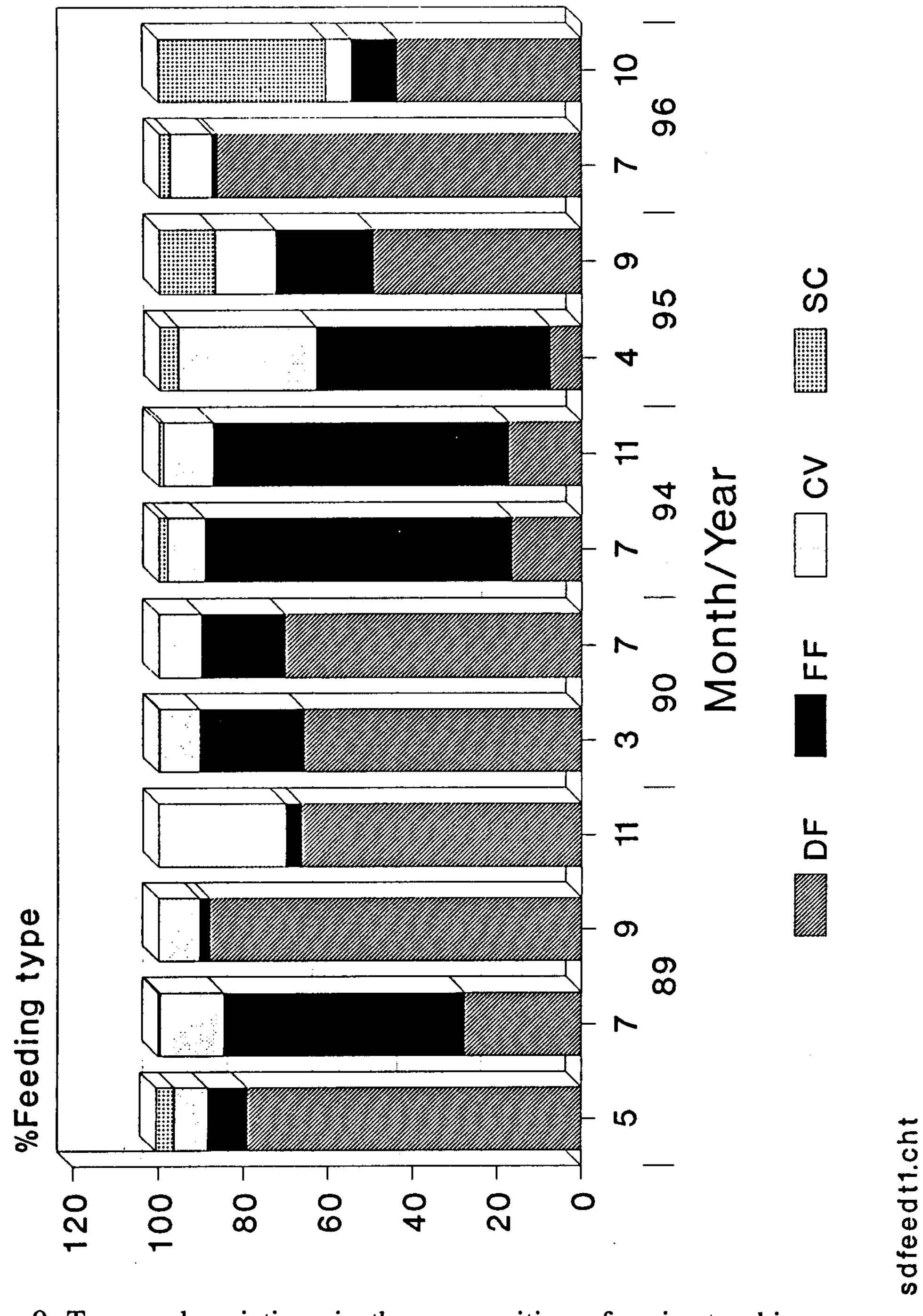
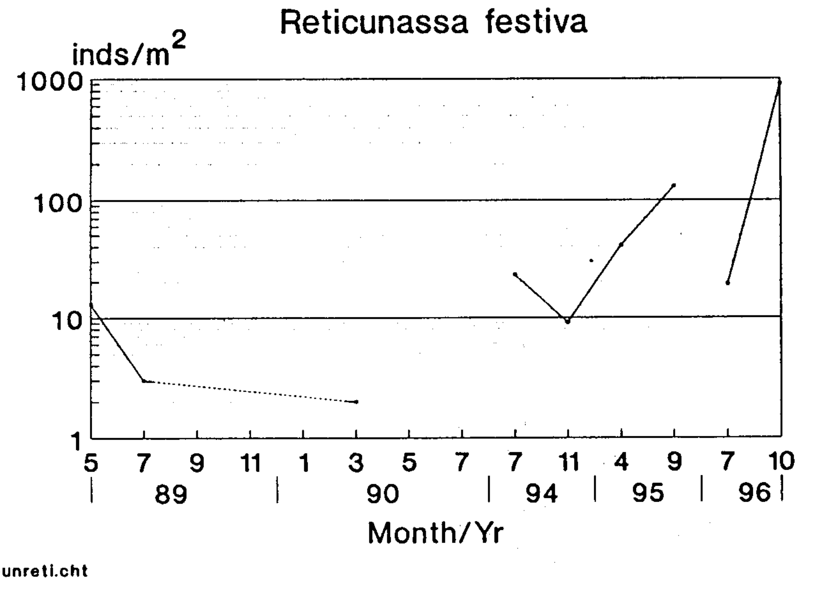


Fig. 9. Temporal variations in the composition of major trophic groups in the Songdo infaunal benthic communities. Data from May 1989 through July 1990 were compiled from Park (1991). (See Table III & Appendix V for the data.)

A



B

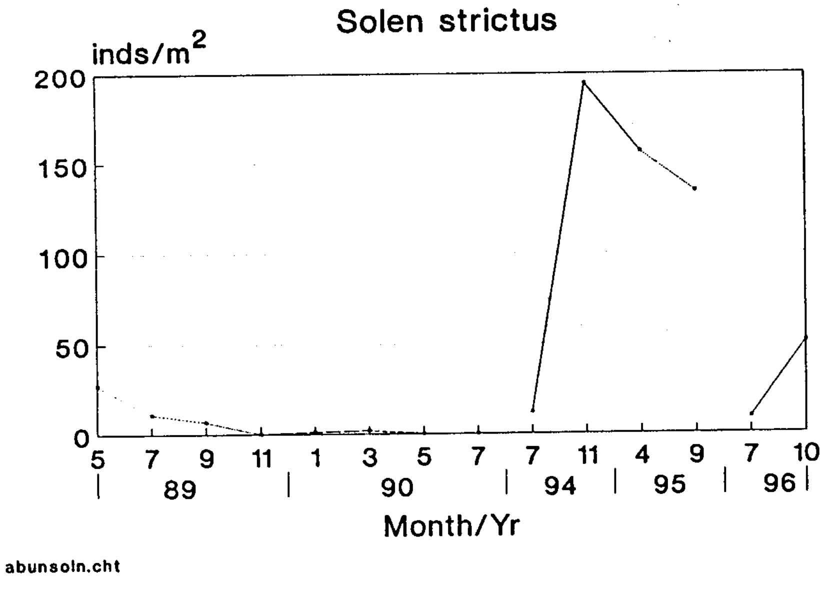
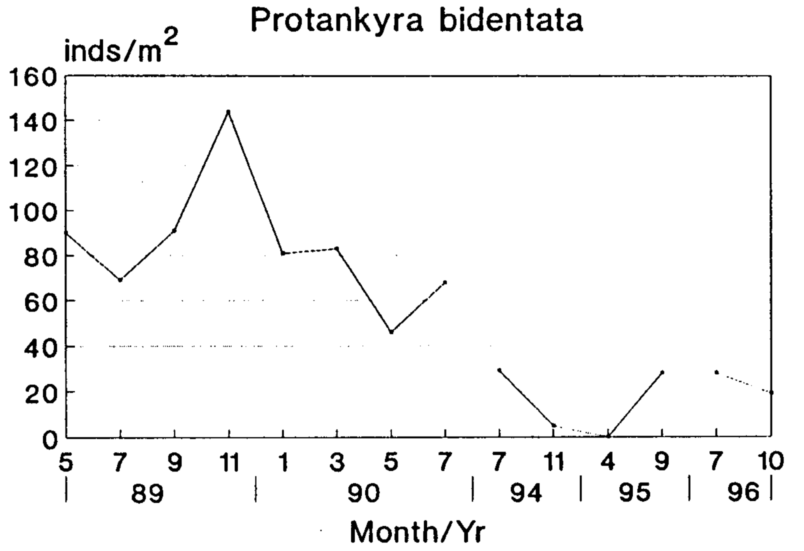


Fig. 10. Temporal variations in the abundance of dominant species in the Songdo intertidal benthic communities. Data from May 1989 through July 1990 were compiled from Park (1991).

C



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D

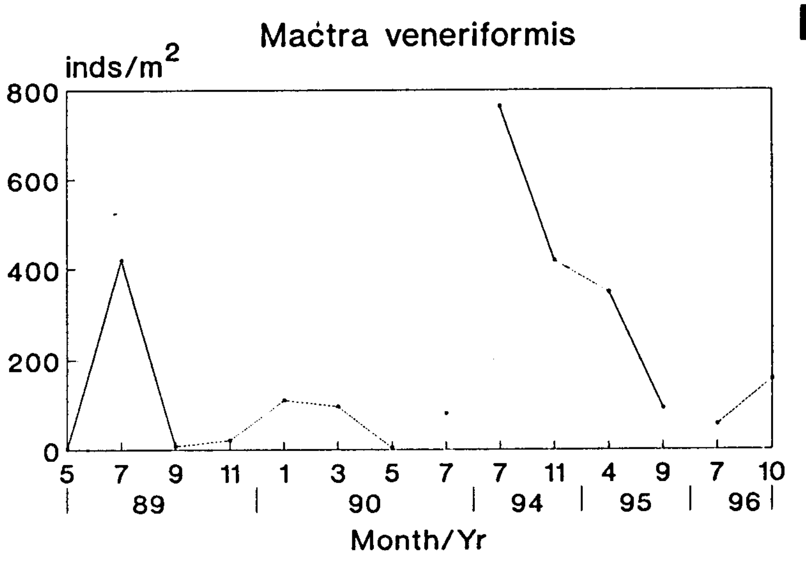

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Fig. 10. (continued)

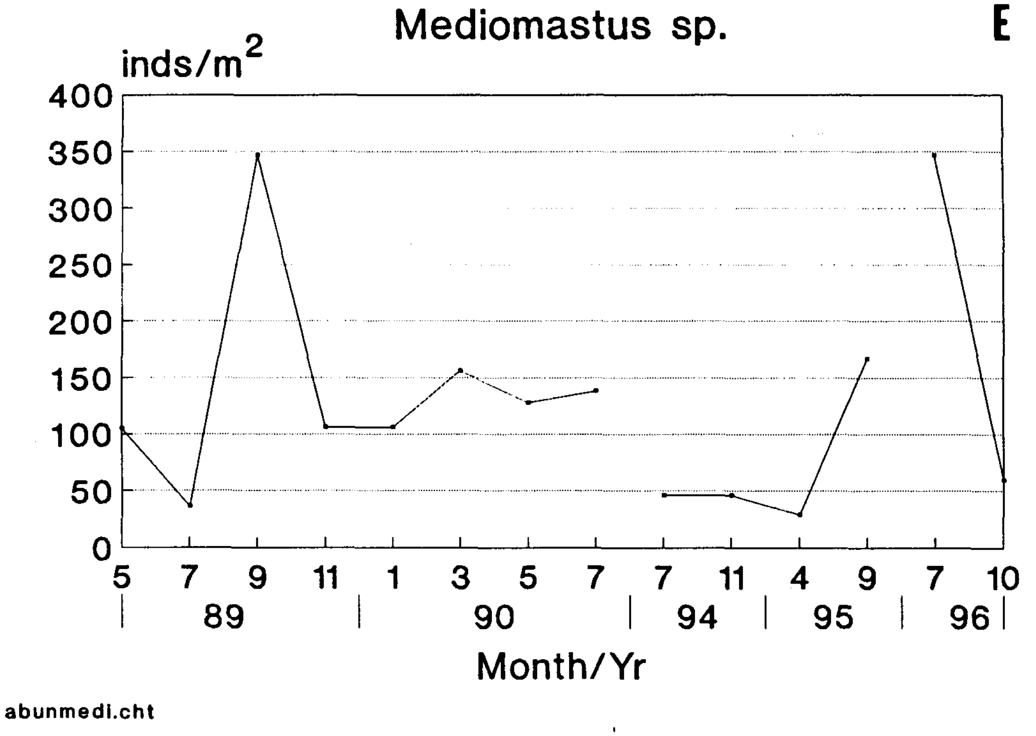
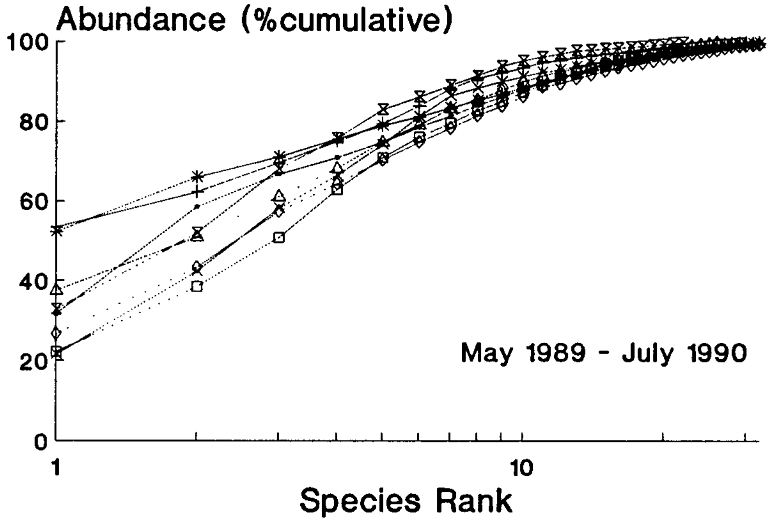
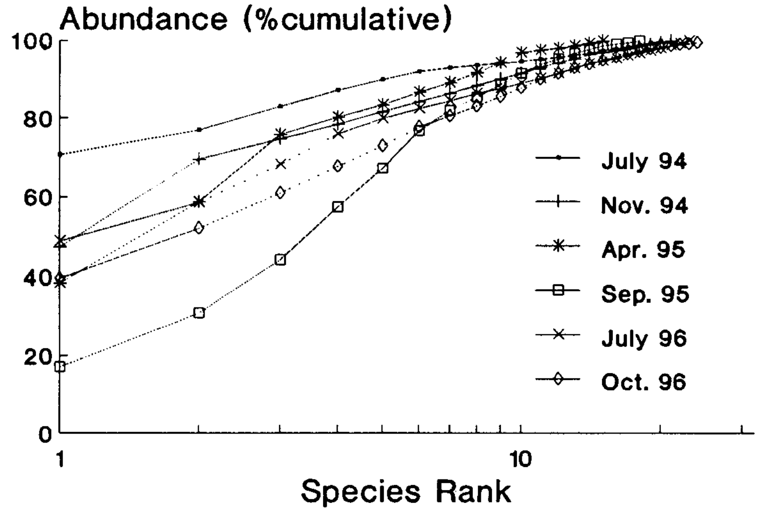


Fig. 10. (continued)

domntot.cht



domn8990.cht



rank9496.cht (97-04-07)

Fig. 11. Comparisons of the rank species abundance curves in the period of July 94 to Oct.96 with those in the period of May 1989 to July 1990. Data from May 1989 through July 1990 were compiled from Park (1991).(See Appendix VI for the data.)

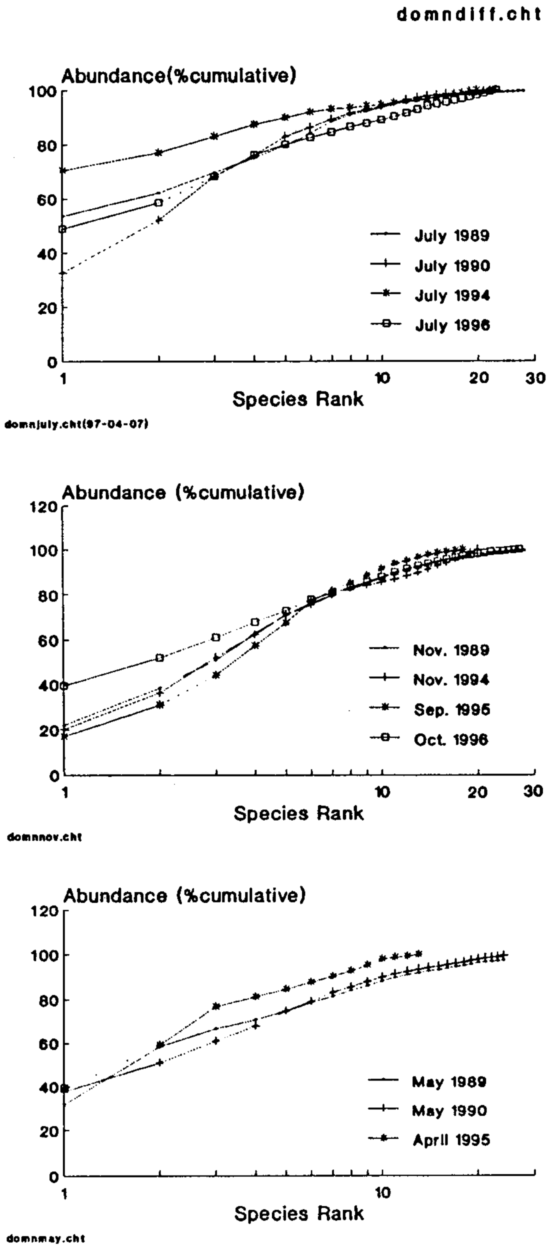


Fig. 12. Rank species abundance curves at different years for three different seasons. Data from May 1989 through July 1990 were compiled from Park (1991). (See Appendix VI for the data.)

Appendix I

95/96 Songdo Project (1994. 7. 28.)　　　　filename: songdoto.wb3

A. Gojan (St.3)

Depth	#1(silt)	#1(clay)	#2(s)	#2(c)	#3(s)	#3(c)	#4(s)	#4(c)	#1%m	#2%m	#3%mu	#4%m	@%mu	SD1	SD(cor
0-0.5	24.2	1.86	35.45	3.29	37.5	2.46	56.18	3.64	26.06	38.74	39.96	59.82	41.145	12.08	13.95
0.5-1	31.44	3.21	30.03	2.98	33.53	2.23	26.34	2.62	34.65	33.01	35.76	28.96	33.095	2.58	2.979
1-2	35.7	2.72	37.82	2.74	18.73	2.09	30.13	2.18	38.42	40.56	20.82	32.31	33.028	7.671	8.858
2-5	32.72	2.73	28.09	2.62	18.73	2.09	29.39	3.43	35.45	30.71	20.82	32.82	29.95	5.532	6.388
5-10	26.75	3.41	19.32	1.14	14.62	0.74	21.7	0.83	30.16	20.46	15.36	22.53	22.128	5.321	6.145
10-15	13.68	1	15.82	0.07	17.05	1.2	16.18	0.49	14.68	15.89	18.25	16.67	16.373	1.295	1.496
15-20	29.92	3.57	28.79	1.86	18.54	1.75	21.98	0.93	33.49	30.65	20.29	22.91	26.835	5.41	6.247
20-25	21.54	0.47	21.89	0.42	31.65	1.79	20.21	1.72	22.01	22.31	33.44	21.93	24.923	4.92	5.681
>25			29.71	1.79	35.49	1.4				31.5	36.89		34.195	2.695	3.112

B. Songdo (St. 1)

Depth	#1(silt)	#1(clay)	#2(s)	#2(c)	#3(s)	#3(c)	#1%m	#2%m	#3%mu	@%mu	SD1	SD(cor
0-0.5	36.79	2.43	42.35	4.24	40.23	3.98	39.22	46.59	44.21	43.34	3.071	3.761
0.5-1	32.2	2.76	41.95	1.9	37.52	4.5	34.96	43.85	42.02	40.277	3.833	4.694
1-2	28.14	1.64	28.34	3.34	29.19	1.27	29.78	31.68	30.46	30.64	0.786	0.963
2-5	19.02	0.42	25.97	1.18	25.14	1.32	19.44	27.15	26.46	24.35	3.483	4.266
5-10	27.76	3.15	24.67	1.37	24.49	1.01	30.91	26.04	25.5	27.483	2.433	2.98
10-15	23.74	0.43	19.55	2.04	22.53	2.97	24.17	21.59	25.5	23.753	1.623	1.988
15-20	26.19	3.38	21.42	1.42	19.97	2.37	29.57	22.84	22.34	24.917	3.297	4.038
20-25	17.56	1.68	19.41	2.57	24.96	1.79	19.24	21.98	26.75	22.657	3.103	3.8
>25			21.27	2.34				23.61		23.61	0	0

95/96 Songdo Project - 1994. 11. 22.

B. Songdo (St. 1) (Chuckjom)

Depth	#1(silt)	#1(clay)	#2(s)	#2(c)	#3(s)	#3(c)	#1%m	#2%m	#3%mu	@%mu	SD1	SD(cor
0-0.5	15.73	1.44	13.93	1.39			17.17	15.32		16.245	0.925	1.308
0.5-1	15.39	1.08	17.03	0			16.47	17.03		16.75	0.28	0.396
1-2	18.7	1.32	16.14	1.15	16.01	1.08	20.02	17.29	17.09	18.133	1.337	1.637
2-5	16.96	1.22	19.41	0.93	13.82	1.19	18.18	20.34	15.01	17.843	2.189	2.681
5-10	12.51	1.66	20.49	2.09	22.54	2.12	14.17	22.58	24.66	20.47	4.535	5.554
10-15	26.27	1.1	25.04	2.93	18.17	2.44	27.37	27.97	20.61	25.317	3.337	4.087
15-20	9.12	0.32	66.67	33.33	18.94	0	9.44	(100)	18.94	14.19	4.75	6.717
20-25	13.22	1.09	21.28	2.03	22.31	0.42	14.31	23.31	22.73	20.117	4.113	5.037
>25												

95/96 Songdo Project (1994. 7. 28.) filename: songdoto.wb3

A. Gojan (St. 3) - %Organic carbon

Depth	#1	#2	#3	#4	mean	SD	SDcor	%CV
0-0.5	0.11278	0.118	0.12		0.11693		0.0041	3.506
0.5-1	0.132	0.126	0.098	0.097	0.11325	0.0159	0.0184	16.21
1-2	0.102	0.098	0.131	0.105	0.109	0.0129	0.0149	13.71
2-5		0.121	0.088	0.1	0.103		0.0167	16.21
5-10	0.089	0.089	0.062	0.098	0.0845	0.0135	0.0156	18.45
10-15	0.087		0.115	0.079	0.093		0.0189	20.32
15-20	0.117	0.098	0.122	0.091	0.107	0.0129	0.0149	13.88
20-25	0.098	0.057	0.115	0.071	0.08525	0.0226	0.0261	30.66
>25								

B. Songdo (St. 1) - %Organic carbon

Depth	#1	#2	#3	mean	SD	SDcor	%CV
0-0.5	0.179	0.147	0.177	0.16767	0.0146	0.0179	10.69
0.5-1	0.17	0.171	0.177	0.17267	0.0031	0.0038	2.193
1-2		0.109	0.08	0.0945	0.0461	0.02	21.16
2-5	0.077	0.062	0.085	0.07467	0.0095	0.0117	15.64
5-10		0.093	0.131	0.112	0.055	0.026	23.21
10-15	0.085	0.102		0.0935	0.0446	0.012	12.83
15-20	0.122	0.1	0.114	0.112	0.0091	0.0111	9.944
20-25	0.083		0.124	0.1035	0.0516	0.028	27.05
>25		0.104		0.104	0	0	

95/96 Songdo Project - 1994. 11.

B. Chuckjern (Songdo? - St. 1) - %Organic carbon

Depth	#1	#2	#3	mean	SD	SDcor	%CV
0-0.5	0.1099	0.1174	0.1308	0.11937	0.0086	0.0106	8.871
0.5-1	0.1198	0.1569	0.1576	0.14477	0.0177	0.0216	14.94
1-2	0.087		0.0801	0.0835	0.0048	0.0048	5.749
2-5	0.071	0.1244	0.0964	0.09727	0.0218	0.0267	27.46
5-10	0.1417	0.1434	0.1364	0.1405	0.003	0.0037	2.599
10-15	0.1226	0.1191	0.0873	0.10967	0.0159	0.0195	17.74
15-20	0.098	0.0688	0.0919	0.08623	0.0126	0.0154	17.86
20-25	0.069	0.1091	0.0875	0.08853	0.0164	0.0201	22.67
>25							

filename: \hwpro\songdo96\sedigr1.hwp

Sample No.	Composition(%) Gra.	Sand	Silt	Clay	Sediment Type by Folk	Statistical Parameters MZ(Phi)	St.De.	Skew.	Kurt.
94-11-22 CHU									
St.1-1(0-0.5)		82.84	15.73	1.44	mS	3.77	0.98	4.40	29.63
(0.5-1)		83.53	15.39	1.08	mS	3.75	0.87	3.09	15.51
(1-2)		79.99	18.70	1.32	mS	3.78	0.96	4.64	32.82
(2-5)		81.82	16.96	1.22	mS	3.76	0.83	3.81	23.20
(5-10)		85.83	12.51	1.66	mS	3.75	0.97	3.49	18.22
(10-15)		72.62	26.27	1.10	mS	3.90	0.96	2.22	9.84
(15-20)		90.56	9.12	0.32	S	3.59	0.56	3.69	30.67
(20-25)		85.69	13.22	1.09	mS	3.70	0.84	5.30	41.38
St.1-2(0-0.5)		84.68	13.93	1.39	mS	3.75	0.94	4.62	31.08
(0.5-1)		82.97	17.03		mS	3.90	1.14	2.34	7.51
(1-2)		82.71	16.14	1.15	mS	3.72	0.88	4.07	29.90
(2-5)		79.66	19.41	0.93	mS	3.76	0.86	4.17	30.10
(5-10)		77.42	20.49	2.09	mS	3.88	1.14	3.87	21.98
(10-15)		72.03	25.04	2.93	mS	4.02	1.30	3.40	16.99
(15-20)			66.67	33.33	M	7.32	2.08	0.82	2.38
(20-25)		76.68	21.28	2.03	mS	3.90	1.10	3.99	23.12
St.1-3(1-2)		82.91	16.01	1.08	mS	3.75	0.87	4.87	35.86
(2-5)		84.99	13.82	1.19	mS	3.72	0.90	4.85	35.05
(5-10)		75.34	22.54	2.12	mS	3.90	1.13	3.46	18.98
(10-15)		79.40	18.17	2.44	mS	3.91	1.22	3.50	17.96
(15-20)		81.06	18.94		mS	3.71	0.57	2.26	11.20
(20-25)		77.27	22.31	0.42	mS	3.76	0.64	2.90	18.89
94-07-28 SONG									
St.1-1(0-0.5)		60.78	36.79	2.43	mS	4.06	1.04	2.95	13.78
(0.5-1)		65.04	32.20	2.76	mS	4.14	1.28	2.97	14.50
(1-2)		70.23	28.14	1.64	mS	3.98	1.11	3.68	21.72
(2-5)		80.56	19.02	0.42	mS	3.74	0.68	2.92	17.56
(5-10)		69.09	27.76	3.15	mS	4.07	1.31	3.21	15.41
(10-15)		75.83	23.74	0.43	mS	3.81	0.73	2.65	14.25
(15-20)		70.43	26.19	3.38	mS	4.10	1.37	3.14	14.46
(20-25)		80.76	17.56	1.68	mS	3.82	1.03	4.00	24.25

94-07-28 SONG (앞장에서 계속)

St.1-2(0-0.5)	53.41	42.35	4.24	mS	4.39	1.44	2.51	10.76
(0.5-1)	56.15	41.95	1.90	mS	4.23	1.23	2.64	13.11
(1-2)	68.31	28.34	3.34	mS	4.12	1.32	3.07	14.28
(2-5)	72.84	25.97	1.18	mS	3.88	0.92	4.26	29.11
(5-10)	73.96	24.67	1.37	mS	3.92	1.00	3.59	21.28
(10-15)	78.41	19.55	2.04	mS	3.88	1.10	3.96	22.54
(15-20)	77.16	21.42	1.42	mS	3.86	1.00	3.71	21.80
(20-25)	78.02	19.41	2.57	mS	3.91	1.21	3.81	20.28
(25-)	76.39	21.27	2.34	mS	3.94	1.20	3.65	19.39
St.1-3(0-0.5)	55.79	40.23	3.98	mS	4.34	1.45	2.76	12.10
(0.5-1)	57.97	37.52	4.50	mS	4.28	1.35	2.22	8.26
(1-2)	69.54	29.19	1.27	mS	3.95	1.00	3.84	24.69
(2-5)	73.54	25.14	1.32	mS	3.90	0.98	3.56	21.63
(5-10)	74.49	24.49	1.01	mS	3.86	0.90	2.84	14.54
(10-15)	74.50	22.53	2.97	mS	4.03	1.33	3.36	16.19
(15-20)	77.66	19.97	2.37	mS	3.91	1.15	3.73	20.30
(20-25)	73.25	24.96	1.79	mS	3.94	1.10	3.64	20.45

94-07-28 GOJAN

St.3-1(0-0.5)	73.94	24.20	1.86	mS	3.95	1.08	3.79	21.93
(0.5-1)	65.35	31.44	3.21	mS	4.15	1.39	3.07	14.63
(1-2)	61.58	35.70	2.72	mS	4.19	1.29	2.86	13.42
(2-5)	64.55	32.72	2.73	mS	4.16	1.21	2.42	9.62
(5-10)	69.85	26.75	3.41	mS	4.07	1.31	3.42	16.14
(10-15)	85.32	13.68	1.00	mS	3.72	0.82	5.71	47.02
(15-20)	66.51	29.92	3.57	mS	4.17	1.38	2.90	12.90
(20-25)	77.98	21.54	0.47	mS	3.80	0.75	3.19	16.92
St.3-2(0-0.5)	61.26	35.45	3.29	mS	4.28	1.38	2.50	10.82
(0.5-1)	66.99	30.03	2.98	mS	4.14	1.33	3.01	14.48
(1-2)	59.44	37.82	2.74	mS	4.21	1.28	2.94	14.17
(2-5)	69.29	28.09	2.62	mS	4.06	1.24	3.32	16.74
(5-10)	79.54	19.32	1.14	mS	3.81	0.84	3.74	21.23
(10-15)	84.11	15.82	0.07	mS	3.67	0.49	2.76	18.45
(15-20)	69.35	28.79	1.86	mS	4.00	1.10	3.62	20.05
(20-25)	77.69	21.89	0.42	mS	3.76	0.62	4.09	30.63
(25-)	68.50	29.71	1.79	mS	3.98	1.05	3.71	21.64

94-07-28 GOJAN (앞장에서 계속)

St.3-3(0-0.5)	60.04	37.50	2.46	mS	4.22	1.27	2.76	13.62
(0.5-1)	64.24	33.53	2.23	mS	4.12	1.18	2.97	14.54
(1-2)	79.17	18.73	2.09	mS	3.89	1.11	4.05	22.99
(2-5)	79.17	18.73	2.09	mS	3.89	1.11	4.05	22.99
(5-10)	84.65	14.62	0.74	mS	3.71	0.72	5.55	50.01
(10-15)	81.75	17.05	1.20	mS	3.38	1.14	3.08	19.07
(15-20)	79.71	18.54	1.75	mS	3.86	1.05	4.10	24.42
(20-25)	66.55	31.65	1.79	mS	4.04	1.04	2.65	11.75
(25-)	63.11	35.49	1.40	mS	4.04	1.01	3.48	21.39
St.3-4(0-0.5)	40.17	56.18	3.64	sM	4.68	1.50	2.16	9.54
(0.5-1)	71.04	26.34	2.62	mS	4.06	1.26	3.13	15.65
(1-2)	67.69	30.13	2.18	mS	4.07	1.18	3.14	16.11
(2-5)	67.17	29.39	3.43	mS	4.17	1.40	2.94	13.15
(5-10)	77.47	21.70	0.83	mS	3.85	0.87	2.72	12.45
(10-15)	83.33	16.18	0.49	mS	3.71	0.63	4.02	26.20
(15-20)	77.09	21.98	0.93	mS	3.80	0.81	4.77	37.20
(20-25)	78.08	20.21	1.72	mS	3.86	1.03	4.40	27.70

송도 조간대 퇴적물 시료 입도분석

1996. 11 에 극지실 Sedigraph 이용 분석: 강 천 윤

자료입력 및 정리: 윤 수미, 양 영선

filename: \hwpro\songdo96\sedigra2.hwp

Sample No.	Composition(%) Gra.	Sand	Silt	Clay	Sediment Type by Folk	%mud	Statistical Parameters MZ(Phi)	St.De.	Skew.	Kurt.
척전 94-11(St. 22)										
0-1		80.25	9.50	10.25	mS		4.47	2.66	2.52	7.68
1-2		81.59	9.41	9.00	mS		4.31	2.53	2.70	8.78
2-5		77.78	12.77	9.45	mS		4.42	2.54	2.59	8.29
5-10		71.82	16.03	12.15	mS		4.71	2.80	2.17	6.14
10-15		78.48	9.22	12.30	mS		4.66	2.89	2.22	6.16
15-20		72.32	14.99	12.69	mS		4.75	2.91	2.12	5.81
>20		66.16	21.61	12.23	mS		4.81	2.81	2.15	6.02
송도 94-11						%mud				
0-1		84.94	8.26	6.80	mS	15.06	3.99	2.28	3.11	11.63
1-2		83.27	9.02	7.71	mS	16.73	4.22	2.37	3.00	10.55
2-5		82.18	8.70	9.12	mS	17.82	4.07	2.66	2.57	8.27
5-10		59.45	24.15	16.40	mS	40.55	5.23	3.14	1.68	4.15
10-15		47.89	35.31	16.80	sM	52.11	5.45	3.02	1.56	3.95
15-20		77.34	5.26	17.40	mS	22.66	5.04	3.34	1.63	3.89
20-25		74.09	13.14	12.77	mS	25.91	4.59	2.99	2.00	5.56
>25		76.34	13.86	9.80	mS	23.66	4.46	2.61	2.52	7.86
송도 95-04						% mud				
0-0.5B		79.88	11.94	8.18	mS	20.12	4.25	2.43	2.79	9.54
0.5-1B		76.29	12.69	11.02	mS	23.71	4.49	2.78	2.31	6.81
1-2B		77.75	12.37	9.88	mS	22.25	4.36	2.64	2.45	7.64
2-5B		73.04	15.83	11.13	mS	26.96	4.58	2.71	2.28	6.75
5-10B		78.23	12.40	9.37	mS	21.77	4.35	2.55	2.55	8.18
10-15B		76.48	11.89	11.63	mS	23.52	4.50	2.82	2.21	6.41
15-20B		74.15	15.50	10.35	mS	25.85	4.49	2.68	2.39	7.29
>20		56.85	28.92	14.23	mS	43.15	5.07	2.97	1.90	4.99
송도 95-09						%mud				
0-0.5A		67.34	19.39	13.27	mS	32.66	4.88	2.90	2.05	5.53
0.5-2A		56.68	27.87	15.45	mS	43.32	5.20	2.94	1.73	4.48
0-0.5B		68.80	19.91	11.29	mS	31.2	4.71	2.70	2.30	6.72
0.5-2B		65.52	21.27	13.20	mS	34.47	4.88	2.87	1.99	5.45

송도 조간대 퇴적물 시료 입도분석
1996. 11 에 극지실 Sedigraph 이용 분석: 강 천 윤
자료입력 및 정리: 윤 수미, 양 영선 filename: \hwpro\songdo96\sedigra2.hwp

고잔 9407-28

Depth(cm)											
0-0.5	st.1-1		0.50	51.57	47.93	M	8.75	3.15	0.12	1.32
0.5-1	st.1-1		0.63	59.87	39.50	M	8.20	2.95	0.47	1.64
1-2	st.1-1		0.53	49.92	49.56	M	8.83	3.20	0.05	1.30
2-5	st.1-1	0.16	0.84	50.77	48.23	(g)M	8.61	2.90	0.11	1.83
5-10	st.1-1	0.30	1.65	50.94	47.11	(g)M	8.51	3.10	0.02	1.93
10-15	st.1-1		1.90	36.30	61.80	M	9.30	2.90	-0.31	1.88
15-20	st.1-1	0.17	2.27	34.29	63.27	(g)M	9.48	3.22	-0.54	1.99
20-25	st.1-1	0.27	2.80	58.68	38.25	(g)M	7.77	3.26	0.30	1.96
25-26	st.1-1		2.84	32.73	64.43	M	9.71	3.50	-0.70	1.91
0-0.5	st.1-2	0.12	0.68	51.94	47.26	(g)M	8.59	3.20	0.12	1.45
0.5-1	st.1-2		0.48	55.86	43.66	M	8.50	2.99	0.32	1.45
1-2	st.1-2		0.35	41.33	58.32	M	9.32	3.10	-0.21	1.36
2-5	st.1-2		0.16	48.66	51.18	M	8.86	2.80	0.17	1.48
5-10	st.1-2		0.48	42.34	57.18	M	9.20	2.82	-0.06	1.50
10-15	st.1-2	0.08	2.01	42.27	55.64	(g)M	8.87	2.91	-0.23	2.25
15-20	st.1-2	0.41	1.93	54.68	42.98	(g)M	8.16	3.29	0.16	1.77
20-25	st.1-2	0.28	2.69	58.00	39.03	(g)M	7.86	3.27	0.31	1.85
25-28	st.1-2	0.76	3.21	65.69	30.34	(g)M	7.17	3.10	0.52	2.58
0-0.5	st.1-3		0.36	56.85	42.79	M	8.41	3.11	0.33	1.39
0.5-1	st.1-3		0.66	46.45	52.89	M	9.09	3.05	-0.01	1.30
1-2	st.1-3		0.85	42.04	57.11	M	9.16	3.23	-0.21	1.36
2-5	st.1-3		0.44	48.00	51.56	M	8.93	2.96	0.06	1.43
5-10	st.1-3		0.72	51.28	48.00	M	8.59	2.78	0.23	1.72
10-15	st.1-3		1.35	54.48	44.17	M	8.19	3.07	0.28	1.62
15-20	st.1-3		1.61	60.00	38.39	M	7.82	2.99	0.48	1.84
20-25	st.1-3	0.72	2.45	59.36	37.47	(g)M	7.75	3.34	0.29	1.99
25-29	st.1-3	0.24	3.21	62.03	34.52	(g)M	7.54	3.27	0.49	1.95
0-0.5	st.1-4		0.57	53.90	45.53	M	8.61	3.08	0.24	1.35
0.5-1	st.1-4		0.42	53.12	46.46	M	8.63	3.07	0.22	1.35
1-2	st.1-4		0.71	51.99	47.30	M	8.73	3.16	0.13	1.34
2-5	st.1-4		0.53	42.36	57.11	M	9.28	2.86	-0.11	1.51
5-10	st.1-4		0.94	50.23	48.83	M	8.70	2.97	0.13	1.54
10-15	st.1-4		1.74	57.23	41.03	M	8.12	3.07	0.33	1.75
15-20	〃		2.11	37.16	60.73	M	9.39	3.22	-0.40	1.68
20-25	st.1-4	0.14	2.85	54.09	42.92	(g)M	8.16	3.17	0.21	1.75
25-29	st.1-4	0.13	2.86	32.29	64.72	(g)M	9.59	3.13	-0.59	2.08

송도 조간대 퇴적물 시료 입도분석
1996. 11 에 극지실 Sedigraph 이용 분석: 강 천 윤
자료입력 및 정리: 윤 수미, 양 영선 filename: \hwpro\songdo96\sedigra2.hwp

고잔 9407-28

Depth(cm)											
0-0.5	st.2-1		3.26	71.68	25.06	M	6.88	3.14	1.06	2.40
0.5-1	st.2-1		4.33	72.55	23.11	M	6.71	2.99	1.18	2.77
1-2	st.2-1		9.35	58.70	31.95	M	7.15	3.35	0.71	1.85
2-5	st.2-1	0.13	8.49	58.26	33.12	(g)M	7.22	3.34	0.56	1.90
5-10	st.2-1		6.70	50.61	42.69	M	8.00	3.38	0.27	1.45
10-15	st.2-1		5.22	60.07	34.71	M	7.50	3.24	0.60	1.75
15-20	st.2-1		5.05	63.44	31.51	M	7.37	3.04	0.74	2.03
20-25	st.2-1		3.89	69.47	26.64	M	6.96	3.06	0.99	2.36
>25	st.2-1		5.41	70.97	23.62	M	6.79	2.98	1.13	2.71
0-0.5	st.2-2	0.23	3.95	58.79	37.03	(g)M	7.63	3.55	0.46	1.52
0.5-1	st.2-2		3.90	50.10	46.00	M	8.34	3.69	0.13	1.17
1-2	st.2-2		5.90	54.31	39.79	M	7.89	3.58	0.36	1.33
2-5	st.2-2		4.35	65.86	29.79	M	7.20	3.26	0.81	1.94
5-10	st.2-2		6.28	64.57	29.15	M	7.16	3.12	0.83	2.12
10-15	st.2-2	0.13	4.10	60.08	35.69	(g)M	7.59	3.30	0.53	1.71
15-20	st.2-2		4.68	56.59	38.73	M	7.83	3.15	0.45	1.64
20-25	st.2-2		6.78	54.60	38.62	M	7.71	3.29	0.43	1.60
25-30	st.2-2		0.42	65.58	34.00	M	7.94	3.02	0.76	1.98
0-0.5	st.2-3		2.96	63.68	33.36	M	7.46	3.46	0.66	1.60
0.5-1	st.2-3		2.50	60.39	37.11	M	7.69	3.55	0.50	1.41
1-2	st.2-3		4.04	72.62	23.34	M	6.79	2.98	1.16	2.72
2-5	st.2-3		6.06	66.09	27.85	M	7.07	3.14	0.90	2.18
5-10	st.2-3		5.22	64.33	30.45	M	7.30	3.00	0.79	2.13
10-15	st.2-3	0.68	4.87	56.51	37.94	(g)M	7.63	3.40	0.33	1.85
15-20	st.2-3	0.11	8.02	55.55	36.32	(g)M	7.46	3.41	0.46	1.73
20-25	st.2-3	0.07	11.65	43.93	44.34	(g)sM	7.92	3.68	0.10	1.50
>25	st.2-3	0.22	12.02	61.06	26.70	(g)sM	6.72	3.25	0.87	2.36
0-0.5	st.2-4		4.47	46.39	49.13	M	8.54	3.77	0.01	1.11
0.5-1	st.2-4		3.91	67.93	28.16	M	7.07	3.29	0.90	2.04
1-2	st.2-4		2.94	64.04	33.02	M	7.43	3.44	0.66	1.64
2-5	st.2-4		3.52	70.00	26.48	M	6.97	3.15	0.99	2.28
5-10	st.2-4		4.68	65.51	29.81	M	7.14	3.22	0.82	2.01
10-15	st.2-4		4.14	65.17	30.69	M	7.21	3.12	0.79	2.02
15-20	st.2-4		5.72	65.04	29.24	M	7.15	3.10	0.84	2.13
20-25	st.2-4	0.08	11.04	59.48	29.40	(g)sM	6.94	3.24	0.80	2.11
>25	st.2-4		6.77	58.18	35.05	M	7.40	3.31	0.58	1.73

%Organic carbon in Songdo tidal flat sediment
filename: org-so.wq1

Songdo 94/11 %OC

Depth(cm	St.1	St.2	St.3	AVG	std(n-1)
0-0.5	0.0845	0.0644	0.0572	0.068734	0.014162
0.5-1	0.0848	0.0666	0.0788	0.07673	0.009266
1-2	0.0535	0.0464	0.0768	0.058896	0.015902
2-5	0.0799	0.0694	0.0575	0.068928	0.011171
5-10	0.1274	0.1418	0.0964	0.121867	0.023212
10-15	0.1059	0.1331	0.1217	0.120219	0.013687
15-20	0.1046	0.1004	0.1112	0.105392	0.00549
20-25	0.0832	0.1197	0.0856	0.096156	0.020393
		0.0879	0.0899	0.088882	0.001393

Songdo 95/4 %OC

Depth(cm	St.A
0-0.5	0.0880
0.5-1	0.1422
1-2	0.1155

Songdo 95/9 %OC

Depth(cm	St.A	St.B	St.C	AVG	std(n-1)
0-0.5	0.1247	0.1201	0.1309	0.125222	0.005443
0.5-1	0.1106	0.1727	0.1202	0.134501	0.033461
1-2	0.1380	0.1485	0.1202	0.135565	0.014318

95/96 Songdo Project (1994. 7. 28.) filename: songdoto.wb3

A. Gojan (St. 3) - %Organic matter(AFDW)

Depth	#1	#2	#3	#4	mean	SD	SDcor	%CV
0-0.5	2.22	1.91	1.59	2.07	1.9475	0.2337	0.2699	13.86
0.5-1	1.94	1.9	1.78	1.44	1.765	0.1967	0.2271	12.87
1-2	2.05	1.56		1.46	1.69	0.2578	0.3157	18.68
2-5	1.8	1.4	1.54	1.54	1.57	0.1446	0.0167	1.064
5-10	1.71		1.57	1.92	1.7333	0.1438	0.1761	10.16
10-15	1.48	1.27	1.4	1.26	1.3525	0.092	0.0189	1.397
15-20	1.91	1.92	1.8	1.37	1.75	0.2244	0.2591	14.81
20-25	1.65	1.35	1.84	1.81	1.6625	0.1943	0.2244	13.5
>25		1.87	1.43		1.65	0.22	0.3111	18.86
D-integrated(0-2cm)								
	2.065	1.7325	0.8425	1.608	1.56188	0.4477	0.517	33.1

B. Songdo (St. 1) - %Organic matter

Depth	#1	#2	#3	mean	SD	SDcor	%CV
0-0.5	2.02	2.21	2.34	2.19	0.1314	0.161	7.35
0.5-1	2.08	2.5	2.11	2.23	0.1913	0.2343	10.51
1-2	1.95	2.02	1.63	1.86667	0.1698	0.208	11.14
2-5	1.59	1.59	1.5	1.56	0.0424	0.052	3.331
5-10	1.61	1.44	1.6	1.55	0.0779	0.0954	6.155
10-15	1.39	1.61	1.44	1.48	0.0942	0.1153	7.793
15-20	1.98	1.71	1.66	1.78333	0.1406	0.1722	9.654
20-25	1.28	1.64	1.55	1.49	0.153	0.1874	12.58
>25		1.75		1.75	0	0	
D-integrated(0-2cm)							
	2	2.1875	1.9275	2.03833	0.1096	0.1342	6.583

95/96 Songdo Project - 1994. 11.

B. Chuckjern (close to Songdo? - St. 1) - %Organic matter

Depth	#1	#2	#3	mean	SD	SDcor	%CV
0-0.5	1.93	1.79	1.76	1.82667	0.0741	0.0907	4.968
0.5-1	1.94	2.44	1.83	2.07	0.2655	0.3252	15.71
1-2	1.54	1.58	1.46	1.52667	0.0499	0.0611	4.003
2-5	1.58	1.74	1.68	1.66667	0.066	0.0808	4.85
5-10	1.65	1.66	1.04	1.45	0.2899	0.3551	24.49
10-15	1.54	1.07	1.38	1.33	0.1951	0.239	17.97
15-20	1.16	1	1.35	1.17	0.1431	0.1752	14.98
20-25	1.18	1	1.23	1.13667	0.0988	0.121	10.64
>25							
D-integrated(0-2cm)							
	1.7375	1.8475	1.6275	1.7375	0.0898	0.11	6.332

Chlorophyll a
file name : SDchla.wb3

mg chl.a/m3 = Fd*r/(r-1)*(Rb-Ra)
mg phaeo-pigment/m3 = Fd*r/(r-1)*(rRa-Rb)
(reference : A Practical Handbook of Seawater Analysis p.203
: A Manual of Chemical and Biological Methods for Seawater Analysis p.110)

Specimen: sediment taken in Gojan, Songdo, Cherkjem tidal plat, Jul. 1994
Fd = 0.185506 (STD 0.06169)
Acid ratio: r/(r-1) = 1.802387 (STD 0.010315)
r = 2.246488 (STD 0.016035)
Multiplication = 100
Door = 31.6
Area = 6.1572 cm2

Gojan(St.A)					Chlo.a			Phaeo-p					
		Rb(bef)	Ra(aft)	Rb-Ra	(ug/cm2)		r*Ra-Rb	(ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.1-1	R1	15.3	11.3	4.0	0.6516		10.0853	1.6430		2.2946		0.3966	
	R2	15.9	11.4	4.5	0.7331	0.692362	9.7100	1.5818	1.61241	2.3149	2.3048	0.4634	
st.1-2	R1	15.9	12.3	3.6	0.5865		11.7318	1.9112		2.4977		0.3069	
	R2	10.8	5.2	5.6	0.9123	0.74938	0.8817	0.1436	1.027427	1.0559	1.7768	6.3511	
st.1-3	R1	17.9	14.3	3.6	0.5865		14.2248	2.3173		2.9038		0.2531	
	R2	17.7	14.0	3.7	0.6028	0.594616	13.7508	2.2401	2.278734	2.8429	2.8734	0.2691	
st.1-4	R1	17.8	13.8	4.0	0.6516		13.2015	2.1506		2.8023		0.3030	
	R2	17.7	13.9	3.8	0.6191	0.635344	13.5262	2.2035	2.177087	2.8226	2.8124	0.2809	
					AVG	0.667925		AVG	1.773915	AVG	2.4418		
								SD(n)	0.5001	SD(n)	0.4429		
								SD(n-1)	0.5775	SD(n-1)	0.5114		

Gojan(St.A)					Chlo.a			Phaeo-p					
		Rb(bef)	Ra(aft)	Rb-Ra	(ug/cm2)		r*Ra-Rb	(ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.2-1	R1	21.0	16.0	5.0	0.8145		14.9438	2.4345		3.2490		0.3346	
	R2	20.9	15.8	5.1	0.8308	0.822688	14.5945	2.3776	2.406023	3.2084	3.2287	0.3494	
st.2-2	R1	19.0	14.5	4.5	0.7331		13.5741	2.2113		2.9444		0.3315	
	R2	18.7	14.2	4.5	0.7331	0.733089	13.2001	2.1504	2.180874	2.8835	2.9140	0.3409	
st.2-3	R1	12.0	8.7	3.3	0.5376		7.5444	1.2291		1.7667		0.4374	
	R2	12.1	8.7	3.4	0.5539	0.545744	7.4444	1.2128	1.22091	1.7667	1.7667	0.4567	
st.2-4	R1	22.8	18.2	4.6	0.7494		18.0861	2.9464		3.6958		0.2543	
	R2	22.8	17.8	5.0	0.8145	0.781961	17.1875	2.8000	2.873184	3.6145	3.6551	0.2909	
					AVG	0.720871		AVG	2.170248	AVG	2.8911		
										SD(n)	0.7005		
										SD(n-1)	0.8089		

Gojan(St.A)					Chlo.a			Phaeo-p					
		Rb(bef)	Ra(aft)	Rb-Ra	(ug/cm2)		r*Ra-Rb	(ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/pha	avg
st.3-1	R1	41.6	28.0	13.6	2.2156		21.3017	3.4702		5.6856		0.6384	
	R2	42.0	29.6	12.4	2.0201	2.117812	24.4960	3.9906	3.73042	6.0107	5.8482	0.5062	0.5723
st.3-2	R1	31.4	21.3	10.1	1.6454		16.4502	2.6799		4.3253		0.6140	
	R2	31.5	21.8	9.7	1.5802	1.612795	17.4734	2.8466	2.763226	4.4268	4.3760	0.5551	0.5846
st.3-3	R1	44.4	29.0	15.4	2.5088		20.7482	3.3801		5.8888		0.7422	
	R2	45.0	29.6	15.4	2.5088	2.508792	21.4960	3.5019	3.440971	6.0107	5.9498	0.7164	0.7293
st.3-4	R1	41.4	26.0	15.4	2.5088		17.0087	2.7709		5.2797		0.9054	
	R2	42.0	25.6	16.4	2.6717	2.590247	15.5101	2.5267	2.648794	5.1984	5.2390	1.0574	0.9814
					AVG	2.207411		AVG	3.145853	AVG	5.3533		0.7169
					SD			SD(n)	0.453	SD(n)	0.6263	SD(n)	0.1647
					SD(n-1)	0.4468		SD(n-1)	0.5235	SD(n-1)	0.7232	SD(n-1)	0.1902

Songdo(St.C)					Chlo.a			Phaeo-p					
		Rb(bef)	Ra(aft)	Rb-Ra	(ug/cm2)		r*Ra-Rb	(ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.1-1	R1	24.5	17.5	7.0	1.1404		14.8135	2.4133		3.5536		0.4725	
	R2	24.7	17.2	7.5	1.2218	1.181087	13.9396	2.2709	2.342066	3.4927	3.5232	0.5380	0.5053
st.1-2	R1	25.3	18.1	7.2	1.1729		15.3614	2.5025		3.6755		0.4687	
	R2	26.3	18.3	8.0	1.3033	1.238105	14.8107	2.4128	2.457652	3.7161	3.6958	0.5401	0.5044
st.1-3	R1	28.5	20.8	7.7	1.2544		18.2270	2.9693		4.2237		0.4225	
	R2	31.6	20.8	10.8	1.7594	1.506905	15.1270	2.4643	2.716819	4.2237	4.2237	0.7140	0.5682
st.1-4	R1	25.2	18.0	7.2	1.1729		15.2368	2.4822		3.6551		0.4725	
	R2	25.2	17.7	7.5	1.2218	1.197378	14.5628	2.3724	2.427307	3.5942	3.6247	0.5150	0.4938
					AVG	1.280869		AVG	2.485961	AVG	3.7668	AVG	0.5179
					SD(n)	0.1321		SD(n)	0.1399	SD(n)	0.2708	SD(n)	0.0294
					SD(n-1)	0.1525		SD(n-1)	0.1615	SD(n-1)	0.3127	SD(n-1)	0.0339

Songdo(St.C)					Chlo.a			Phaeo-p					
		Rb(bef)	Ra(aft)	Rb-Ra	(ug/cm2)		r*Ra-Rb	(ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.2-1	R1	24.8	15.8	9.0	1.4662		10.6945	1.7422		3.2084		0.8416	
	R2	24.9	15.8	9.1	1.4825	1.474323	10.5945	1.7259	1.734082	3.2084	3.2084	0.8589	0.8502
st.2-2	R1	23.7	15.5	8.2	1.3359		11.1206	1.8116		3.1475		0.7374	
	R2	23.6	15.2	8.4	1.3684	1.352141	10.5466	1.7181	1.764885	3.0866	3.1170	0.7965	0.7669
st.2-3	R1	22.8	15.8	7.0	1.1404		12.6945	2.0680		3.2084		0.5514	
	R2	22.8	15.8	7.0	1.1404	1.14036	12.6945	2.0680	2.068045	3.2084	3.2084	0.5514	0.5514
st.2-4	R1	21.8	13.8	8.0	1.3033		9.2015	1.4990		2.8023		0.8694	
	R2	21.9	13.8	8.1	1.3196	1.311414	9.1015	1.4827	1.490864	2.8023	2.8023	0.8900	0.8797
					AVG	1.31956		AVG	1.764469	AVG	3.0840	AVG	0.7621
					SD(n)	0.1196		SD(n)	0.2049	SD(n)	0.1669	SD(n)	0.1285
					SD(n-1)	0.1381		SD(n-1)	0.2366	SD(n-1)	0.1927	SD(n-1)	0.1483

Chlorophyll a
file name : SDchla.wb3

Cherk.(St.B)		Rb(bef)	Ra(aft)	Rb-Ra	Chlo.a (ug/cm2)		r*Ra-Rb	Phaeo-p (ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.1-1	R1	22.0	15.2	6.8	1.1078		12.1466	1.9788		3.0866		0.5598	
	R2	22.0	15.6	6.4	1.0426	1.075197	13.0452	2.1252	2.051983	3.1678	3.1272	0.4906	0.5252
st.1-2	R1	25.3	19.2	6.1	0.9937		17.8326	2.9051		3.8988		0.3421	
	R2	25.3	19.3	6.0	0.9775	0.985597	18.0572	2.9417	2.923377	3.9191	3.9090	0.3323	0.3372
st.1-3	R1	25.2	19.0	6.2	1.0100		17.4833	2.8482		3.8582		0.3546	
	R2	25.0	18.7	6.3	1.0263	1.018179	17.0093	2.7710	2.80957	3.7973	3.8277	0.3704	0.3625
st.1-4	R1	26.0	19.5	6.5	1.0589		17.8065	2.9008		3.9597		0.3650	
	R2	26.0	18.7	7.3	1.1892	1.124069	16.0093	2.6081	2.754446	3.7973	3.8765	0.4560	0.4105
					AVG	1.05076		AVG	2.634844	AVG	3.6856	AVG	0.4089
					SD(n)	0.0531		SD(n)	0.3420	SD(n)	0.3237	SD(n)	0.0722
					SD(n-1)	0.0613		SD(n-1)	0.3949	SD(n-1)	0.3738	SD(n-1)	0.0833

Specimen: sediment taken in Songdo, Cherkjern tidal plat, Nov. 1994

mg chl.a/m3 = Fd*r/(r-1)*(Rb-Ra)   mg phaeo-pigment/m3 = Fd*r/(r-1)*(rRa-Rb)
Fd = 0.29527
r = 2.10379   Acid ratio: r/(r-1) = 1.91271
Multiplication = 100   Door = 31.6 or 10   Area = 6.1572 cm2

Cherkj.-9411		Rb(bef)	Ra(aft)	Rb-Ra	Chlo.a (ug/cm2)		r*Ra-Rb	Phaeo-p (ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.1-1	R1	9.8	6.6	3.2	0.8806		4.0850	1.1241		2.0046		0.7834	
	R2	9.9	6.6	3.3	0.9081	0.894314	3.9850	1.0966	1.110329	2.0046	2.0046	0.8281	0.8057
st.1-2	R1	15.1	11.9	3.2	0.8806		9.9351	2.7339		3.6144		0.3221	
	R2	15.2	12.0	3.2	0.8806	0.880555	10.0455	2.7642	2.749062	3.6448	3.6296	0.3186	0.3203
st.1-3	R1	7.2	4.4	2.8	0.7705		2.0567	0.5659		1.3364		1.3614	
	R2	7.0	4.4	2.6	0.7237	0.747096	2.1936	0.6036	0.584776	1.3273	1.3319	1.1990	1.2802
st.1-4	R1	9.0	7.0	2.0	0.5503		5.7265	1.5758		2.1261		0.3493	
	R2	9.0	7.0	2.0	0.5503	0.550347	5.7265	1.5758	1.575789	2.1261	2.1261	0.3493	0.3493
					AVG	0.768078		AVG	1.504989	AVG	2.2731	AVG	0.6889
					SD(n)	0.1382		SD(n)	0.7992	SD(n)	0.8396	SD(n)	0.3919
					SD(n-1)	0.1596		SD(n-1)	0.9229	SD(n-1)	0.9695	SD(n-1)	0.4526

Songdo-9411		Rb(bef)	Ra(aft)	Rb-Ra	Chlo.a (ug/cm2)		r*Ra-Rb	Phaeo-p (ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.2-1	R1	4.8	2.9	1.9	0.5173		1.3210	0.3635		0.8808		1.4232	
	R2	4.8	2.9	1.9	0.5256	0.521454	1.2579	0.3461	0.354818	0.8717	0.8763	1.5184	1.4708
st.2-2	R1	8.8	5.8	3.0	0.8310		3.3599	0.9246		1.7556		0.8988	
	R2	8.8	5.8	3.0	0.8255	0.828272	3.4020	0.9361	0.930346	1.7617	1.7586	0.8818	0.8903
st.2-3	R1	5.9	3.8	2.1	0.5751		2.1154	0.5821		1.1572		0.9880	
	R2	5.9	3.8	2.1	0.5779	0.576488	2.0944	0.5763	0.579218	1.1542	1.1557	1.0027	0.9953
st.2-4	R1	5.3	3.4	1.9	0.5228		1.8529	0.5099		1.0327		1.0254	
	R2	5.2	3.4	1.8	0.5008	0.511823	1.9108	0.5258	0.517835	1.0266	1.0297	0.9525	0.9890
					AVG	0.609509		AVG	0.595554	AVG	1.2051	AVG	1.0864
					SD(n)	0.1286		SD(n)	0.2100	SD(n)	0.3346	SD(n)	0.2258
					SD(n-1)	0.1485		SD(n-1)	0.2425	SD(n-1)	0.3863	SD(n-1)	0.2608

Specimen: sediment taken in Songdo tidal plat, Apr. 1995
mg chl.a/m3 = Fd*r/(r-1)*(Rb-Ra)   mg phaeo-pigment/m3 = Fd*r/(r-1)*(rRa-Rb)
Fd = 0.17359
r = 2.5165   Acid ratio: r/(r-1) = 1.6697421   Acid ratio: r/(r-1) = 1.6697421
Multiplication = 100   Door = 31.6   Area = 6.1572 cm2

Songdo-950420		Rb(bef)	Ra(aft)	Rb-Ra	Chlo.a (ug/cm2)		r*Ra-Rb	Phaeo-p (ug/cm2)		Ch.a+phae	tot. Chl	Ch.a/phae	
st.1-1	R1	28.2	21.8	6.4	1.5374		26.6597	6.4042		7.9416		0.2401	
	R2	28.3	21.8	6.5	1.5614	1.54941	26.5597	6.3801	6.392146	7.9416	7.9416	0.2447	0.2424
st.1-2	R1	13.0	9.0	4.0	0.9609		9.6485	2.3177		3.2786		0.4146	
	R2	13.0	9.1	3.9	0.9369	0.948864	9.9002	2.3782	2.347975 *	3.3151	3.2968 *	0.3939	0.4043 *
st.1-3	R1	30.3	24.0	6.3	1.5134		30.0960	7.2296		8.7430		0.2093	
	R2	30.4	24.2	6.2	1.4894	1.501367	30.4993	7.3265	7.27806	8.8159	8.7794	0.2033	0.2063
st.1-4	R1	25.8	20.8	5.0	1.2011		26.5432	6.3762		7.5773		0.1884	
	R2	25.8	20.8	5.0	1.2011	1.201093	26.5432	6.3762	6.376172	7.5773	7.5773	0.1884	0.1884
					AVG	1.300183		AVG	5.598588	AVG	6.8988	AVG	0.2603
					SD(n)	0.2428		SD(n)	1.9119	SD(n)	2.1248	SD(n)	0.0853
					SD(n-1)	0.2804		SD(n-1)	2.2077	SD(n-1)	2.4535	SD(n-1)	0.0985
								w/o outlier (n = 3)		w/o outlier (n = 3)		w/o outlier (n = 3)	
								AVG	6.6821	AVG	8.0993	AVG	0.2124
								SD(n-1)	0.5162	SD(n-1)	0.6160	SD(n-1)	0.0275

Specimen: sediment taken in Songdo tidal plat, Sep. 1995

mg chl a/m3 = Fd*r/(r-1)*(Rb-Ra)   mg phaeo-pigment/m3 = Fd*r/(r-1)*(rRa-Rb)
Fd = 0.17967
r = 2.51517   Acid ratio: r/(r-1) = 1.66467
Multiplication = 100   Door = 31.6   Area = 6.1572 cm2

Songdo-950919		Rb(bef)	Ra(aft)	Rb-Ra	Chlo.a (ug/cm2)		r*Ra-Rb	Phaeo-p (ug/cm2)		Ch.a+phae	tot. Chl	Ch a/phae	
st.1-1	R1	20.2	15.8	4.4	0.6412		19.5397	2.8475		3.4887		0.2252	
	R2	20.4	15.9	4.5	0.6558	0.648488	19.5912	2.8550	2.851225	3.5108	3.4997	0.2297	0.2274
st.1-2	R1	25.0	15.0	10.0	1.4573		12.7276	1.8548		3.3120		0.7857	
	R2	25.2	15.0	10.2	1.4864	1.471848	12.5276	1.8256	1.840182	3.3120	3.3120	0.8142	0.8000
st.1-3	R1	26.2	16.3	9.9	1.4427		14.7973	2.1564		3.5991		0.6690	
	R2	26.2	16.8	9.4	1.3698	1.406271	16.0549	2.3396	2.248003	3.7095	3.6543	0.5855	0.6273
st.1-4	R1	17.5	12.2	5.3	0.7724		13.1851	1.9214		2.6938		0.4020	
	R2	17.5	12.3	5.2	0.7578	0.76507	13.4366	1.9581	1.939755	2.7159	2.7048	0.3870	0.3945
					AVG	1.072919		AVG	2.219791	AVG	3.2927	AVG	0.5123
					SD(n)	0.3692		SD(n)	0.3943	SD(n)	0.3604	SD(n)	0.2185
					SD(n-1)	0.4263		SD(n-1)	0.4553	SD(n-1)	0.4162	SD(n-1)	0.2523

Appendix II

95/96 Son Songdo-Project - (1994/1995) Filename: SONGDOMT.Wq1

A. Gojan (St. 3) - 1994. 7. 28.

Cu

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	5.51	4.87	4.99	4.64	5.0025	0.319	0.368	4	
0.5-1	5.68		5.27	4.92	5.29	0.31	0.38	3	
1-2	6.65	4.64	5.09	4.47	5.2125	0.86	0.993	4	
2-5	5.31	5.33	6.41	5.86	5.7275	0.452	0.521	4	
5-10	5.94	5.24	4.46	5.23	5.2175	0.524	0.605	4	
10-15	4.66	3.99	5.48	4.22	4.5875	0.569	0.657	4	
15-20	5.44	4.41	5.49	4.27	4.9025	0.565	0.652	4	
20-25	4.99	3.99	5.36	4.47	4.7025	0.519	0.599	4	
		4.3	3.68		3.99	0.31	0.438	2	
D-integrated(0-2 cm)									
	6.1225	4.755	5.11	4.625	5.1531	0.587	0.678	High	5.831124
								Low	4.475126

Mn

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	308.17	269.4	309.4	319.5	301.62	19.13	22.09	4	
0.5-1	192.36		181.5	184.2	185.9	4.662	5.71	3	
1-2	177.1	172.6	92.01	168.8	152.63	35.12	40.56	4	
2-5	145.57	160	172	178.7	164.08	12.61	14.56	4	
5-10	155.55	134	126	96.71	128.06	21.09	24.35	4	
10-15	134.91	125.8	135.1	128.6	131.11	4.035	4.659	4	
15-20	168.12	153.8	138.6	144.8	151.35	11.09	12.8	4	
20-25	166.72	143.2	166.6	161	159.36	9.623	11.11	4	
		156.4	157.2		156.81	0.4	0.565	2	
D-integrated(0-2 cm)									
	213.683	221	168.7	210.3	203.43	20.41	23.57	High	226.9992
								Low	179.8583

Zn

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	36.04	36.58	34.93	35.11	35.665	0.676	0.78	4	
0.5-1	37.97		35.41	36.15	36.51	1.075	1.317	3	
1-2	38.94	34.13	35.82	32.66	35.388	2.336	2.697	4	
2-5	35.7	34.38	36.44	38.57	36.273	1.518	1.753	4	
5-10	35.17	32.73	29.36	37.6	33.715	3.047	3.519	4	
10-15	31.64	28.05	35.84	29.25	31.195	2.977	3.438	4	
15-20	37.71	34.88	37.4	33.93	35.98	1.614	1.864	4	
20-25	35.74	30.78	37.01	34.28	34.453	2.33	2.691	4	
		38.51	33.53		36.02	2.49	3.521	2	
D-integrated(0-2 cm)									
	37.9725	35.36	35.5	34.15	35.742	1.391	1.606	High	37.34778
								Low	34.13597

Co

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	6.82	7.24	6.56	6.68	6.825	0.257	0.296	4	
0.5-1	6.78		6.8	6.6	6.726	0.09	0.11	3	
1-2	6.77	6.46	6.82	6.14	6.5475	0.273	0.315	4	
2-5	6.54	6.69	6.72	6.78	6.6825	0.088	0.102	4	
5-10	5.97	6.12	5.76	6.5	6.0875	0.27	0.312	4	
10-15	5.92	5.24	6.44	5.54	5.785	0.448	0.518	4	
15-20	6.66	6.94	6.83	6.31	6.685	0.238	0.275	4	
20-25	6.66	5.57	6.25	6.32	6.2	0.395	0.457	4	
		7.33	6.71		7.02	0.31	0.438	2	
D-integrated(0-2 cm)									
	6.785	6.85	6.75	6.39	6.6938	0.179	0.207	High	6.900451
								Low	6.487049

A. Gojan (St. 3) -1994. 7. (Continued)

Cr

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	21.44	11.5	12.52	12.12	14.395	4.084	4.716	4	
0.5-1	16.19		21.42	18	18.536	2.168	2.655	3	
1-2	17.75	14.92	7.47	19.77	14.978	4.664	5.386	4	
2-5	11.18	16.83	14.72	16.27	14.75	2.201	2.542	4	
5-10	20.88	12.32	11.31	9.18	13.423	4.452	5.141	4	
10-15	17.4	14.38	14.66	14.73	15.293	1.224	1.413	4	
15-20	20.04	18.22	10.79	14.8	15.963	3.529	4.076	4	
20-25	17.85	17.88	19.92	19.29	18.735	0.898	1.037	4	
		13.89	15		14.445	0.555	0.784	2	
D-integrated(0-2 cm)									
	18.2825	13.21	12.22	17.42	15.282	2.609	3.012	Hig	18.29426
								Low	12.26949

Ni

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	15.68	14.08	13.67	12.81	14.06	1.042	1.203	4	
0.5-1	16.14		14.31	14.26	14.72	0.795	0.889	3	
1-2	16.89	13.29	12.61	14.32	14.278	1.627	1.878	4	
2-5	15.18	11.45	14.38	14.47	13.87	1.431	1.653	4	
5-10	13.9	11.39	10.49	13.11	12.223	1.351	1.56	4	
10-15	13.4	10.91	12.3	10.2	11.703	1.237	1.429	4	
15-20	16.54	13.41	13.5	12.26	13.928	1.586	1.831	4	
20-25	13.89	12.13	14.99	13.25	13.565	1.036	1.197	4	
		15.07	13.55		14.31	0.76	1.074	2	
D-integrated(0-2 cm)									
	16.4	13.69	13.3	13.93	14.328	1.217	1.405	Hig	15.73337
								Low	12.92288

Pb

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	12.45	8.91	10.95	10.6	10.728	1.259	1.453	4	
0.5-1	11.18		10.17	10.9	10.75	0.425	0.521	3	
1-2	13.06	9.56	8.46	10.65	10.433	1.703	1.967	4	
2-5	10.47	9.96	11.24	11.02	10.673	0.498	0.575	4	
5-10	11.65	8.3	7.8	8.69	9.11	1.5	1.732	4	
10-15	10.09	7.62	8.4	8.64	8.6875	0.893	1.031	4	
15-20	12.55	9.7	10.04	8.75	10.26	1.404	1.621	4	
20-25	12.32	8.38	12.57	10.43	10.925	1.686	1.947	4	
		8.93	9.31		9.12	0.19	0.268	2	
D-integrated(0-2 cm)									
	12.4375	9.235	9.51	10.7	10.471	1.262	1.457	Hig	11.92792
								Low	9.013327

Cd

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	
0-0.5	0.019	0.027	0.027	0.022	0.0238	0.003	0.004	4	
0.5-1	0.024		0.025	0.017	0.022	0.004	0.004	3	
1-2	0.025	0.021	0.026	0.012	0.021	0.006	0.006	4	
2-5	0.022	0.02	0.025	0.016	0.0208	0.003	0.004	4	
5-10	0.018	0.026	0.019	0.017	0.02	0.004	0.004	4	
10-15	0.019	0.015	0.022	0.012	0.017	0.004	0.004	4	
15-20	0.019	0.022	0.025	0.011	0.0193	0.005	0.006	4	
20-25	0.018	0.02	0.021	0.013	0.018	0.003	0.004	4	
		0.021	0.014		0.0175	0.004	0.005	2	
D-integrated(0-2 cm)									
	0.02325	0.024	0.026	0.016	0.0223	0.004	0.004	Hig	0.026736
								Low	0.017764

95/96 Son Songdo-Project (1994/1995) Filename: SONGDOMT.Wq1

A. Gojan (St. 3) -1994. 7. (Continued)

Fe(%)

Depth	#1	#2	#3	#4	mean	SD	SDcor	n	int(0-2cm)
0-0.5	2.11	1.4	1.64	1.37	1.63	0.296	0.342	4	1.6075
0.5-1	1.65		1.88	1.69	1.74	0.1	0.122	3	
1-2	1.71	1.63	0.94	1.84	1.53	0.349	0.403	4	
2-5	1.26	1.75	1.73	1.56	1.575	0.196	0.227	4	
5-10	1.73	1.42	1.53	0.99	1.4175	0.271	0.313	4	
10-15	1.72	1.33	1.47	1.56	1.52	0.142	0.164	4	
15-20	1.76	1.63	1.21	1.67	1.5675	0.212	0.244	4	
20-25	1.83	1.74	1.72	1.86	1.7875	0.059	0.068	4	
		1.67	1.64		1.655	0.015	0.021	2	
D-integrated(0-2 cm)									
	1.795	1.515	1.35	1.685	1.5863	0.169	0.195	Hig	1.781379
								Low	1.391121

95/96 Son Songdo-Project (1994/1995) Filename: SONGDOMT.Wq1

B. Songdo(St. 1)- 1994. 7. 28.

Cu

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	4.61	4.47	5.43	4.8367	0.423	0.519	3	4.579167
0.5-1	4.62	6.22	4.94	5.26	0.691	0.847	3	
1-2	4.05	4.77	3.51	4.11	0.516	0.632	3	
2-5	3.85	3.56	4.37	3.9267	0.335	0.41	3	
5-10	3.78	4.42	4.89	4.3633	0.455	0.557	3	
10-15	3.87	4.81	5.17	4.6167	0.548	0.671	3	
15-20	4.91	4.95	7.3	5.72	1.117	1.369	3	
20-25	4.24	5.44	5.1	4.9267	0.505	0.619	3	
		5.85		5.85	0	0	1	
D-integrated(0-2 cm)								
	4.3325	5.058	4.348	4.5792	0.338	0.414	Hig	4.993534
							Low	4.1648

Mn

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	624.71	513.1	556.3	564.72	45.94	56.27	3	428.1392
0.5-1	509.66	500.2	506.4	505.41	3.943	4.83	3	
1-2	381.05	383.6	199	321.21	86.41	105.8	3	
2-5	224.09	254.3	161.2	213.2	38.77	47.49	3	
5-10	154.13	164.2	157.4	158.55	4.174	5.113	3	
10-15	104.24	147.4	146.1	132.59	20.05	24.56	3	
15-20	156.29	150.5	171.7	159.51	8.938	10.95	3	
20-25	130.31	141	150.2	140.49	8.127	9.955	3	
		150.8		150.7	0	0	1	
D-integrated(0-2 cm)								
	474.118	445.1	365.2	428.14	46.06	56.42	Hig	484.5544
							Low	371.7239

Zn

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	35.89	35.76	38.14	36.597	1.093	1.338	3	35.10917
0.5-1	35.65	37.58	37.41	36.88	0.873	1.069	3	
1-2	34.95	33.29	32.2	33.48	1.131	1.385	3	
2-5	32.87	29.19	33.31	31.79	1.847	2.263	3	
5-10	32.02	32.44	34.21	32.89	0.949	1.162	3	
10-15	33.65	33.21	34.29	33.717	0.443	0.543	3	
15-20	37.35	33.67	41.55	37.523	3.219	3.943	3	
20-25	30.9	35	35.93	33.943	2.185	2.677	3	
		37.9		37.9	0	0	1	
D-integrated(0-2 cm)								
	35.36	34.98	34.99	35.109	0.177	0.217	Hig	35.32645
							Low	34.89188

Co

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	7.93	8.26	8.67	8.2867	0.303	0.371	3	7.630833
0.5-1	7.69	7.06	8.22	7.6567	0.474	0.581	3	
1-2	7.93	6.49	7.45	7.29	0.599	0.733	3	
2-5	7.13	6.39	7.33	6.95	0.404	0.495	3	
5-10	6.58	6.41	7.16	6.7167	0.321	0.393	3	
10-15	6.47	5.76	6.66	6.2967	0.387	0.474	3	
15-20	6.61	6.21	7.73	6.85	0.643	0.788	3	
20-25	5.44	6.16	7.6	6.4	0.898	1.1	3	
		6.3		6.3	0	0	1	
D-integrated(0-2 cm)								
	7.87	7.075	7.948	7.6308	0.394	0.483	Hig	8.113815
							Low	7.147852

Cr

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	17.39	12.92	20.35	16.887	3.054	3.741	3	16.54833
0.5-1	19	20.18	17.9	19.027	0.931	1.14	3	
1-2	17.69	13.59	14.14	15.14	1.817	2.226	3	
2-5	16.82	8.79	18.88	14.83	4.353	5.332	3	
5-10	14.62	14.1	19.26	15.993	2.32	2.841	3	
10-15	9.26	17.41	17.27	14.647	3.809	4.666	3	
15-20	15.34	17.7	18.98	17.34	1.508	1.847	3	
20-25	11.26	10.12	14.49	11.957	1.851	2.267	3	
		9.68		9.68	0	0	1	
D-integrated(0-2 cm)								
	17.9425	15.07	16.63	16.548	1.174	1.438	Hig	17.98661
							Low	15.11006

Ni

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	13.37	11.88	12.9	12.717	0.622	0.762	3	12.5275
0.5-1	11.92	15.21	13.75	13.627	1.346	1.649	3	
1-2	12.91	11.98	10.76	11.883	0.88	1.078	3	
2-5	11.7	9.62	12.02	11.113	1.064	1.303	3	
5-10	10.69	11.33	12.33	11.45	0.675	0.827	3	
10-15	10.37	11.11	10.75	10.743	0.302	0.37	3	
15-20	13.33	10.62	12.38	12.11	1.123	1.375	3	
20-25	9.4	10.7	11.34	10.48	0.807	0.989	3	
		10.86		10.86	0	0	1	
D-integrated(0-2 cm)								
	12.7775	12.76	12.04	12.528	0.343	0.42	Hig	12.94764
							Low	12.10736

Pb

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	9.94	11.47	11.09	10.833	0.65	0.797	3	10.85
0.5-1	10.22	11.22	11.88	11.107	0.682	0.836	3	
1-2	10.48	11.16	10.55	10.73	0.305	0.374	3	
2-5	9.5	9.9	10.57	9.99	0.441	0.541	3	
5-10	9.54	10.51	9.95	10	0.398	0.487	3	
10-15	8.73	9.72	9.86	9.4367	0.503	0.616	3	
15-20	9.6	9.45	10.83	9.96	0.618	0.757	3	
20-25	9	9.35	10.09	9.48	0.454	0.557	3	
		10.16		10.16	0	0	1	

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	10.28	11.25	11.02	10.85	0.414	0.507	Hig	11.35749
							Low	10.34251

Cd

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	0.014	0.008	0.01	0.0107	0.002	0.003	3	0.008833
0.5-1	0.011	0.01	0.005	0.0087	0.003	0.003	3	
1-2	0.009	0.008	0.007	0.008	******	0.001	3	
2-5	0.01	0.002	0.004	0.0053	0.003	0.004	3	
5-10	0.011	0.007	0.003	0.007	0.003	0.004	3	
10-15	0.008	0.004	0.005	0.0057	0.002	0.002	3	
15-20	0.014	0.004	0.007	0.0083	0.004	0.005	3	
20-25	0.006	0.009	0.005	0.0067	0.002	0.002	3	
		0.008		0.008	0	0	1	

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	0.01075	0.009	0.007	0.0088	0.001	0.002	Hig	0.010607
							Low	0.007059

95/96 Son Songdo-Project (1994/1995) Filename: SONGDOMT.Wq1

B. Songdo(St. 1)- 1994. 7. 28.(continued)

Fe(%)

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	1.57	1.44	1.68	1.5633	0.098	0.12	3	1.6725
0.5-1	1.87	1.72	1.77	1.7867	0.062	0.076	3	
1-2	1.99	1.65	1.37	1.67	0.254	0.311	3	
2-5	1.85	1.2	1.6	1.55	0.268	0.328	3	
5-10	1.75	1.55	1.58	1.6267	0.088	0.108	3	
10-15	1.12	1.75	1.56	1.4767	0.264	0.323	3	
15-20	1.78	1.62	1.71	1.7033	0.065	0.08	3	
20-25	1.47	1.33	1.48	1.4267	0.068	0.084	3	
		1.3		1.3	0	0	1	

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	1.855	1.615	1.548	1.6725	0.132	0.162	Hig	1.834133
							Low	1.510867

C. Cherkjern (Songdo?)- 1994. 11.

Cu

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	3.69	3.53	4.48	3.9	0.415	0.509	3	4.01083
0.5-1	4.47	5	4.3	4.59	0.298	0.365	3	
1-2	2.88	3.67	4.78	3.7767	0.779	0.955	3	
2-5	3.22	4.36	4.02	3.8667	0.478	0.585	3	
5-10	4.34	5.51	4.75	4.8667	0.485	0.594	3	
10-15	6.09	4.99	4.59	5.2233	0.634	0.777	3	
15-20	3.9	4.33	3.48	3.9033	0.347	0.425	3	
20-25	4.02	4.76	4.3	4.36	0.305	0.374	3	
D-integrated(0-2 cm)								
	3.48	3.968	4.585	4.0108	0.452	0.554	High	4.56467
							Low	3.45699

Mn

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	243.27	236	275.4	251.56	17.1	20.94	3	236.099
0.5-1	288.44	284	271.7	281.37	7.099	8.695	3	
1-2	201.39	172.6	243.2	205.73	28.97	35.49	3	
2-5	197.2	144.8	196	179.3	24.44	29.93	3	
5-10	136.99	178	159.3	158.07	16.75	20.52	3	
10-15	167.72	156.7	143.6	156	9.881	12.1	3	
15-20	135.05	126.8	123.3	128.38	4.926	6.034	3	
20-25	156.76	121.9	147.5	142.07	14.73	18.04	3	
D-integrated(0-2 cm)								
	233.623	216.3	258.4	236.1	17.25	21.13	High	257.228
							Low	214.97

Zn

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	30.51	29.68	33.57	31.253	1.673	2.049	3	30.9767
0.5-1	34.96	36.3	33.42	34.893	1.177	1.441	3	
1-2	25.89	30.95	29.8	28.88	2.166	2.653	3	
2-5	29.09	31.73	30.18	30.333	1.083	1.327	3	
5-10	32.82	36.58	32.74	34.047	1.792	2.195	3	
10-15	38.04	33.64	31.35	34.343	2.776	3.4	3	
15-20	31.81	31.55	28.04	30.467	1.719	2.106	3	
20-25	31.84	33.11	32.04	32.33	0.558	0.683	3	
D-integrated(0-2 cm)								
	29.3125	31.97	31.65	30.977	1.184	1.45	High	32.427
							Low	29.5263

Co

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	7	6.68	7.26	6.98	0.237	0.291	3	6.75083
0.5-1	7.42	7.62	6.83	7.29	0.335	0.411	3	
1-2	6.15	6.45	6.5	6.3667	0.155	0.189	3	
2-5	6.51	6.62	6.1	6.41	0.224	0.274	3	
5-10	6.93	7.6	6.26	6.93	0.547	0.67	3	
10-15	7.53	6.91	6.11	6.85	0.581	0.712	3	
15-20	6.56	6.83	6.01	6.4667	0.341	0.418	3	
20-25	6.64	6.74	6.3	6.56	0.188	0.231	3	
D-integrated(0-2 cm)								
	6.68	6.8	6.773	6.7508	0.051	0.063	High	6.81371
							Low	6.68796

Cr

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	19.61	16.07	14.73	16.803	2.059	2.522	3	15.3242
0.5-1	20.67	15.4	14.83	16.967	2.629	3.22	3	
1-2	13.48	15.02	12.79	13.763	0.932	1.142	3	
2-5	12.9	14.87	13.85	13.873	0.804	0.985	3	
5-10	11.79	16.96	10.86	13.203	2.683	3.287	3	
10-15	19.57	14.62	9.61	14.6	4.066	4.981	3	
15-20	14.43	13.41	9.31	12.383	2.213	2.71	3	
20-25	20.6	14.53	15.12	16.75	2.733	3.348	3	
D-integrated(0-2 cm)								
	16.81	15.38	13.79	15.324	1.236	1.513	High	16.8376
							Low	13.8108

Ni

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	11.84	11.42	11.87	11.71	0.205	0.252	3	11.1008
0.5-1	10.94	13.45	11.05	11.813	1.158	1.419	3	
1-2	9	11.26	11.06	10.44	1.022	1.251	3	
2-5	12.4	10.43	10.46	11.097	0.922	1.129	3	
5-10	12.69	12.57	10.49	11.917	1.01	1.237	3	
10-15	13.24	10.63	10.76	11.543	1.201	1.471	3	
15-20	9.96	10.76	9	9.9067	0.72	0.881	3	
20-25	11.61	12.75	10	11.453	1.128	1.382	3	
D-integrated(0-2 cm)								
	10.195	11.85	11.26	11.101	0.684	0.838	High	11.9386
							Low	10.2631

Pb

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	9.43	10.08	11.25	10.253	0.753	0.922	3	9.8525
0.5-1	10.98	11.3	10.35	10.877	0.395	0.483	3	
1-2	7.81	10.66	8.95	9.14	1.171	1.435	3	
2-5	9.17	11.08	10.24	10.163	0.782	0.957	3	
5-10	9.57	12.08	10.41	10.687	1.043	1.278	3	
10-15	10.95	10.1	9.63	10.227	0.546	0.669	3	
15-20	8.94	9.13	8.57	8.88	0.233	0.285	3	
20-25	9.54	8.4	8.84	8.9267	0.469	0.575	3	
D-integrated(0-2 cm)								
	9.0075	10.68	9.875	9.8525	0.681	0.834	High	10.6866
							Low	9.01842

Cd

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm
0-0.5	0.019	0.016	0.01	0.015	0.004	0.005	3	0.01783
0.5-1	0.02	0.023	0.018	0.0203	0.002	0.003	3	
1-2	0.018	0.021	0.015	0.018	0.002	0.003	3	
2-5	0.019	0.018	0.014	0.017	0.002	0.003	3	
5-10	0.019	0.019	0.021	0.0197	0.001	0.001	3	
10-15	0.03	0.018	0.015	0.021	0.006	0.008	3	
15-20	0.017	0.015	0.014	0.0153	0.001	0.002	3	
20-25	0.021	0.017	0.014	0.0173	0.003	0.004	3	
D-integrated(0-2 cm)								
	0.01875	0.02	0.015	0.0178	0.002	0.003	High	0.02082
							Low	0.01485

95/96 So Songdo-Project (1994/1995) Filename: SONGDOMT.Wq1

C. Cherkjern (Songdo?)- 1994. 11. (continued)

Fe(%)

Depth	#1	#2	#3	mean	SD	SDcor	n	int(0-2cm)
0-0.5	1.49	1.49	1.79	1.59	0.141	0.173	3	1.495
0.5-1	1.65	1.45	1.59	1.5633	0.084	0.103	3	
1-2	1.31	1.37	1.56	1.4133	0.107	0.131	3	
2-5	1.43	1.33	1.9	1.5533	0.249	0.304	3	
5-10	1.33	1.63	1.75	1.57	0.177	0.216	3	
10-15	1.52	1.27	1.39	1.3933	0.102	0.125	3	
15-20	1.38	1.4	1.24	1.34	0.071	0.087	3	
20-25	1.58	1.4	1.7	1.56	0.123	0.151	3	

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	1.44	1.42	1.625	1.495	0.092	0.113	Hig	1.60804
							Low	1.38196

D. Songdo- 1994. 11.

As

Depth	#1	#2	#3	mean	SD	SDcor	n	
0-0.5	3.18	3.4	3.9	3.4933	0.301	0.369	3	
0.5-1	3.24	3.79	4.77	3.9333	0.633	0.775	3	
1-2	4.95	3.68	6.31	4.98	1.074	1.315	3	

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	4.08	3.638	5.323	4.3467	0.713	0.874	Hig	5.220352
							Low	3.472982

Cd

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	n.d.			0	0	0	3
0.5-1				0	0	0	3
1-2							

Co

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	4.27	4.9	4.68	4.6167	0.261	0.32	3
0.5-1	4.86	4.86	4.57	4.7633	0.137	0.167	3
1-2	4.16	4.58	4.63	4.4567	0.211	0.258	3

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	4.3625	4.73	4.628	4.5733	0.155	0.19	Hig	4.763
							Low	4.383667

Cr

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	12.11	14.3	13.35	13.253	0.897	1.098	3
0.5-1	13.63	13.7	14.01	13.78	0.165	0.202	3
1-2	12.97	13.64	17.44	14.683	1.968	2.411	3

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	12.92	13.82	15.56	14.1	1.096	1.342	Hig	15.44225
							Low	12.75775

Pb

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	9.93	10.2	10.43	10.187	0.204	0.25	3
0.5-1	11.34	10.5	10.7	10.847	0.358	0.439	3
1-2	11.09	10.26	12.02	11.123	0.719	0.881	3

D-integrated(0-2 cm)

	#1	#2	#3	mean	SD	SDcor		
	10.8625	10.31	11.29	10.82	0.404	0.495	Hig	11.31518
							Low	10.32482

Mn

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	241.2	268.9	255.3	255.13	11.31	13.85	3
0.5-1	284.9	288.6	243.3	272.27	20.54	25.16	3
1-2	249.4	272.8	219.7	247.3	21.73	26.62	3

D-integrated(0-2 cm)

256.225	275.8	234.5	255.5	16.86	20.65	Hig	276.1496
						Low	234.8504

Zn

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	22.8	25	22.4	23.4	1.143	1.4	3
0.5-1	24.8	24.3	23.4	24.167	0.579	0.71	3
1-2	19.8	24.9	23.6	22.767	2.164	2.65	3

D-integrated(0-2 cm)

21.8	24.78	23.25	23.275	1.215	1.488	Hig	24.76284
						Low	21.78716

Ni

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	7.4	8.4	7.7	7.8333	0.419	0.513	3
0.5-1	8.1	8.2	8.1	8.1333	0.047	0.058	3
1-2	7.2	8	8.4	7.8667	0.499	0.611	3

D-integrated(0-2 cm)

7.475	8.15	8.15	7.925	0.318	0.39	Hig	8.314759
						Low	7.535241

Cu

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	2.58	2.7	2.63	2.6367	0.049	0.06	3
0.5-1	2.76	2.82	2.92	2.8333	0.066	0.081	3
1-2	2.18	2.59	3.45	2.74	0.529	0.648	3

D-integrated(0-2 cm)

2.425	2.675	3.113	2.7375	0.284	0.348	Hig	3.085528
						Low	2.389472

E. Songdo- 1995. 04. (St.A)

Depth	As	Cd	Co	Cr	Pb	Mn	Zn	Ni	Cu
0-0.5	3.52	n.d.	4.69	13.09	10.26	226.6	24.4	8	2.64
0.5-1	4.2		5.37	16.71	11.82	282.4	28.3	9.6	3.71
1-2	3.17		4.65	11.97	10.98	254.2	24.7	7.6	2.97
avg	3.63	0	4.903	13.92	11.02	254.4	25.8	8.4	3.106667
std(n-1)	0.52385	0	0.405	2.478	0.7809	27.91	2.171	1.1	0.54805
int(0-2)	3.515	n.d.	4.84	13.44	11.01	254.4	25.53	8.2	3.0725

F. Songdo- 1995. 09.

As

Depth	#1	#2	#3	mean	SD	SDcor	n	
0-0.5	4.09	5.65	5.97	5.2367	0.821	1.006	3	
0.5-1	5.1	5.48	5.46	5.3467	0.175	0.214	3	
1-2	4.5	4.78	5.46	4.9133	0.403	0.494	3	
D-integrated(0-2 cm)								
	4.5475	5.173	5.588	5.1025	0.427	0.524	Hig	5.626085
							Low	4.578915

Cd

Depth	#1	#2	#3	mean	SD	SDcor	n
0-0.5	n.d.			0	0	0	3
0.5-1				0	0	0	3
1-2							

Co

Depth	#1	#2	#3	mean	SD	SDcor	n	
0-0.5	5.26	5.75	6.37	5.7933	0.454	0.556	3	
0.5-1	5.68	6.37	5.94	5.9967	0.285	0.349	3	
1-2	5.77	6.34	5.94	6.0167	0.239	0.293	3	
D-integrated(0-2 cm)								
	5.62	6.2	6.048	5.9558	0.245	0.301	Hig	6.256539
							Low	5.655127

Cr

Depth	#1	#2	#3	mean	SD	SDcor	n	
0-0.5	16.07	20.56	22.4	19.677	2.659	3.257	3	
0.5-1	18.77	25	20.95	21.573	2.581	3.162	3	
1-2	18.3	25.76	20.95	21.67	3.088	3.782	3	
D-integrated(0-2 cm)								
	17.86	24.27	21.31	21.148	2.619	3.209	Hig	24.35607
							Low	17.93893

Appendix Ⅲ

95. 5. - 96. 2. Songdo Project File name: SONGDO96.Wb3

A. Gojan - St. 3 (1994. 7. 28.)

Depth	%mud	SD(n-1)	n	%OC	SD(n-1)	n
0-0.5	41.14	13.94	4	0.1169	0.0041	3
0.5-1	33.09	2.979	4	0.1132	0.0183	4
1 - 2	33.02	8.857	4	0.109	0.0149	4
2 - 5	29.95	6.388	4	0.103	0.0167	3
5-10	22.12	6.144	4	0.0845	0.0155	4
10-15	16.37	1.495	4	0.093	0.0189	3
15-20	26.83	6.247	4	0.107	0.0148	4
20-25	24.92	5.68	4	0.0852	0.0261	4
>25	34.19	3.112	2			

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
2.207	0.4468	3.146	0.5235	0.71	0.19

Depth	n	Cu	SD(n-1)	Mn	SD(n-1)	Zn	SD(n-1)	Co	SD(n-1)	Cr	SD(n-1)	Ni	SD(n-1)	Pb	SD(n-1)
0-0.5	4	5	0.368	301.61	22.08	35.665	0.78	6.825	0.296	14.395	4.715	14.06	1.202	10.727	1.453
0.5-1	3	5.29	0.38	185.9	5.71	36.51	1.317	6.726	0.11	18.536	2.655	14.72	0.889	10.75	0.521
1 - 2	4	5.21	0.993	152.62	40.55	35.387	2.697	6.547	0.314	14.977	5.385	14.277	1.878	10.432	1.966
2 - 5	4	5.73	0.521	164.08	14.56	36.272	1.752	6.682	0.102	14.75	2.541	13.87	1.652	10.672	0.574
5-10	4	5.22	0.604	128.05	24.34	33.715	3.518	6.087	0.312	13.422	5.141	12.222	1.559	9.11	1.732
10-15	4	4.59	0.656	131.1	4.659	31.195	3.437	5.785	0.517	15.292	1.413	11.702	1.428	8.687	1.031
15-20	4	4.9	0.652	151.35	12.8	35.98	1.863	6.685	0.275	15.962	4.075	13.927	1.83	10.26	1.621
20-25	4	4.7	0.599	159.36	11.11	34.452	2.69	6.2	0.456	18.735	1.037	13.565	1.196	10.925	1.947
>25	2	3.99	0.438	156.8	0.565	36.02	3.521	7.02	0.438	14.445	0.784	14.31	1.074	9.12	0.268

Depth	n	Cd	SD(n-1)	Fe(%)	SD(n-1)
0-0.5	4	0.0237	0.003	1.63	0.342
0.5-1	3	0.022	0.004	1.74	0.122
1 - 2	4	0.021	0.006	1.53	0.402
2 - 5	4	0.0207	0.003	1.57	0.226
5-10	4	0.02	0.004	1.41	0.312
10-15	4	0.017	0.004	1.52	0.163
15-20	4	0.0192	0.006	1.56	0.244
20-25	4	0.018	0.003	1.78	0.068
>25	2	0.0175	0.004	1.65	0.021

B. Songdo - St. 1 (1994. 7. 28.)

Depth	%mud	SD(n-1)	N	%OC	SD(n-1)	N
0-0.5	43.34	3.761	3	0.1676	0.0179	3
0.5-1	40.276	4.694	3	0.1726	0.0037	3
1 - 2	30.64	0.962	3	0.0945	0.02	2
2 - 5	24.35	4.266	3	0.0746	0.0116	3
5-10	27.483	2.979	3	0.112	0.026	2
10-15	23.753	1.987	3	0.0935	0.012	2
15-20	24.916	4.037	3	0.112	0.0111	3
20-25	22.656	3.8	3	0.1035	0.028	2
>25	23.61	0	1	0.104	0	1
D-avg (0-2)	36.224			0.1323		

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
1.2808	0.1525	2.4859	0.1614	0.51	0.028

Depth	n	Cu	SD(n-1)	Mn	SD(n-1)	Zn	SD(n-1)	Co	SD(n-1)	Cr	SD(n-1)	Ni	SD(n-1)	Pb	SD(n-1)
0-0.5	3	4.836	0.518	564.71	56.27	36.596	1.338	8.286	0.37	16.88	3.74	12.71	0.761	10.833	0.796
0.5-1	3	5.26	0.846	505.41	4.829	36.88	1.068	7.656	0.58	19.02	1.14	13.62	1.648	11.106	0.835
1 - 2	3	4.11	0.632	321.21	105.8	33.48	1.384	7.29	0.733	15.14	2.225	11.88	1.078	10.73	0.374
2 - 5	3	3.926	0.41	213.2	47.48	31.79	2.262	6.95	0.495	14.83	5.331	11.11	1.303	9.99	0.54
5-10	3	4.363	0.557	158.55	5.112	32.89	1.162	6.716	0.393	15.99	2.841	11.45	0.826	10	0.486
10-15	3	4.616	0.671	132.58	24.56	33.716	0.543	6.296	0.474	14.64	4.666	10.74	0.37	9.436	0.616
15-20	3	5.72	1.368	159.51	10.94	37.52	3.943	6.85	0.788	17.34	1.846	12.11	1.375	9.96	0.757
20-25	3	4.926	0.618	140.49	9.954	33.94	2.676	6.4	1.099	11.956	2.267	10.48	0.988	9.48	0.556
>25	1	5.85	0	150.7	0	37.9	0	6.3	0	9.68	0	10.86	0	10.16	0
D-avg		4.579		428.14		35.109		7.631		16.545		12.523		10.85	

Depth	n	Cd	SD	Fe(%)	SD
0-0.5	3	0.0106	0.003	1.56	0.12
0.5-1	3	0.0086	0.003	1.78	0.076
1 - 2	3	0.008	0.001	1.67	0.31
2 - 5	3	0.0053	0.004	1.55	0.327
5-10	3	0.007	0.004	1.62	0.107
10-15	3	0.0056	0.002	1.47	0.323
15-20	3	0.0083	0.005	1.7	0.08
20-25	3	0.0066	0.002	1.42	0.083
>25	1	0.008	0	1.3	0
D-avg		0.0088		1.67	

C. Chuckjern(considered as Songdo) - St. 1 (1994. 11.)

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
0.768	0.1596	1.5049	0.9229	0.69	0.45

Depth	%mud	SD(n-1)	N	%OC	SD(n-1)	N
0-0.5	16.245	1.308	2	0.1193	0.0105	3
0.5-1	16.75	0.395	2	0.1447	0.0216	3
1 - 2	18.133	1.636	3	0.0835	0.0048	2
2 - 5	17.843	2.68	3	0.0972	0.0267	3
5-10	20.47	5.554	3	0.1405	0.0036	3
10-15	25.316	4.087	3	0.1096	0.0194	3
15-20	~~42.793~~	~~49.769~~	~~3~~	~~0.0862~~	~~0.0154~~	~~3~~ 1
20-25	20.116	5.036	3	0.0885	0.02	3
>25	~~14.19~~ 12.94	6.717	1		0.0911	
D-avg	17.315			0.1078		

Depth	n	Cu	SD(n-1)	Mn	SD(n-1)	Zn	SD(n-1)	Co	SD(n-1)	Cr	SD(n-1)	Ni	SD(n-1)	Pb	SD(n-1)
0-0.5	3	3.9	0.508	251.56	20.94	31.253	2.049	6.98	0.29	16.803	2.521	11.71	0.251	10.253	0.922
0.5-1	3	4.59	0.365	281.36	8.695	34.89	1.441	7.29	0.41	16.966	3.22	11.813	1.418	10.876	0.483
1 - 2	3	3.776	0.954	205.73	35.48	28.88	2.652	6.366	0.189	13.763	1.141	10.44	1.251	9.14	1.434
2 - 5	3	3.866	0.585	179.3	29.93	30.33	1.326	6.41	0.274	13.873	0.985	11.096	1.128	10.163	0.957
5-10	3	4.866	0.593	158.07	20.51	34.04	2.194	6.93	0.67	13.203	3.286	11.916	1.237	10.686	1.277
10-15	3	5.223	0.776	156	12.1	34.34	3.4	6.85	0.711	14.6	4.98	11.543	1.47	10.226	0.669
15-20	~~3~~ 2	3.903	0.425	128.38	6.033	30.46	2.105	6.466	0.417	12.383	2.71	9.906	0.881	8.88	0.284
20-25	3	4.36	0.373	142.07	18.03	32.33	0.682	6.56	0.23	16.75	3.347	11.453	1.381	8.9266	0.574
D-avg		4.0105		236.1		30.976		6.751		15.324		11.101		9.8523	

Depth	n	Cd	SD(n-1)	Fe(%)	SD(n-1)
0-0.5	3	0.015	0.004	1.59	0.173
0.5-1	3	0.0203	0.002	1.56	0.102
1 - 2	3	0.018	0.003	1.41	0.13
2 - 5	3	0.017	0.002	1.55	0.304
5-10	3	0.0196	0.001	1.57	0.216
10-15	3	0.021	0.007	1.39	0.125
15-20	~~3~~ 2	0.0153	0.001	1.34	0.087
20-25	3	0.0173	0.003	1.56	0.151
D-avg		0.0178		1.4925	

	Cu	Mn	Zn	Co	Cr	Ni	Pb	Cd	Fe
n = 4 (at 15-20) 1-3	3.48 ~~3.69~~	123.3 ~~129~~	28.04 ~~29.9~~	6.01 ~~6.29~~	9.31	9	8.57	0.014	1.24
SD n-1	~~0.30~~	8.3	2.7	0.39					

D. Songdo (1994-11)

Depth	%mud	SD(n-1)	N	%OC	SD(n-1)	N
0-1	15.06		1	0.0687	0.0141	3
0.5-1			1	0.0767	0.0092	3
1 - 2	16.73		1	0.0588	0.0159	3
2 - 5	17.82		1	0.0689	0.0111	3
5-10	40.55		1	0.1218	0.0232	3
10-15	52.11		1	0.1202	0.0137	3
15-20	22.66		1	0.1053	0.0054	3
20-25	25.91		1	0.0961	0.0203	3
>25	23.66			0.0899	0.0888	3
D-intg	15.895	D-intg		0.0658		

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
0.609	0.129	0.595	0.242	1.086	0.226

Depth	n	Cu	SD(n-1)	Mn	SD(n-1)	Zn	SD(n-1)	Co	SD(n-1)	Cr	SD(n-1)	Ni	SD(n-1)	Pb	SD(n-1)
0-0.5	3	2.636	0.06	255.13	13.85	23.4	1.4	4.616	0.319	13.253	1.098	7.833	0.513	10.186	0.25
0.5-1	3	2.833	0.08	272.26	25.15	24.166	0.709	4.763	0.167	13.78	0.202	8.133	0.057	10.846	0.438
1 - 2	3	2.74	0.648	247.3	26.61	22.766	2.65	4.456	0.258	14.683	2.411	7.866	0.611	11.123	0.88
D-integrated		2.7373		255.5		23.275		4.573		14.1		7.9245		10.82	

Depth	n	Cd	SD(n-1)	Fe(%)	As	SD(n-1)
0-0.5	3				3.49	0.369
0.5-1	3				3.93	0.775
1 - 2	3				4.98	1.315
D-integrated		n.d.			4.345	

E. Songdo (1995. 04.) St. B filename: SONGDO96.Wb3

Depth	%mud	SD(n-1)	N	%OC	SD(n-1)	N
0-0.5	20.12		1	0.088		1
0.5-1	23.71		1	0.1422		1
1 - 2	22.25		1	0.1155		1
2 - 5	26.96		1			
5-10	21.77		1			
10-15	23.52		1			
15-20	25.85		1			
>20	43.15		1			
D-intg (0-2)	22.083			0.1153		

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
1.3	0.28	5.598	2.043	0.2601	0.0985

Depth	n	As	Cd	Co	Cr	Pb	Mn	Zn	Ni	Cu
0-0.5	1	3.52		4.69	13.09	10.26	226.6	24.4	8	2.64
0.5-1	1	4.2		5.37	16.71	11.82	282.4	28.3	9.6	3.71
1 - 2	1	3.17		4.65	11.97	10.98	254.2	24.7	7.6	2.97
avg		3.63		4.9033	13.923	11.02	254.4	25.8	8.4	3.1067
std(n-1)		0.5238		0.4047	2.478	0.7809	27.906	2.171	1.05852	0.548
D-integrated		3.515	n.d.	4.84	13.435	11.01	254.35	25.53	8.2	3.0725

F. Songdo (1995. 09.) St. A and B

Depth	%mud	SD(n-1)	N	Depth	%OC	SD(n-1)	N
0-0.5	31.93	0.73	2	0-0.5	0.125	0.0054	3
0.5-2	38.89	4.425	2	0.5-1	0.135	0.0334	3
				1-2	0.136	0.0143	3
D-intg	37.15			D-intg	0.133		

micrograms/square cm (n = 4)

Chl a	SD(n-1)	Phaeo	SD(n-1)	Chl a/Phaeo	SD(n-1)
1.0729	0.426	2.219	0.455	0.5117	0.252

Depth	n	Cu	SD(n-1)	Mn	SD(n-1)	Zn	SD(n-1)	Co	SD(n-1)	Cr	SD(n-1)	Ni	SD(n-1)	Pb	SD(n-1)
0-0.5	3	4.84	1.225	390.33	51.39	34.0	4.398	5.793	0.556	19.676	3.256	10.933	1.457	12.34	1.227
0.5-1	3	5.23	0.804	286.63	40.31	36.533	3.761	5.996	0.348	21.573	3.161	11.766	1.32	13.17	0.756
1 - 2	3	5.303	0.686	232.03	10.05	36.433	2.223	6.016	0.292	21.67	3.782	12.133	1.274	12.92	1.028
D-integrated		5.169		285.26		35.858		5.955		21.147		11.741		12.838	

Depth	n	Cd	SD(n-1)	Fe(%)		As	SD(n-1)
0-0.5	3					5.236	1.005
0.5-1	3					5.346	0.213
1 - 2	3					4.913	0.493
D-integrated		n.d.				5.102	

Appendix Ⅳ

Compositions of Taxonomic groups of Songdo Benthic Fauna (1989. 5-1990. 7)　　　　filename: SDtaxon.wb3

		0589 /sq.m	0789 /sq.m	0989 /sq.m	1189 /sq.m	0190 /sq.m	0390 /sq.m	0590 /sq.m	0790 /sq.m
[redacted] Sp.									
Polychaetes									
1 Mediomastus sp.	SSDF	105	36	347	106	106	156	128	138
***** Megelona (japonica)	DF	4	34	11	21	10	20	34	10
***** Heteromastus sp.	DF	2	10	13	12	8	6	8	6
***** Loimia medusa	SDF	7	1	9	15	7	1	0	0
21 Aricidea	SSDF	0	0	2	3	1	6	0	3
22 Scoloplos armiger	SSDF	0	0	0	0	0	0	0	0
***** Eunoe oerstedi	DF	1	4	10	3	2	14	8	0
***** Glycera chirori	CV	14	58	15	81	40	14	7	12
***** Nephtys caeca	CV	5	42	22	78	42	19	15	10
***** Anaitides koreana	CV	0	0	15	10	1	14	2	0
23 Nephtys oligobranchia	CV	0	0	0	0	0	1	0	1
20 Glycinde sp.	CV	1	3	3	6	1	0	3	14
***** Lumbrineridae heteropoda	CV	3	10	6	7	4	3	2	4
	subtotal	142	198	453	342	222	254	207	198
	%	43.6923	25.2229	68.120300752	52.6154	43.61	46.182	61.062	46.919
Bivalves									
***** Solen strictus	FF	27	11	7	0	1	2	0	0
2 M. veneriformis	FF	1	419	8	22	110	97	3	81
	subtotal	28	430	15	22	111	99	3	81
	%	8.61538	54.7771	2.2556390977	3.38462	21.81	18	0.885	19.194
Crustaceans									
Asthenognathus inaeq.	SDF	7	35	31	52	27	40	24	30
Tritodynamia rathbuni	SDF	9	0	7	15	5	4	2	0
***** Monoculodes carinatus	FF	0	0	0	1	2	35	2	0
	subtotal	16	35	38	67	32	44	26	30
	%	4.92308	4.4586	5.7142857143	10.3077	6.287	8	7.6696	7.109
(excluded in the counting)									
18 Nippon. oblongata		2	4	7	1	12	8	0	1
4 Nippo. subtruncata		6	321	50	33	26	40	22	99
	subtotal	8	325	57	34	38	48	22	100
Gastropods									
19 Reti. festiva	SCV	13	3	0	0	0	1	14	0
***** Eulima sp.	SDF	9	20	34	35	36	27	23	33
	subtotal	22	23	34	35	36	28	37	33
	%	6.76923	2.92994	5.1127819549	5.38462	7.073	5.0909	10.914	7.8199
3 Holothuroidea	SDF	90	69	91	144	81	83	46	68
	%	27.6923	8.78981	13.684210526	22.1538	15.91	15.091	13.569	16.114
Others		27	30	34	40	27	42	20	12
	%	8.30769	3.82166	5.1127819549	6.15385	5.305	7.6364	5.8997	2.8436
	sum =	333	1110	722	684	547	598	361	522
	sum'	325	785	665	650	509	550	339	422
	%sum	100	100	100	100	100	100	100	100

Appendix V

Compositions of Feeding types of Songdo Benthic Fauna (1989. 5-1990. 7) filename: SDfeed.wb3

Ran	Sp.		0589 /sq.m	0789 /sq.m	0989 /sq.m	1189 /sq.m	0190 /sq.m	0390 /sq.m	0590 /sq.m	0790 /sq.m
1	Mediomastus sp.	SSDF	105	36	347	106	106	156	128	138
*****	Megelona (japonica)	DF	4	34	11	21	10	20	34	10
*****	Heteromastus sp.	DF	2	10	13	12	8	6	8	6
3	Holothuroidea	SDF	90	69	91	144	81	83	46	68
21	Aricidea	SSDF	0	0	2	3	1	6	0	3
22	Scoloplos armiger	SSDF	0	0	0	0	0	0	0	0
*****	Tritodynamia rathbuni	SDF	9	0	7	15	5	4	2	0
*****	Loimia medusa	SDF	7	1	9	15	7	1	0	0
*****	Eulima sp.	SDF	9	20	34	35	36	27	23	33
*****	Eunoe oerstedi		1	4	10	3	2	14	8	0
	Asthenognathus inaeq.	SDF	7	35	31	52	27	40	24	30
		subtotal	234	209	555	406	283	357	273	288
		%	78.5235	27.6821	87.95562599	66.4484	58.47	65.746	85.047	70.244
*****	Glycera chirori	CV	14	58	15	81	40	14	7	12
*****	Nephtys caeca	CV	5	42	22	78	42	19	15	10
*****	Anaitides koreana	CV	0	0	15	10	1	14	2	0
23	Nephtys oligobranchia	CV	0	0	0	0	0	1	0	1
20	Glycinde sp.	CV	1	3	3	6	1	0	3	14
*****	Lumbrineridae heteropoda	CV	3	10	6	7	4	3	2	4
		subtotal	23	113	61	182	88	51	29	41
		%	7.71812	14.9669	9.6671949287	29.7872	18.18	9.3923	9.0343	10
*****	Solen strictus	FF	27	11	7	0	1	2	0	0
2	M. veneriformis	FF	1	419	8	22	110	97	3	81
*****	Monoculodes carinatus	FF	0	0	0	1	2	35	2	0
		subtotal	28	430	15	23	113	134	5	81
		%	9.39597	56.9536	2.3771790808	3.76432	23.35	24.678	1.5576	19.756
(excluded in the counting)										
18	Nippon. oblongata	DF	2	4	7	1	12	8	0	1
4	Nippo. subtruncata	DF	6	321	50	33	26	40	22	99
		subtotal	8	325	57	34	38	48	22	100
19	Reti. festiva	SCV	13	3	0	0	0	1	14	0
		subtotal	13	3	0	0	0	1	14	0
		%	4.36242	0.39735	0	0	0	0.1842	4.3614	0
		sum =	306	1080	688	645	522	591	343	510
		sum'	298	755	631	611	484	543	321	410
	(w/o Nipponomysella spp.)	%sum	100	100	100	100	100	100	100	100

Appendix VI

%Cumulative K-dominance curves for rank species abundance (filename:sdrank.wb3)

	89/5			89/7			89/9			89/11		
		%	%cum		%	%cum		%	%cum		%	%cum
1	105	31.53	31.53	419	53.38	53.38	347	52.18	52.18	144	22.12	22.12
2	90	27.03	58.56	69	8.79	62.17	91	13.68	65.86	106	16.28	38.4
3	27	8.108	66.67	58	7.389	69.56	34	5.113	70.98	81	12.44	50.85
4	14	4.204	70.87	42	5.35	74.91	31	4.662	75.64	78	11.98	62.83
5	13	3.904	74.77	36	4.586	79.49	22	3.308	78.95	52	7.988	70.81
6	13	3.904	78.68	35	4.459	83.95	15	2.256	81.2	35	5.376	76.19
7	9	2.703	81.38	34	4.331	88.28	15	2.256	83.46	22	3.379	79.57
8	9	2.703	84.08	20	2.548	90.83	13	1.955	85.41	21	3.226	82.8
9	7	2.102	86.18	11	1.401	92.23	11	1.654	87.07	15	2.304	85.1
10	7	2.102	88.29	10	1.274	93.51	10	1.504	88.57	15	2.304	87.4
11	5	1.502	89.79	10	1.274	94.78	9	1.353	89.92	12	1.843	89.25
12	4	1.201	90.99	5	0.637	95.42	8	1.203	91.13	10	1.536	90.78
13	3	0.901	91.89	5	0.637	96.06	7	1.053	92.18	10	1.536	92.32
14	3	0.901	92.79	4	0.51	96.56	7	1.053	93.23	8	1.229	93.55
15	2	0.601	93.39	4	0.51	97.07	7	1.053	94.29	7	1.075	94.62
16	2	0.601	93.99	3	0.382	97.46	6	0.902	95.19	6	0.922	95.55
17	2	0.601	94.59	3	0.382	97.84	3	0.451	95.64	4	0.614	96.16
18	2	0.601	95.19	3	0.382	98.22	3	0.451	96.09	3	0.461	96.62
19	2	0.601	95.79	2	0.255	98.48	3	0.451	96.54	3	0.461	97.08
20	2	0.601	96.39	2	0.255	98.73	3	0.451	96.99	3	0.461	97.54
21	1	0.3	96.7	1	0.127	98.86	3	0.451	97.44	3	0.461	98
22	1	0.3	97	1	0.127	98.99	2	0.301	97.74	3	0.461	98.46
23	1	0.3	97.3	1	0.127	99.11	2	0.301	98.04	2	0.307	98.77
24	1	0.3	97.6	1	0.127	99.24	2	0.301	98.35	2	0.307	99.08
25	1	0.3	97.9	1	0.127	99.37	2	0.301	98.65	2	0.307	99.39
26	1	0.3	98.2	1	0.127	99.49	2	0.301	98.95	1	0.154	99.54
27	1	0.3	98.5	1	0.127	99.62	2	0.301	99.25	1	0.154	99.69
28	1	0.3	98.8	1	0.127	99.75	1	0.15	99.4	1	0.154	99.85
29	1	0.3	99.1	1	0.127	99.88	1	0.15	99.55	1	0.154	100
30	1	0.3	99.4	1	0.127	100	1	0.15	99.7			
31	1	0.3	99.7				1	0.15	99.85	651		
32	1	0.3	100	785			1	0.15	100			
	333						665					

* Nipponomysella spp. excluded

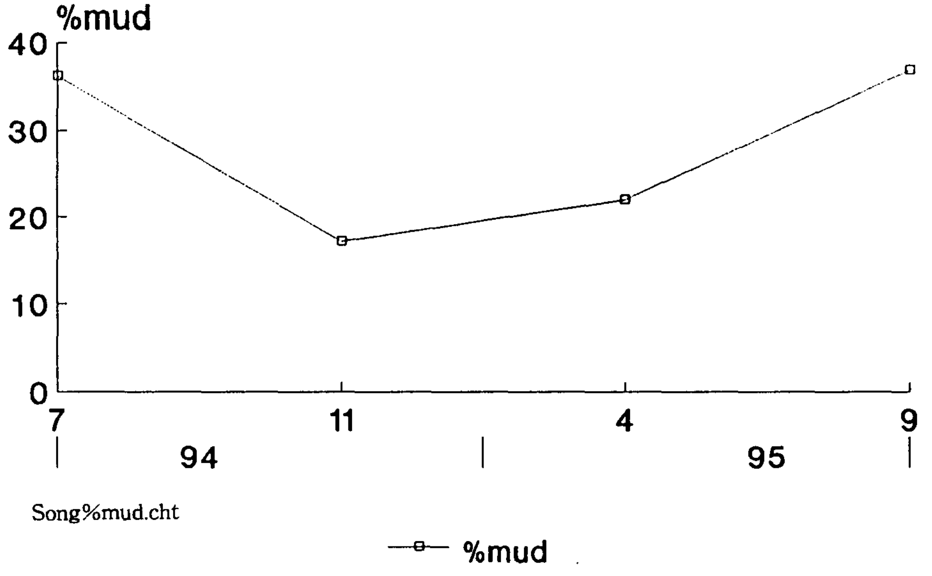
%Cumulative K-dominance curves for rank species abundance(filename:sdrank.wb3)

	90/01			90/03			90/05			90/07		
		%	%cum		%	%cum		%	%cum		%	%cum
1	110	21.53	21.53	156	26.67	26.67	128	37.54	37.54	138	32.7	32.7
2	106	20.74	42.27	97	16.58	43.25	46	13.49	51.03	81	19.19	51.89
3	81	15.85	58.12	83	14.19	57.44	34	9.971	61	68	16.11	68.01
4	42	8.219	66.34	40	6.838	64.28	24	7.038	68.04	33	7.82	75.83
5	40	7.828	74.17	35	5.983	70.26	23	6.745	74.78	30	7.109	82.94
6	36	7.045	81.22	27	4.615	74.88	15	4.399	79.18	14	3.318	86.25
7	27	5.284	86.5	20	3.419	78.29	14	4.106	83.29	12	2.844	89.1
8	10	1.957	88.46	19	3.248	81.54	8	2.346	85.63	10	2.37	91.47
9	8	1.566	90.02	14	2.393	83.93	8	2.346	87.98	10	2.37	93.84
10	7	1.37	91.39	14	2.393	86.33	7	2.053	90.03	6	1.422	95.26
11	5	0.978	92.37	14	2.393	88.72	5	1.466	91.5	4	0.948	96.21
12	4	0.783	93.15	5	0.855	89.58	4	1.173	92.67	4	0.948	97.15
13	4	0.783	93.94	7	1.197	90.77	3	0.88	93.55	3	0.711	97.87
14	4	0.783	94.72	6	1.026	91.8	3	0.88	94.43	1	0.237	98.1
15	3	0.587	95.31	6	1.026	92.82	2	0.587	95.02	1	0.237	98.34
16	2	0.391	95.7	4	0.684	93.51	2	0.587	95.6	1	0.237	98.58
17	2	0.391	96.09	4	0.684	94.19	2	0.587	96.19	1	0.237	98.81
18	2	0.391	96.48	3	0.513	94.7	2	0.587	96.78	1	0.237	99.05
19	2	0.391	96.87	3	0.513	95.22	2	0.587	97.36	1	0.237	99.29
20	2	0.391	97.26	3	0.513	95.73	2	0.587	97.95	1	0.237	99.52
21	2	0.391	97.66	3	0.513	96.24	2	0.587	98.54	1	0.237	99.76
22	2	0.391	98.05	3	0.513	96.76	1	0.293	98.83	1	0.237	100
23	1	0.196	98.24	2	0.342	97.1	1	0.293	99.12			
24	1	0.196	98.44	2	0.342	97.44	1	0.293	99.42	422		
25	1	0.196	98.63	2	0.342	97.78	1	0.293	99.71			
26	1	0.196	98.83	2	0.342	98.12	1	0.293	100			
27	1	0.196	99.03	2	0.342	98.46						
28	1	0.196	99.22	2	0.342	98.81	341					
29	1	0.196	99.42	1	0.171	98.98						
30	1	0.196	99.61	1	0.171	99.15						
31	1	0.196	99.81	1	0.171	99.32						
32	1	0.196	100	1	0.171	99.49						
33				1	0.171	99.66						
34				1	0.171	99.83						
	sum			1	0.171	100						
	511											
				585								

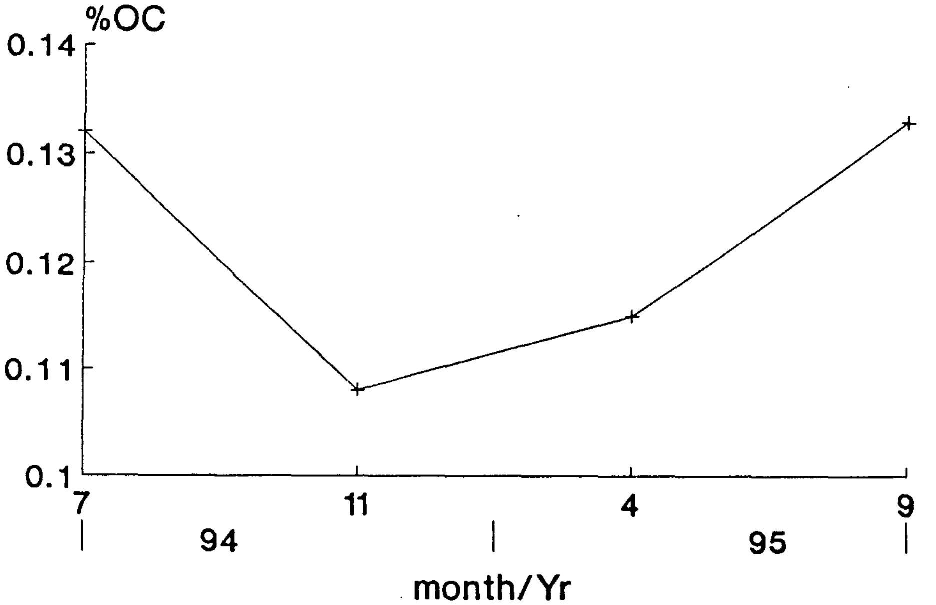
%Cumulative K-dominance curves for rank species abundance(filename:songrank.wb3)

	94/07	%	%cum	94/11	%	%cum	95/04	%	%cum	95/09	%	%cum	96/07	%	%cum	96/10	%	%cum
1	132	70.59	70.58	90	47.37	47.37	60	38.22	38.2	36	17.06	17.06	75	48.7	48.7	194	39.35	39.35
2	12	6.417	77	42	22.11	69.48	32	20.38	58.58	29	13.74	30.8	15	9.74	58.44	62	12.58	51.93
3	11	5.882	82.88	10	5.263	74.74	27	17.2	75.78	28	13.27	44.07	15	9.74	68.18	44	8.925	60.85
4	8	4.278	87.16	7	3.684	78.42	7	4.459	80.24	28	13.27	57.34	12	7.792	75.97	34	6.897	67.75
5	5	2.674	89.83	6	3.158	81.58	5	3.185	83.42	21	9.953	67.3	6	3.896	79.87	25	5.071	72.82
6	4	2.139	91.97	5	2.632	84.21	5	3.185	86.61	20	9.479	76.78	4	2.597	82.47	24	4.868	77.69
7	2	1.07	93.04	4	2.105	86.32	4	2.548	89.16	11	5.213	81.99	3	1.948	84.41	14	2.84	80.53
8	1	0.535	93.57	4	2.105	88.42	4	2.548	91.7	7	3.318	85.31	3	1.948	86.36	13	2.637	83.16
9	1	0.535	94.11	3	1.579	90	4	2.548	94.25	7	3.318	88.62	2	1.299	87.66	12	2.434	85.6
10	1	0.535	94.64	3	1.579	91.58	4	2.548	96.8	6	2.844	91.47	2	1.299	88.96	11	2.231	87.83
11	1	0.535	95.18	3	1.579	93.16	1	0.637	97.44	5	2.37	93.84	2	1.299	90.26	11	2.231	90.06
12	1	0.535	95.71	2	1.053	94.21	1	0.637	98.07	3	1.422	95.26	2	1.299	91.56	7	1.42	91.48
13	1	0.535	96.25	2	1.053	95.26	1	0.637	98.71	3	1.422	96.68	2	1.299	92.86	7	1.42	92.9
14	1	0.535	96.78	2	1.053	96.32	1	0.637	99.35	2	0.948	97.63	2	1.299	94.15	5	1.014	93.91
15	1	0.535	97.32	1	0.526	96.84	1	0.637	99.98	2	0.948	98.58	1	0.649	94.8	5	1.014	94.93
16	1	0.535	97.85	1	0.526	97.37				1	0.474	99.05	1	0.649	95.45	4	0.811	95.74
17	1	0.535	98.39	1	0.526	97.9	sum			1	0.474	99.52	1	0.649	96.1	4	0.811	96.55
18	1	0.535	98.92	1	0.526	98.42	157			1	0.474	100	1	0.649	96.75	3	0.609	97.16
19	1	0.535	99.46	1	0.526	98.95				sum			1	0.649	97.4	3	0.609	97.77
20	1	0.535	99.99	1	0.526	99.48				211			1	0.649	98.05	2	0.406	98.17
21	sum			1	0.526	100							1	0.649	98.7	2	0.406	98.58
22	183			sum									1	0.649	99.35	2	0.406	98.98
23				190									1	0.649	100	1	0.203	99.19
24													sum			1	0.203	99.39
25													154			1	0.203	99.59
																1	0.203	99.8
																1	0.203	100
																sum		
																493		

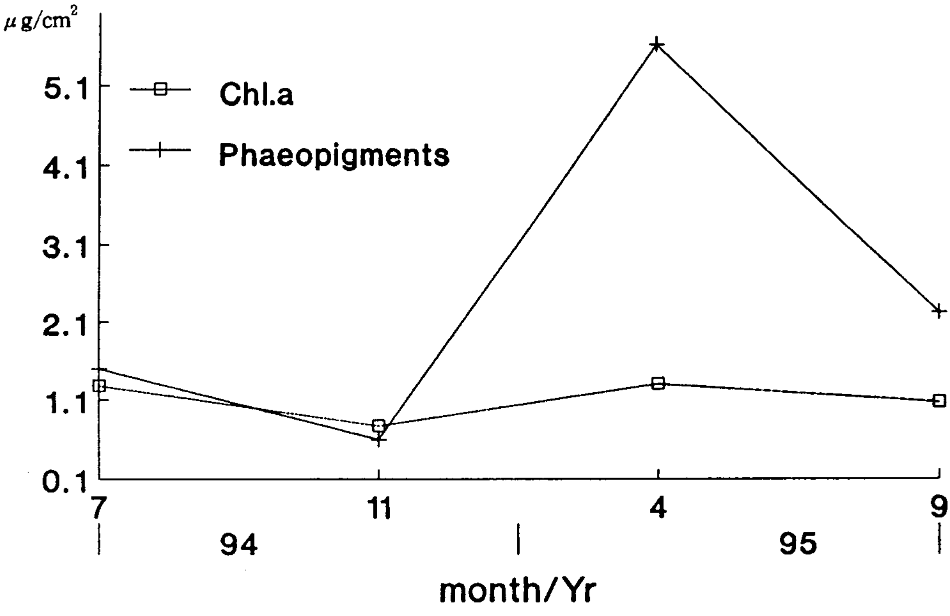
Appendix Ⅶ



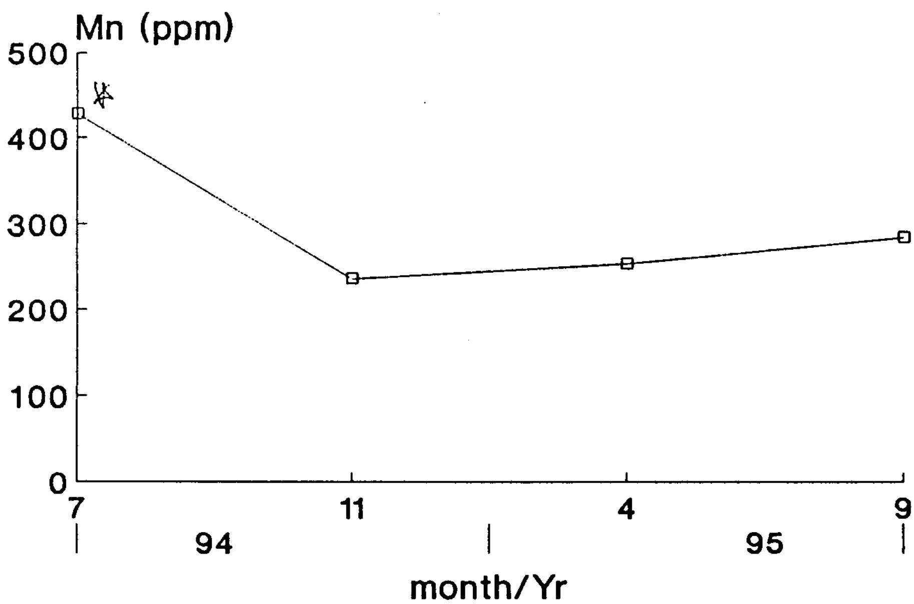
Song%mud.cht



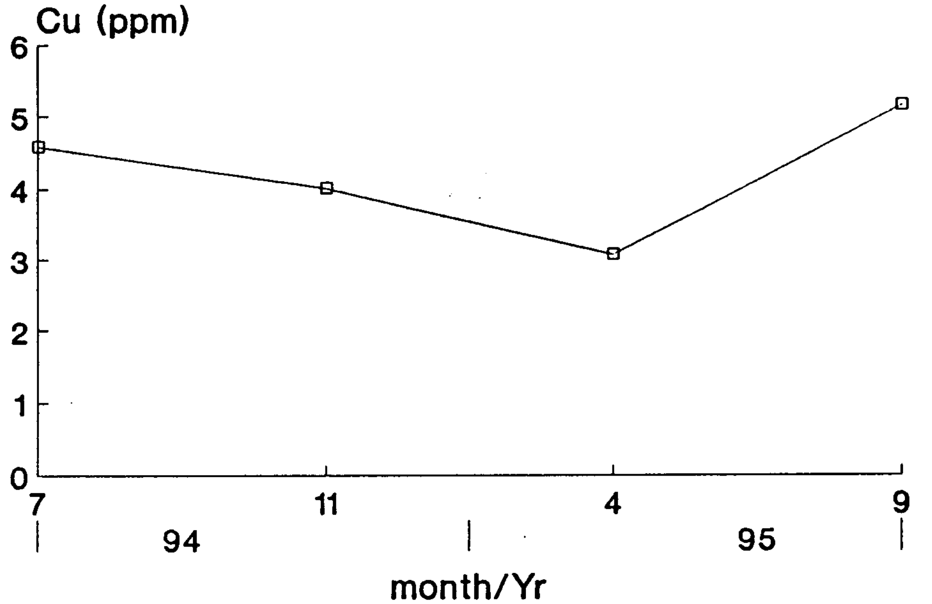
song%org.cht (93-3-10)



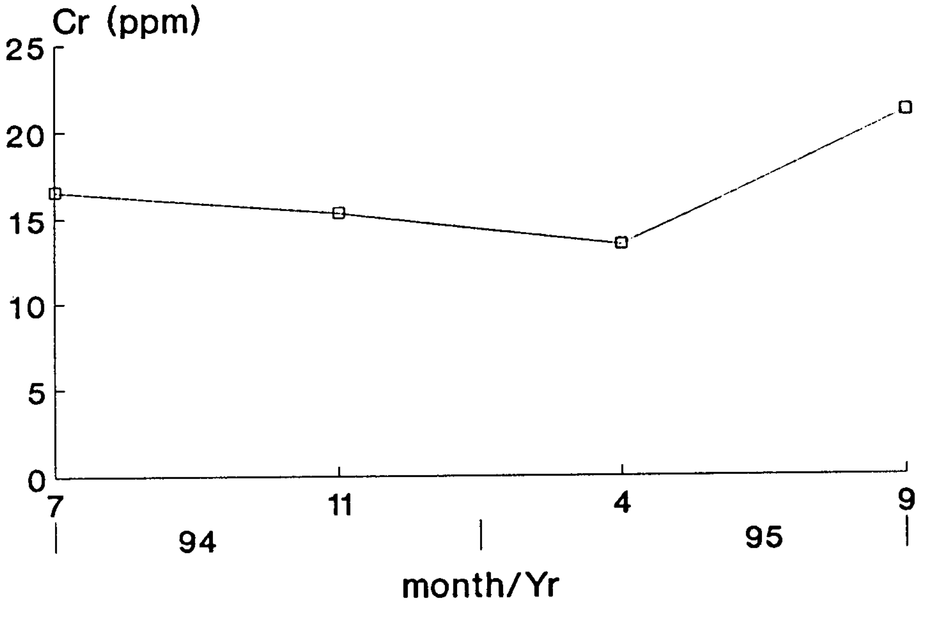
songchl.cht (93-3-10)



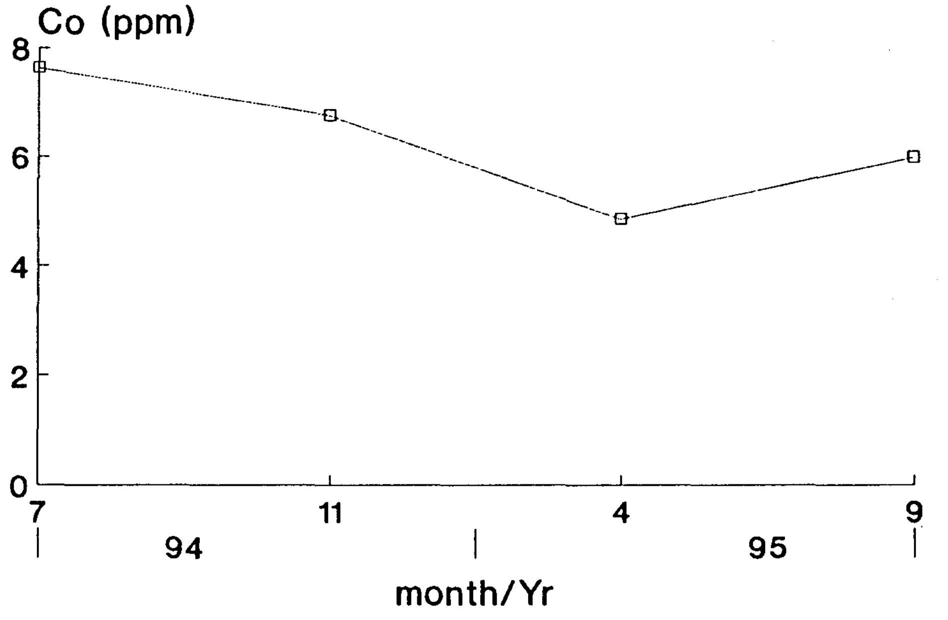
songdomn.cht (93-3-10)



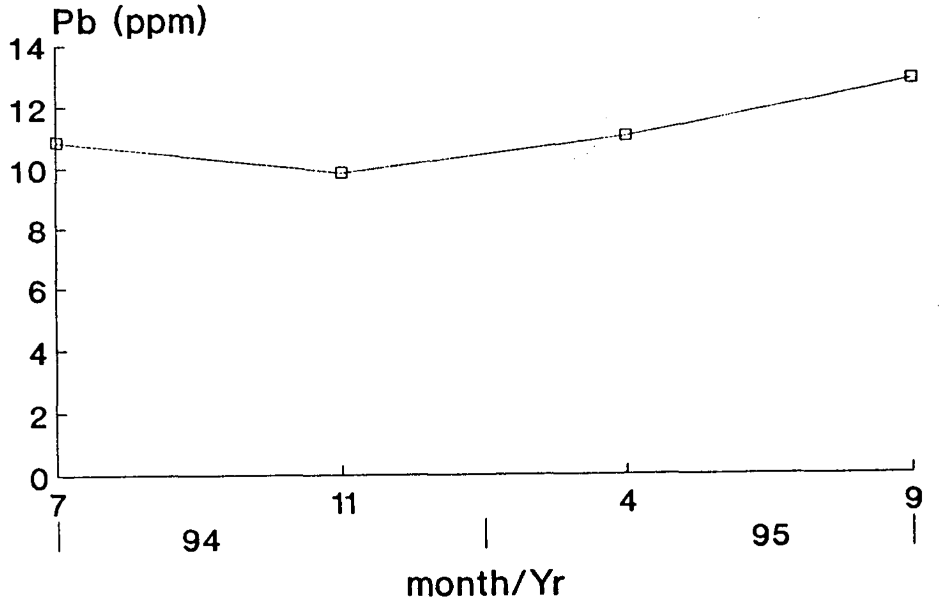
songdocu.cht (93-3-10)



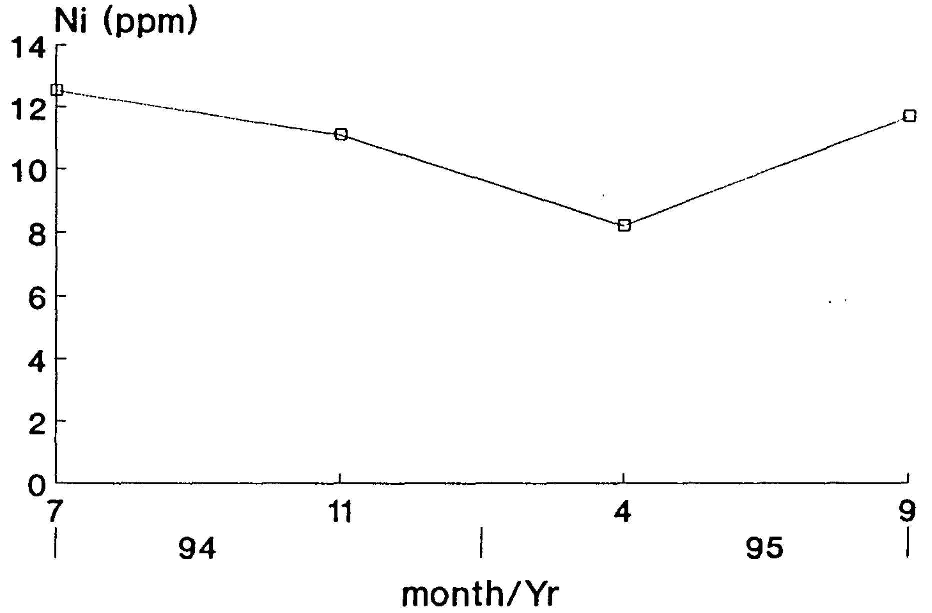
songdocr.cht (93-3-10)



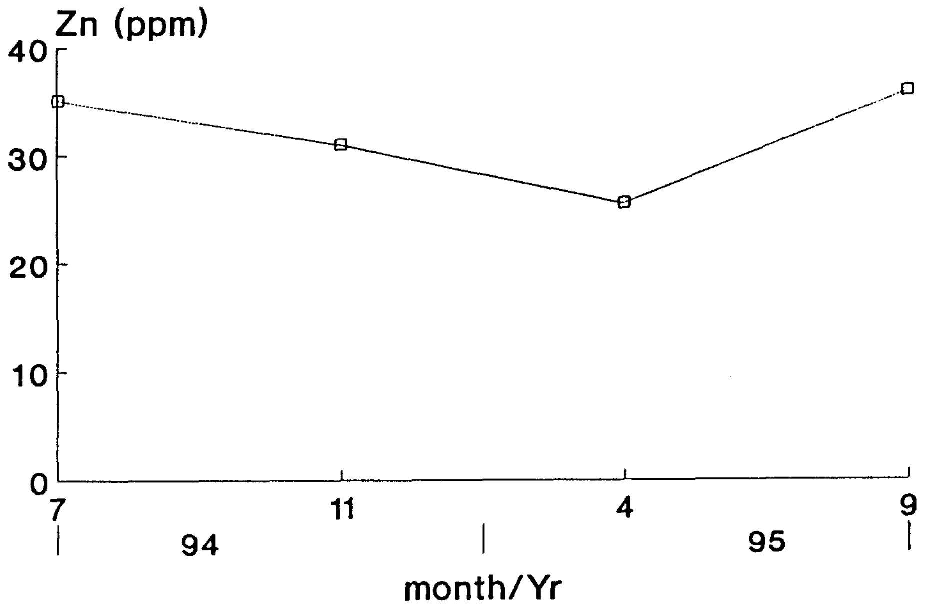
songdoco.cht (93-3-10)



songdoPb.cht (93-3-10)



songdoni.cht (93-3-10)



songdozn.cht (93-3-10)

KRWALL
ID =Kruskal-Wallis test;seasonal var. of Cu in top(0-2) sed (Songcu.krw)

KRUSKAL-WALLIS TEST
4 GROUPS
SAMPLE SIZES
3 3 1 3

THE KRUSKAL-WALLIS STATISTIC H = 4.9024
IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
3 DEGREES OF FREEDOM

$\chi^2_{.1}[3] = 6.251$

--end--

$\chi^2_{.05}[3] = 7.815$

$\chi^2_{.01}[3] = 11.345$

$\chi^2_{.001}[3] = 16.266$

KRWALL
ID =Kruskal-Wallis test;seasonal var. of total Chl in top(0-2) sed (Songtchl

KRUSKAL-WALLIS TEST
4 GROUPS
SAMPLE SIZES
4 4 3 4

THE KRUSKAL-WALLIS STATISTIC H = 10.0750 ($p<0.05$)
IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
3 DEGREES OF FREEDOM

--end--

KRWALL
ID =Kruskal-Wallis test;seasonal var. of %OC in top(0-2) sed (Song%oc.krw)

KRUSKAL-WALLIS TEST
4 GROUPS
SAMPLE SIZES
3 3 1 3

THE KRUSKAL-WALLIS STATISTIC H = 4.4182
IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
3 DEGREES OF FREEDOM

--end--

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Ni in top(0-2) sed (Songni.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      5.0727
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Cr in top(0-2) sed (Songcr.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      6.7455    (p<0.1)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Pb in top(0-2) sed (Songpb.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      7.3273    (p<0.1)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Zn in top(0-2) sed (Songzn.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      7.0364    (p<0.1)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Mn in top(0-2) sed (Songmn.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      8.0545  (p<0.05)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Co in top(0-2) sed (Songco.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    3

    THE KRUSKAL-WALLIS STATISTIC H =      8.3455   (p<0.05)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of %mud in top(0-2) sed (Song%mud.krw)

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   3    3    1    2

    THE KRUSKAL-WALLIS STATISTIC H =      6.5111   (p<0.1)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of total Chl in top(0-2) sed (Songtchl

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   4    4    4    4

    THE KRUSKAL-WALLIS STATISTIC H =      7.5000   (p<0.01)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

```
KRWALL
ID =Kruskal-Wallis test;seasonal var. of Chl. a in top(0-2) sed (Songchl.krw

KRUSKAL-WALLIS TEST
        4 GROUPS
     SAMPLE SIZES
   4    4    4    4

    THE KRUSKAL-WALLIS STATISTIC H =      6.8382   (p<0.1)
    IS TO BE COMPARED WITH A CHI SQUARE DISTRIBUTION WITH
   3 DEGREES OF FREEDOM

--end--
```

Appendix Ⅷ

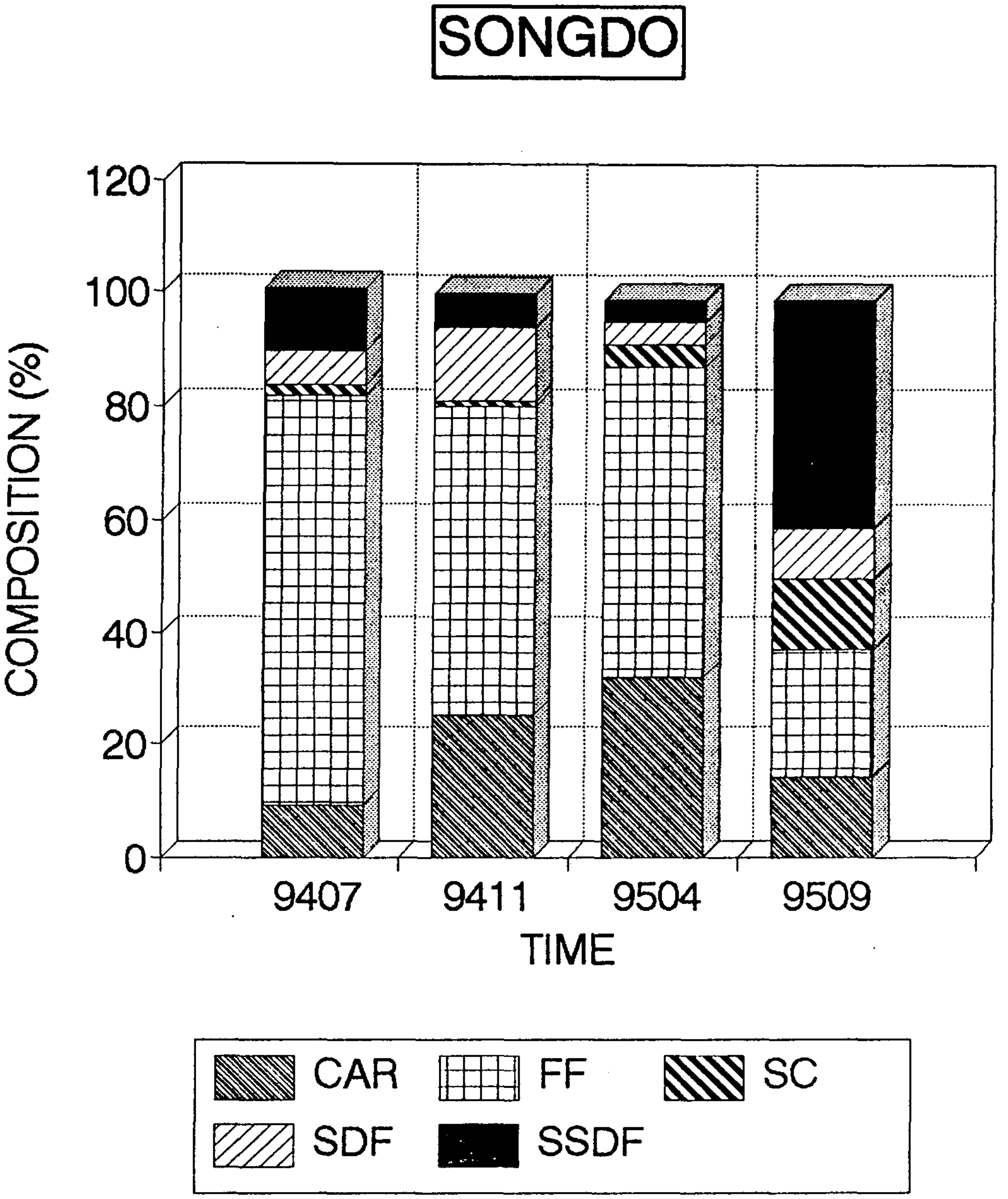
Table 1. The macrobenthos occurred in the Song-do intertidal flat during 1994 and Sept. 1995.

Taxon	Feeding types
Nemertinea	Carnivore (Car.)
Actiniaria	Filter feeder (FF)
Brachiopoda	
Lingula sp. 개맛류	FF
Mollusca	
Mactra veneriformis 동죽	FF
Solen strictus 맛	"
Phacosoma 떡조개	"
Reticunassa festiva 왕좁쌀무늬고둥	Scavenger (Sca.)
Stenothyra edogawaensis	SDF
Eulima sp.	〃
Umbonium thomasi 서해비단고둥	SDF
Polychaeta	
Glycera chirori 치로리미갑갯지렁이	Car.
Anaitides koreana	〃
Harmothoe sp.	〃
Scoloplos armiger	subsurface deposit feeder (SSDF)
Glycinde sp.	Car.
Glycera caitata	〃
Nephtys caeca	〃
N. oligobranchia	〃
N. polybranchia	〃
Mediomastus sp.	SSDF
Sigambra tentaculata	Car.
Aricidea sp.	SSDF
Spionidae unid.	SDF
Spiophanes bombyx	〃
Nectoneanthes latipoda	〃
Nereidae unid.	〃
Eteone longa	SSDF
Loimia mudusa	SDF
Diopatra sugokai	〃
Lumbrineris nipponica	Car.
L. heteropoda	〃

Magelona sp.	SDF
Thryx sp.	〃
Crustacea	
Monoculodes sp.	FF
Corophium sp.	〃
Macrophthalmus japonicus 칠게	SDF
Asthenognathus inaeguipes	〃
Tritodynainia rathburni 엽길게	〃
Pinnotheres sp. 속살이게	〃
Leptochela gracilis 돗대기새우	"
Echinodermata	
Amphiura sp.	SDF
Protankyra bidentata	〃

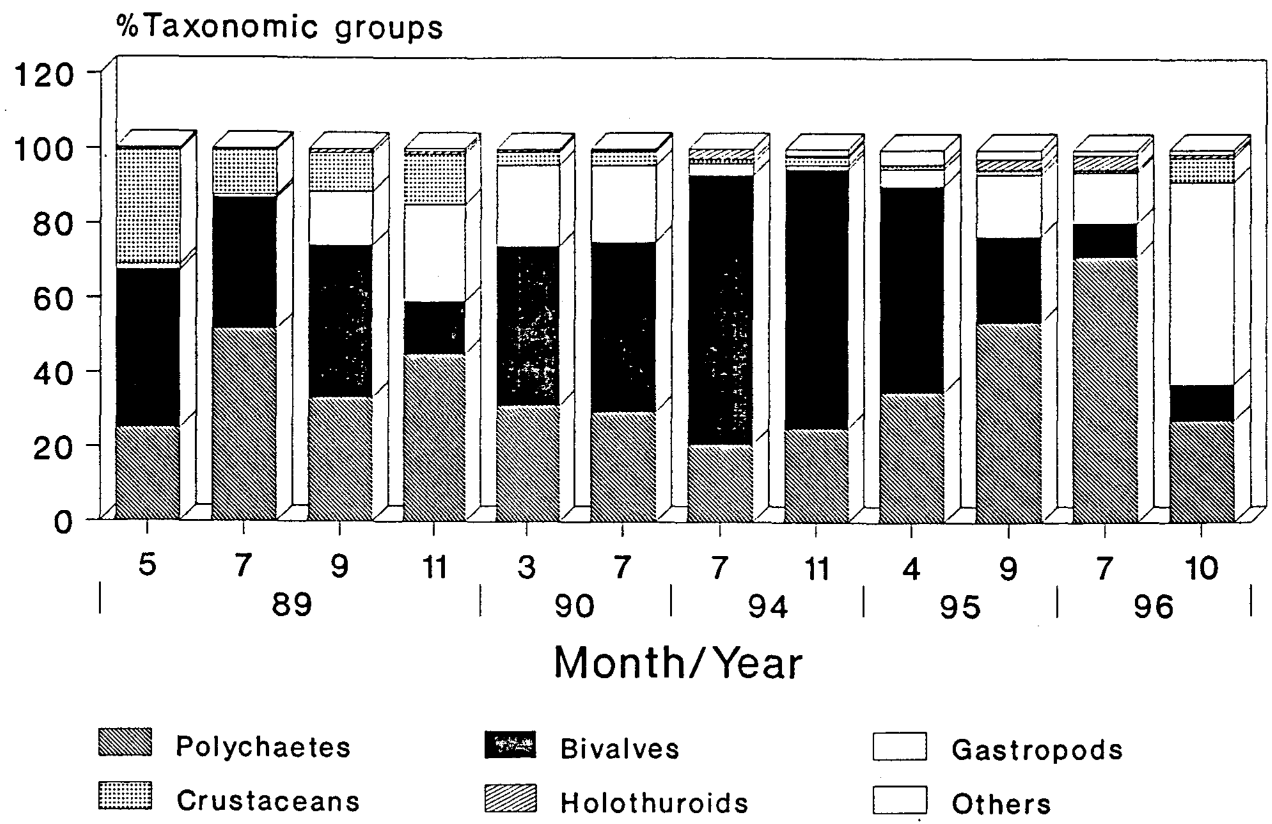
TABLE 2. THE TROPHIC GROUP COMPOSITION (%) OF MACROFAUNA IN SAND FLAT OF INCHEON

	SONGDO				CHOKJON		KOZAN
FEEDING group	9407	9411	9504	9509	9407	9411	9407
C	9	25	32	14	2	12	18
FF	73	55	55	23	78	70	37
SC	2	1	4	13	2	1	5
SDF	6	13	4	9	3	6	5
SSDF	11	6	4	40	15	11	34

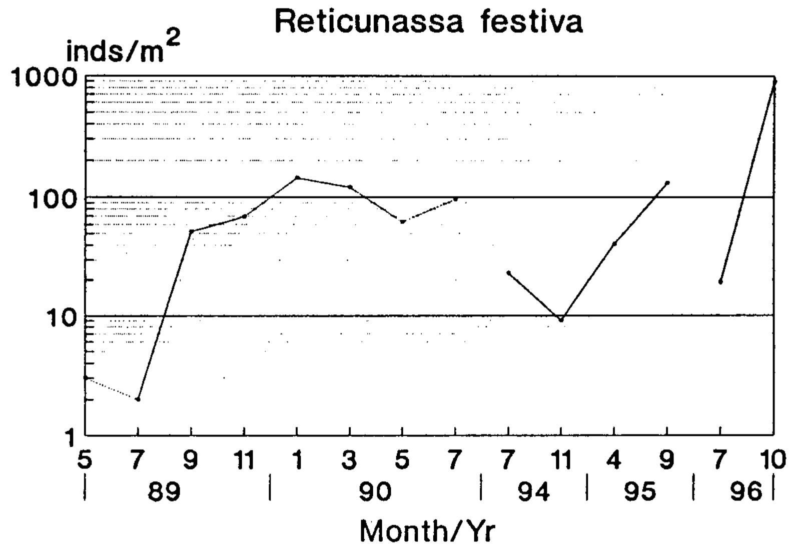

SONGDO
COMPOSITION (%)
0
20
40
60
80
100
120
9407
9411
9504
9509
TIME
CAR
FF
SC
SDF
SSDF

Appendix IX

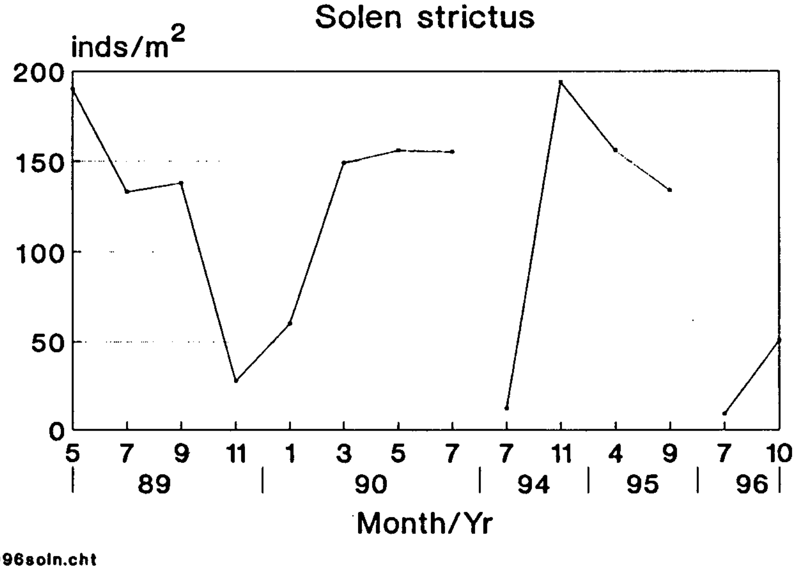
(Data from May 1989 to July 1990 were compiled from the data of St. 2 in Park(1991))



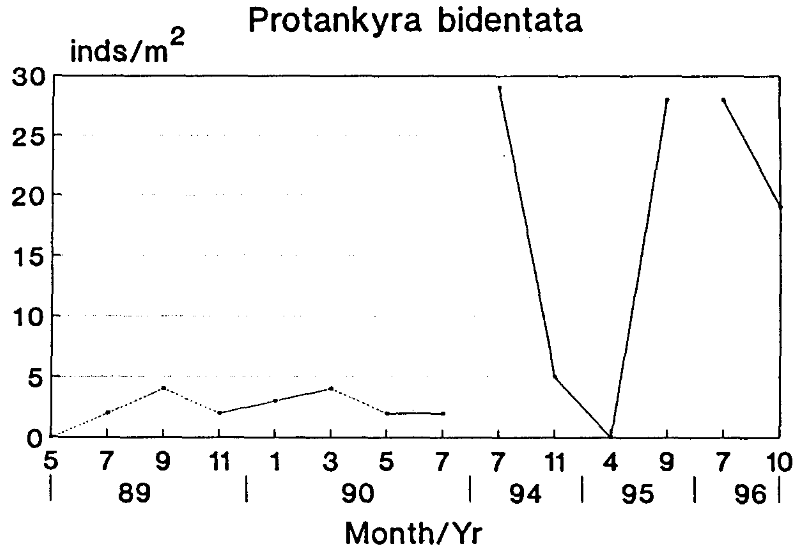
sdtaxon2.cht



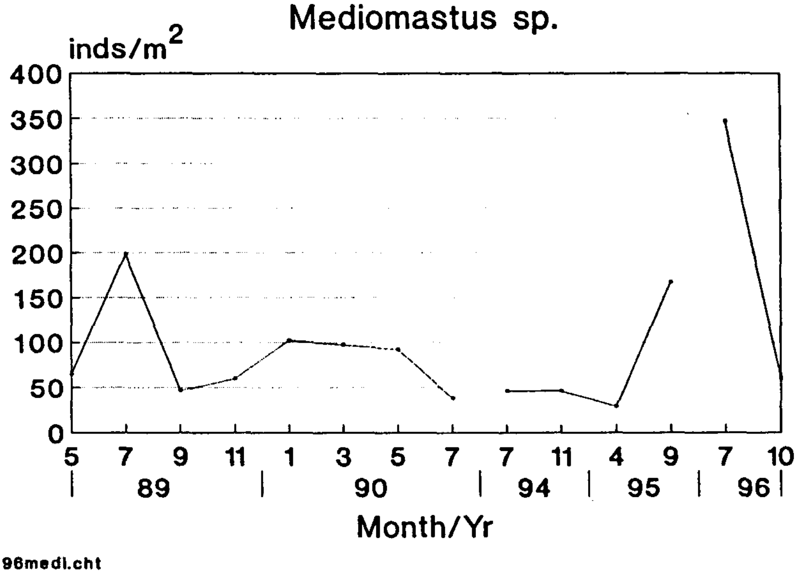
8996retl.cht



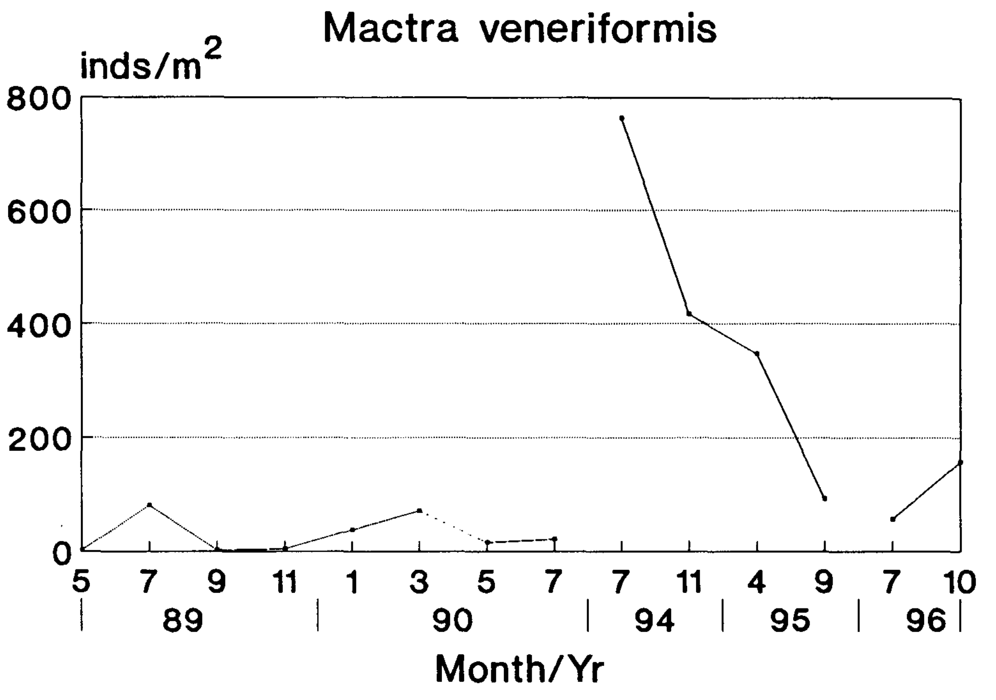
8996soln.cht



8996ankv.cht



8996medl.cht

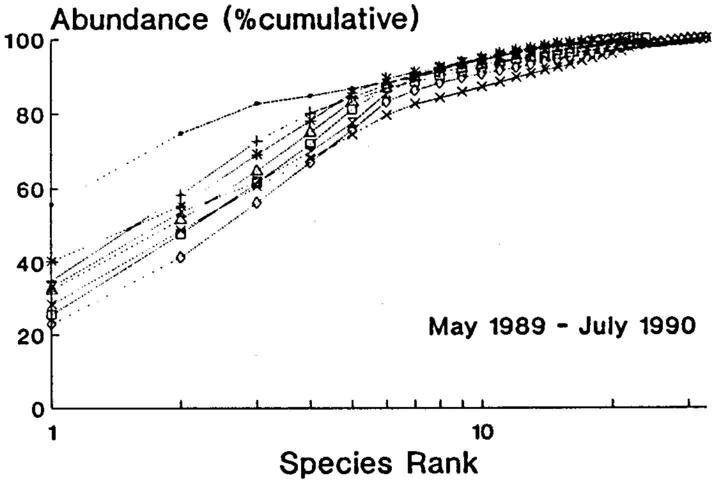


8996mact.cht

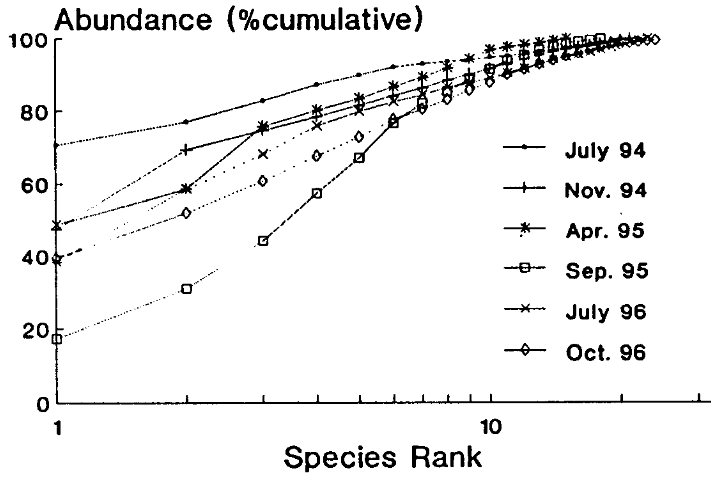
Appendix X

(Data from may 1989 to July 1990 were Compiled from the data of st. 2 in Park(1991))

domntotr.cht



dm2r8990.cht



rank9496.cht (97-04-07)

(Data from Park (1991), St. 2 from May 1989 to July 1990)

%Cumulative K-dominance curves for rank species abundance (filename:sdrank2r.wb3

*Ilyoplax pingi and Nipponomysella spp. excluded

	89/5			89/7			89/9			89/11		
		%	%cum		%	%cum		%	%cum		%	%cum
1	190	55.72	55.72	198	34.92	34.92	138	40.23	40.23	69	25.56	25.56
2	65	19.06	74.78	133	23.46	58.38	52	15.16	55.39	60	22.22	47.78
3	27	7.918	82.7	81	14.29	72.66	47	13.7	69.09	37	13.7	61.49
4	7	2.053	84.75	43	7.584	80.25	31	9.038	78.13	28	10.37	71.86
5	7	2.053	86.81	23	4.056	84.3	25	7.289	85.42	25	9.259	81.12
6	5	1.466	88.27	19	3.351	87.65	13	3.79	89.21	15	5.556	86.67
7	5	1.466	89.74	16	2.822	90.48	6	1.749	90.96	5	1.852	88.52
8	4	1.173	90.91	7	1.235	91.71	5	1.458	92.42	4	1.481	90
9	4	1.173	92.08	7	1.235	92.94	4	1.166	93.58	3	1.111	91.12
10	3	0.88	92.96	7	1.235	94.18	4	1.166	94.75	3	1.111	92.23
11	3	0.88	93.84	7	1.235	95.41	4	1.166	95.92	3	1.111	93.34
12	3	0.88	94.72	5	0.882	96.3	3	0.875	96.79	3	1.111	94.45
13	3	0.88	95.6	4	0.705	97	2	0.583	97.37	2	0.741	95.19
14	2	0.587	96.19	3	0.529	97.53	2	0.583	97.96	2	0.741	95.93
15	2	0.587	96.78	3	0.529	98.06	2	0.583	98.54	2	0.741	96.67
16	2	0.587	97.36	2	0.353	98.41	1	0.292	98.83	1	0.37	97.04
17	1	0.293	97.66	2	0.353	98.76	1	0.292	99.12	1	0.37	97.41
18	1	0.293	97.95	2	0.353	99.12	1	0.292	99.41	1	0.37	97.78
19	1	0.293	98.24	1	0.176	99.29	1	0.292	99.71	1	0.37	98.15
20	1	0.293	98.54	1	0.176	99.47	1	0.292	100	1	0.37	98.52
21	1	0.293	98.83	1	0.176	99.65				1	0.37	98.89
22	1	0.293	99.12	1	0.176	99.82				1	0.37	99.26
23	1	0.293	99.42	1	0.176	100	343			1	0.37	99.63
24	1	0.293	99.71							1	0.37	100
25	1	0.293	100									
26				567								
										270		
	341											

(Data from Park (1991), St. 2 from May 1989 to July 1990)
mulative K-dominance curves for rank species abundance(filename:sdrank2r.wb
*Ilyoplax pingi and Nipponomysella spp. excluded

90/01			90/03			90/05			90/07		
	%	%cum		%	%cum		%	%cum		%	%cum
143	28.37	28.37	149	22.85	22.9	156	32.43	32.43	155	33.12	33.12
102	20.24	48.61	120	18.4	41.3	92	19.13	51.56	96	20.51	53.63
60	11.9	60.51	97	14.88	56.1	63	13.1	64.65	38	8.12	61.75
38	7.54	68.05	71	10.89	67	50	10.4	75.05	38	8.12	69.87
32	6.349	74.4	56	8.589	75.6	40	8.316	83.37	36	7.692	77.56
26	5.159	79.56	49	7.515	83.1	16	3.326	86.69	36	7.692	85.26
15	2.976	82.54	20	3.067	86.2	15	3.119	89.81	21	4.487	89.74
8	1.587	84.12	13	1.994	88.2	6	1.247	91.06	10	2.137	91.88
8	1.587	85.71	9	1.38	89.6	5	1.04	92.1	7	1.496	93.38
7	1.389	87.1	6	0.92	90.5	4	0.832	92.93	4	0.855	94.23
6	1.19	88.29	6	0.92	91.4	4	0.832	93.76	4	0.855	95.09
6	1.19	89.48	5	0.767	92.2	3	0.624	94.38	4	0.855	95.94
5	0.992	90.47	5	0.767	92.9	2	0.416	94.8	3	0.641	96.58
5	0.992	91.47	5	0.767	93.7	2	0.416	95.22	3	0.641	97.22
4	0.794	92.26	4	0.613	94.3	2	0.416	95.63	2	0.427	97.65
4	0.794	93.05	4	0.613	94.9	2	0.416	96.05	2	0.427	98.08
4	0.794	93.85	4	0.613	95.5	2	0.416	96.46	2	0.427	98.5
4	0.794	94.64	3	0.46	96	2	0.416	96.88	2	0.427	98.93
3	0.595	95.24	3	0.46	96.5	2	0.416	97.29	2	0.427	99.36
3	0.595	95.83	3	0.46	96.9	2	0.416	97.71	1	0.214	99.57
3	0.595	96.43	3	0.46	97.4	1	0.208	97.92	1	0.214	99.79
3	0.595	97.02	2	0.307	97.7	1	0.208	98.13	1	0.214	100
3	0.595	97.62	2	0.307	98	1	0.208	98.33			
2	0.397	98.01	2	0.307	98.3	1	0.208	98.54			
2	0.397	98.41	2	0.307	98.6	1	0.208	98.75	468		
1	0.198	98.61	2	0.307	98.9	1	0.208	98.96			
1	0.198	98.81	1	0.153	99.1	1	0.208	99.17			
1	0.198	99	1	0.153	99.2	1	0.208	99.37			
1	0.198	99.2	1	0.153	99.4	1	0.208	99.58			
1	0.198	99.4	1	0.153	99.5	1	0.208	99.79			
1	0.198	99.6	1	0.153	99.7	1	0.208	100			
1	0.198	99.8	1	0.153	99.8						
1	0.198	100	1	0.153	100						
						481					
sum											
504			652								

%Cumulative K-dominance curves for rank species abundance(filename:sdrank2.wb3)

	94/07	%	%cum	94/11	%	%cum	95/04	%	%cum	95/09	%	%cum	96/07	%	%cum	96/10	%	%cum
1	132	70.59	70.58	14	20.29	20.28	60	38.22	38.2	36	17.06	17.06	75	48.7	48.7	194	39.35	39.35
2	12	6.417	77	11	15.94	36.22	32	20.38	58.58	29	13.74	30.8	15	9.74	58.44	62	12.58	51.93
3	11	5.882	82.88	11	15.94	52.16	27	17.2	75.78	28	13.27	44.07	15	9.74	68.18	44	8.925	60.85
4	8	4.278	87.16	7	10.14	62.31	7	4.459	80.24	28	13.27	57.34	12	7.792	75.97	34	6.897	67.75
5	5	2.674	89.83	6	8.696	71	5	3.185	83.42	21	9.953	67.3	6	3.896	79.87	25	5.071	72.82
6	4	2.139	91.97	3	4.348	75.35	5	3.185	86.61	20	9.479	76.78	4	2.597	82.47	24	4.868	77.69
7	2	1.07	93.04	3	4.348	79.7	4	2.548	89.16	11	5.213	81.99	3	1.948	84.41	14	2.84	80.53
8	1	0.535	93.57	2	2.899	82.6	4	2.548	91.7	7	3.318	85.31	3	1.948	86.36	13	2.637	83.16
9	1	0.535	94.11	1	1.449	84.05	4	2.548	94.25	7	3.318	88.62	2	1.299	87.66	12	2.434	85.6
10	1	0.535	94.64	1	1.449	85.5	4	2.548	96.8	6	2.844	91.47	2	1.299	88.96	11	2.231	87.83
11	1	0.535	95.18	1	1.449	86.95	1	0.637	97.44	5	2.37	93.84	2	1.299	90.26	11	2.231	90.06
12	1	0.535	95.71	1	1.449	88.4	1	0.637	98.07	3	1.422	95.26	2	1.299	91.56	7	1.42	91.48
13	1	0.535	96.25	1	1.449	89.85	1	0.637	98.71	3	1.422	96.68	2	1.299	92.86	7	1.42	92.9
14	1	0.535	96.78	1	1.449	91.29	1	0.637	99.35	2	0.948	97.63	2	1.299	94.15	5	1.014	93.91
15	1	0.535	97.32	1	1.449	92.74	1	0.637	99.98	2	0.948	98.58	1	0.649	94.8	5	1.014	94.93
16	1	0.535	97.85	1	1.449	94.19				1	0.474	99.05	1	0.649	95.45	4	0.811	95.74
17	1	0.535	98.39	1	1.449	95.64	sum			1	0.474	99.52	1	0.649	96.1	4	0.811	96.55
18	1	0.535	98.92	1	1.449	97.09	157			1	0.474	100	1	0.649	96.75	3	0.609	97.16
19	1	0.535	99.46	1	1.449	98.54				sum			1	0.649	97.4	3	0.609	97.77
20	1	0.535	99.99	1	1.449	99.99				211			1	0.649	98.05	2	0.406	98.17
21	sum			sum									1	0.649	98.7	2	0.406	98.58
22	183			69									1	0.649	99.35	2	0.406	98.98
23													1	0.649	100	1	0.203	99.19
24													sum			1	0.203	99.39
25													154			1	0.203	99.59
																1	0.203	99.8
																1	0.203	100
																sum		
																493		

(Data from Park (1991), St. 2 from May 1989 to July 1990)
%Cumulative K-dominance curves for rank species abundance(filename:[redacted]
*Ilyoplax pingi excluded

	90/01			90/03			90/05			90/07		
		%	%cum		%	%cum		%	%cum		%	%cum
1	143	28.37	28.37	149	22.85	22.85	156	32.43	32.43	155	33.12	33.12
2	102	20.24	48.61	120	18.4	41.25	92	19.13	51.56	96	20.51	53.63
3	60	11.9	60.51	97	14.88	56.13	63	13.1	64.65	38	8.12	61.75
4	38	7.54	68.05	71	10.89	67.02	50	10.4	75.05	38	8.12	69.87
5	32	6.349	74.4	56	8.589	75.61	40	8.316	83.37	36	7.692	77.56
6	26	5.159	79.56	49	7.515	83.13	16	3.326	86.69	36	7.692	85.26
7	15	2.976	82.54	20	3.067	86.19	15	3.119	89.81	21	4.487	89.74
8	8	1.587	84.12	13	1.994	88.19	6	1.247	91.06	10	2.137	91.88
9	8	1.587	85.71	9	1.38	89.57	5	1.04	92.1	7	1.496	93.38
10	7	1.389	87.1	6	0.92	90.49	4	0.832	92.93	4	0.855	94.23
11	6	1.19	88.29	6	0.92	91.41	4	0.832	93.76	4	0.855	95.09
12	6	1.19	89.48	5	0.767	92.18	3	0.624	94.38	4	0.855	95.94
13	5	0.992	90.47	5	0.767	92.94	2	0.416	94.8	3	0.641	96.58
14	5	0.992	91.47	5	0.767	93.71	2	0.416	95.22	3	0.641	97.22
15	4	0.794	92.26	4	0.613	94.32	2	0.416	95.63	2	0.427	97.65
16	4	0.794	93.05	4	0.613	94.94	2	0.416	96.05	2	0.427	98.08
17	4	0.794	93.85	4	0.613	95.55	2	0.416	96.46	2	0.427	98.5
18	4	0.794	94.64	3	0.46	96.01	2	0.416	96.88	2	0.427	98.93
19	3	0.595	95.24	3	0.46	96.47	2	0.416	97.29	2	0.427	99.36
20	3	0.595	95.83	3	0.46	96.93	2	0.416	97.71	1	0.214	99.57
21	3	0.595	96.43	3	0.46	97.39	1	0.208	97.92	1	0.214	99.79
22	3	0.595	97.02	2	0.307	97.7	1	0.208	98.13	1	0.214	100
23	3	0.595	97.62	2	0.307	98	1	0.208	98.33			
24	2	0.397	98.01	2	0.307	98.31	1	0.208	98.54			
25	2	0.397	98.41	2	0.307	98.62	1	0.208	98.75	468		
26	1	0.198	98.61	2	0.307	98.92	1	0.208	98.96			
27	1	0.198	98.81	1	0.153	99.08	1	0.208	99.17			
28	1	0.198	99	1	0.153	99.23	1	0.208	99.37			
29	1	0.198	99.2	1	0.153	99.38	1	0.208	99.58			
30	1	0.198	99.4	1	0.153	99.54	1	0.208	99.79			
31	1	0.198	99.6	1	0.153	99.69	1	0.208	100			
32	1	0.198	99.8	1	0.153	99.84						
33	1	0.198	100	1	0.153	100						
34							481					
	sum											
	504			652								

(Data from Park (1991), St. 2 from May 1989 to July 1990)
%Cumulative K-dominance curves for rank species abundance (filename:sdrank2r.wb3
*Ilyoplax pingi excluded

	89/5			89/7			89/9			89/11		
		%	%cum		%	%cum		%	%cum		%	%cum
1	190	55.72	55.72	198	34.92	34.92	138	40.23	40.23	69	25.56	25.56
2	65	19.06	74.78	133	23.46	58.38	52	15.16	55.39	60	22.22	47.78
3	27	7.918	82.7	81	14.29	72.66	47	13.7	69.09	37	13.7	61.49
4	7	2.053	84.75	43	7.584	80.25	31	9.038	78.13	28	10.37	71.86
5	7	2.053	86.81	23	4.056	84.3	25	7.289	85.42	25	9.259	81.12
6	5	1.466	88.27	19	3.351	87.65	13	3.79	89.21	15	5.556	86.67
7	5	1.466	89.74	16	2.822	90.48	6	1.749	90.96	5	1.852	88.52
8	4	1.173	90.91	7	1.235	91.71	5	1.458	92.42	4	1.481	90
9	4	1.173	92.08	7	1.235	92.94	4	1.166	93.58	3	1.111	91.12
10	3	0.88	92.96	7	1.235	94.18	4	1.166	94.75	3	1.111	92.23
11	3	0.88	93.84	7	1.235	95.41	4	1.166	95.92	3	1.111	93.34
12	3	0.88	94.72	5	0.882	96.3	3	0.875	96.79	3	1.111	94.45
13	3	0.88	95.6	4	0.705	97	2	0.583	97.37	2	0.741	95.19
14	2	0.587	96.19	3	0.529	97.53	2	0.583	97.96	2	0.741	95.93
15	2	0.587	96.78	3	0.529	98.06	2	0.583	98.54	2	0.741	96.67
16	2	0.587	97.36	2	0.353	98.41	1	0.292	98.83	1	0.37	97.04
17	1	0.293	97.66	2	0.353	98.76	1	0.292	99.12	1	0.37	97.41
18	1	0.293	97.95	2	0.353	99.12	1	0.292	99.41	1	0.37	97.78
19	1	0.293	98.24	1	0.176	99.29	1	0.292	99.71	1	0.37	98.15
20	1	0.293	98.54	1	0.176	99.47	1	0.292	100	1	0.37	98.52
21	1	0.293	98.83	1	0.176	99.65				1	0.37	98.89
22	1	0.293	99.12	1	0.176	99.82				1	0.37	99.26
23	1	0.293	99.42	1	0.176	100	343			1	0.37	99.63
24	1	0.293	99.71							1	0.37	100
25	1	0.293	100									
26				567								
										270		
	341											

Appendix 2.2 Species list showing abundance(no.inds/m²) at station 2 from May 1989 to July 1990. From Park (1991)

STATION 2 SPECIES	89' MAY	JULY	SEPT.	NOV.	90' JAN.	MAR.	MAY	JULY	TOTAL
Rhynchocoela									
nemertine sp1				1	1		2		4
nemertine sp2				1			1		2
Brachiopoda									
Lingula anatina	3	1				1			5
Mollusca									
Gastropoda									
Bullacta exarata	4	2	1	3	5	13	2		30
Reticunassa festiva	3	2	52	69	143	120	63	96	548
Euspira fortunei						2			2
Neverita didyma						1			1
Stenothyra edogawaensis					8				8
Didontoglossa koyasensis						2			2
Agatha virgo						4			4
Devonia semperi		1					1		2
Bivalvia									
Cyclina sinesis	2		4	1	1	1	1	1	11
Moerella rutila	5	7	6	5	15	56	50	38	182
Potamocobula amurensis				1					1
Mactra veneriformis	2	81	2	4	38	71	16	21	235
Solen strictus	190	133	138	28	60	149	156	155	1009
Tapes philippinarum	1					1	1		3
Nipponomysella oblongata						3			3
Nipponomysella subtruncata		1							1
Arthropoda									
Crustacea									
Macrophthalmus ~~japonicus~~ dilatatus	3	7	13	25	8	3	1	4	64
Camptandrium sexdentatum					4	3	2		9
Ilyoplax pingi	130	63	24	7	76	1	10	3	314
Philyra pisum	1			1	5				7
Tritodynamia rathbuni	7		1	3	6	9	1		27
Hemigrapsus penicillatus						1		1	2
Upogebia major		3			4			3	10
Caridea sp1		1			4			3	8
Alpheus brevicristatus		1					1		2
Monoculodes carinatus?					1	6	2	2	11

P	25.1	51.7	33.4	45.1	34.1	31.25	36.3	29.7
B	42.5	35.2	40.8	14.1	19.7	42.8	45.6	45.6
G	1.49	0.79	11.34	26.0	26.9	21.6	13.4	20.3
Cr	30.4	11.9	10.3	13.4	18.6	3.5	3.67	3.81
H	0	0.32	1.09	0.72	0.52	0.61	0.41	0.42
Others	0.64	0.16	0	0.72	0.17	0.15	0.61	0.21

Appendix 2.2 - continued

Jassa falcata?	1							2	3
Corophium sp1									
Gammaridea sp1				1					1
Gammaridea sp2	1								1
Sphaeromidae sp1									
Sphaeromidae sp2									
Dimorphostylis asiatica?							1		1
Annelida									
Polychaeta									
Heteromastus sp.		5	2	1	2	6	2		18
Mediomastus sp.	65	198	47	60	102	97	92	38	699
Nephtys caeca	27	43	31	37	32	49	40	36	295
Nephtys polybranchia					1			1	2
Glycera chirori	5	23	25	15	26	20	15	36	165
Glycera capitata		7	1		1				9
Diopatra sugokai			2	1	7	2	6	4	22
Glycinde sp.	2	19			1	5	3	10	40
Magelona japonica	4	16	4	2	4	3	2		35
Lumbrineridae heteropoda	1	4	3	2	6	3	5	4	28
Lumbrineridae longifolia	3	7					1		11
Haploscoloplos elongata	1		(5)			4	4		14
Loimia medusa	7		1	3	1	5	2	2	21
Eunoe oerstedi					3				3
Tylorrhynchus heterochaetus					3	2			5
Dispio sp.	1			1	2		4	2	10
Aricidea sp.	1	3	(1)	3	3	5	1	7	24
Prionospio sp.						1			1
Marphysa sanguinea	1				1	2			4
Nereidae sp.		1	1		3	1	1		7
Echinodermata									
Holothuroidea									
Protankyra bidentata		2	4	2	3	4	2	2	19
Chordata									
Gobiidae								1	1

TOTAL	471	631	368	277	580	656	491	472	3946
Number of species	26	25	22	26	35	36	32	25	

Appendix XI

```
REGR
ID =%mud and %org C in Sondo sediment core in 0794(sd07ocmd.reg)

NO. X-VALUES           =   21      INPUT CODE = 1
TRANSFORMATION CODES =    0,  0
T( .0500)              =   2.093


XBAR    =      29.89000   YBAR    =        .11867   TOTAL N=  21.
VAR. X =      73.79797   VAR. Y =        .00142

REGRESSION COEFFICIENT =      .003546
STANDARD ERROR  B       =      .000593
Y-INTERCEPT             =      .012688

THE   95.0 PERCENT CONFIDENCE LIMITS FOR THE SLOPE ARE
      .002305 AND     .004786
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ANALYSIS OF VARIANCE

SOURCE	SS	DF	MS	FS
GROUPS	.0284	20	.0014	---------
LINEAR	.0186	1	.0186	35.7706
DEV.	.0099	19	.0005	---------
ERROR	.0000	0	.0000	
TOTAL	.0284	20		

SAMP. NO.	X	Y	L1	YHAT	L2
1	39.22000	.17900	.13618	.15175	.16731
2	34.96000	.17000	.12449	.13664	.14880
3	19.44000	.07700	.06499	.08161	.09824
4	24.17000	.08500	.08579	.09839	.11098
5	29.57000	.12200	.10712	.11753	.12794
6	19.24000	.08300	.06409	.08091	.09772
7	46.59000	.14700	.15469	.17788	.20106
8	43.85000	.17100	.14796	.16816	.18837
9	31.68000	.10900	.11438	.12501	.13565
10	27.15000	.06200	.09801	.10895	.11990
11	26.04000	.09300	.09357	.10502	.11646
12	21.59000	.10200	.07460	.08924	.10388
13	22.84000	.10000	.08008	.09367	.10726
14	23.61000	.10400	.08340	.09640	.10940
15	44.21000	.17700	.14885	.16944	.19003
16	42.02000	.17700	.14338	.16168	.17997
17	30.46000	.08000	.11026	.12069	.13111
18	26.46000	.08500	.09527	.10651	.11774
19	25.50000	.13100	.09136	.10310	.11484
20	22.34000	.11400	.07790	.09190	.10590
21	26.75000	.12400	.09643	.10753	.11864

SAMP.	DEVIATION	H(I)	STAND. RESID.
1	.02725	.10660	1.26595

2	.03336	.06503	1.51469
3	-.00461	.12161	-.21620
4	-.01339	.06979	-.60937
5	.00447	.04769	.20103
6	.00209	.12447	.09827
7	-.03088	.23657	-1.55170
8	.00284	.17966	.13750
9	-.01601	.04979	-.72128
10	-.04695	.05271	-2.11808
11	-.01202	.05766	-.54349
12	.01276	.09429	.58879
13	.00633	.08129	.28997
14	.00760	.07434	.34683
15	.00756	.18655	.36803
16	.01532	.14731	.72868
17	-.04069	.04784	-1.83080
18	-.02151	.05559	-.97162
19	.02790	.06068	1.26389
20	.02210	.08624	1.01523
21	.01647	.05430	.74346

--end--

CORR
ID =%mud and %org C in Sondo sediment core in 0794(sd07%c%m.cor)

N = 21, F(1,N-2) = 4.380, F(2,N-2) = 3.520, ALPHA =.0500
THE TRANSFORMATION CODES ARE 0 AND 0

	Y1	Y2
MEAN	29.89000	.11867
VARIANCE	73.79798	.00142
STANDARD DEVIATION	8.59058	.03769
STANDARD ERROR	1.87462	.00822
COVARIANCE	.26166	

THE PRODUCT-MOMENT CORRELATION COEFFICIENT IS .80815

THE 95.0 PER CENT CONFIDENCE LIMITS ARE L1 = .5781 AND L2 = .9192

THE EIGENVALUES ARE 73.79890 AND .00049

THE EQUATION OF THE PRINCIPAL AXIS IS
Y1= -3.57825 + 282.03580 Y2

THE EQUATION OF THE MINOR AXIS IS
Y1= 29.89042 + -.00355 Y2

THE 95.0 PER CENT CONFIDENCE LIMITS TO THE SLOPE OF THE PRINCIPAL AXIS ARE

L1= 208.92690 L2= 433.84960

FOLLOWING PAIRS SHOW THE COORDINATES OF POINTS A TO H
FOR PLOTTING CONFIDENCE ELLIPSE(SEE BOX 15.5).

	Y1	Y2
A	32.8957	.1187
B	26.8843	.1187
C	29.8900	.1319
D	29.8900	.1055
E	34.9931	.1368
F	24.7869	.1006
G	29.8900	.1319
H	29.8901	.1055

--end--

```
POLY
ID =%mud and Pb in Sondo sediment core in 0794(sd07pbmd.pol)

POLYNOMIAL REGRESSION ANALYSIS

N             =  25
MAX DEGREE    =   1
INPUT CODE    =   1
RESIDUAL CODE =   0
PLOT CODE     =   0

X TRANSF.     =   0 POWER =   1.00000
Y TRANSF.     =   0 POWER =   1.00000

DEPENDENT VARIABLE:

MEAN          =     10.19080
VARIANCE      =       .61541
STAND. DEV.   =       .78448

INDEPENDENT VARIABLES:

DEGREE       MEAN                  SD
    1         29.43440            8.04587

CORRELATION BETWEEN Y AND X**K

    1     .71847

CORRELATION BETWEEN THE X**K


              1
   1         1.00000


--DEGREE =  1--

TERM COEFFICIENT          SE           T          VIF
  0      8.1288778      .4309000     18.865
  1       .0700514      .0141409      4.954          1.000

RESIDUAL SS      =      7.14565, DEGREES OF FREEDOM =    23
RESIDUAL MS      =       .31068
RMULT. SQ.       =       .51620
FS               =     24.54015, WITH  1 AND  23 DEGREES OF FREEDOM


INVERSE OF CORRELATION MATRIX


              1
   1         1.00000

--end--
```

```
POLY
ID =%mud and Ni in Sondo sediment core in 0794(sd07nimd.pol)

POLYNOMIAL REGRESSION ANALYSIS

N              =  25
MAX DEGREE     =   1
INPUT CODE     =   1
RESIDUAL CODE  =   0
PLOT CODE      =   0

X TRANSF.      =   0 POWER =    1.00000
Y TRANSF.      =   0 POWER =    1.00000

DEPENDENT VARIABLE:

MEAN           =     11.72920
VARIANCE       =      1.81876
STAND. DEV.    =      1.34861

INDEPENDENT VARIABLES:

DEGREE       MEAN                  SD
     1        29.43440            8.04587

CORRELATION BETWEEN Y AND X**K

     1    .65507

CORRELATION BETWEEN THE X**K


              1
    1        1.00000


--DEGREE =  1--

TERM COEFFICIENT         SE           T          VIF
  0      8.4973172      .8046813    10.560
  1       .1097995      .0264074     4.158        1.000

RESIDUAL SS     =    24.91933, DEGREES OF FREEDOM =    23
RESIDUAL MS     =     1.08345
RMULT. SQ.      =      .42911
FS              =    17.28818, WITH  1 AND  23 DEGREES OF FREEDOM


INVERSE OF CORRELATION MATRIX


              1
    1        1.00000

--end--
```

```
POLY
ID =%mud and Co in Sondo sediment core in 0794(sd07comd.pol)

POLYNOMIAL REGRESSION ANALYSIS

N              =  25
MAX DEGREE     =   1
INPUT CODE     =   1
RESIDUAL CODE  =   0
PLOT CODE      =   0

X TRANSF.      =   0 POWER =   1.00000
Y TRANSF.      =   0 POWER =   1.00000

DEPENDENT VARIABLE:

MEAN           =      7.02560
VARIANCE       =       .70004
STAND. DEV.    =       .83669

INDEPENDENT VARIABLES:

DEGREE        MEAN                 SD
     1         29.43440            8.04587

CORRELATION BETWEEN Y AND X**K

     1    .70184

CORRELATION BETWEEN THE X**K


              1
    1         1.00000


--DEGREE =  1--

TERM COEFFICIENT         SE           T          VIF
  0     4.8773736      .4706631     10.363
  1      .0729835      .0154459      4.725        1.000

RESIDUAL SS     =      8.52528, DEGREES OF FREEDOM =   23
RESIDUAL MS     =       .37066
RMULT. SQ.      =       .49257
FS              =     22.32675, WITH  1 AND  23 DEGREES OF FREEDOM


INVERSE OF CORRELATION MATRIX


              1
    1         1.00000

--end--
```

```
POLY
ID =%mud and Mn in Sondo sediment core in 0794(sd07mnmd.pol)

POLYNOMIAL REGRESSION ANALYSIS

N              =  25
MAX DEGREE     =   1
INPUT CODE     =   1
RESIDUAL CODE  =   0
PLOT CODE      =   0

X TRANSF.      =   0 POWER =    1.00000
Y TRANSF.      =   0 POWER =    1.00000

DEPENDENT VARIABLE:

MEAN           =   269.51520
VARIANCE       = 28100.28893
STAND. DEV.    =   167.63141

INDEPENDENT VARIABLES:

DEGREE        MEAN                 SD
     1         29.43440           8.04587

CORRELATION BETWEEN Y AND X**K

     1    .87592

CORRELATION BETWEEN THE X**K


               1
    1        1.00000


--DEGREE =  1--

TERM COEFFICIENT        SE          T         VIF
  0  -267.6426814     63.8668900    -4.191
  1    18.2493232      2.0959340     8.707       1.000

RESIDUAL SS     =156978.40000, DEGREES OF FREEDOM =   23
RESIDUAL MS     =  6825.14946
RMULT. SQ.      =       .76723
FS              =     75.81204, WITH  1 AND  23 DEGREES OF FREEDOM


INVERSE OF CORRELATION MATRIX


               1
    1        1.00000

--end--
```

```
POLY
ID =%mud and Cr in Sondo sediment core in 0794(sd07crmd.pol)

POLYNOMIAL REGRESSION ANALYSIS

N              =  25
MAX DEGREE     =   1
INPUT CODE     =   1
RESIDUAL CODE  =   0
PLOT CODE      =   0

X TRANSF.      =   0 POWER =    1.00000
Y TRANSF.      =   0 POWER =    1.00000

DEPENDENT VARIABLE:

MEAN           =     15.48560
VARIANCE       =     12.64683
STAND. DEV.    =      3.55624

INDEPENDENT VARIABLES:

DEGREE        MEAN                    SD
     1         29.43440             8.04587

CORRELATION BETWEEN Y AND X**K

     1     .33543

CORRELATION BETWEEN THE X**K


              1
    1          1.00000


--DEGREE =  1--

TERM COEFFICIENT         SE           T          VIF
  0     11.1217019     2.6456550     4.204
  1       .1482585      .0868231     1.708         1.000

RESIDUAL SS     =   269.37360, DEGREES OF FREEDOM =    23
RESIDUAL MS     =    11.71190
RMULT. SQ.      =      .11251
FS              =     2.91587, WITH  1 AND  23 DEGREES OF FREEDOM


INVERSE OF CORRELATION MATRIX


              1
    1          1.00000

--end--
```