Polychaete jaws

CLAES BERGMAN

There are very few previous reports of polychaete jaws (scolecodonts) from the Silurian of Gotland. Although, according to Hinde (1882:4) and Thorell & Lindström (1885:4), Angelin had identified specimens from Gotland as jaw elements of annelids as early as 1864, the paper by Hinde (1882) is the first published account of these fossils from the island. Hinde's report is a well illustrated account of scolecodonts from two localities, one of which was in "decomposed shale from the neighbourhood of Wisby", later stated by Thorell & Lindström (1885:4) to be from the "*Pterygotus*" Beds of Vattenfallet.

Hede recorded the occurrence of annelid jaws from a large number of localities on Gotland in the descriptions of the geological map sheets. More recently Martinsson (1960) described two clusters of jaws from the Mulde Marl, and Eisenack (1975) discussed some scolecodont material from the island within a more general study of the group.

I am currently studying both fused and dispersed polychaete jaws from the Silurian of Sweden, mainly from Gotland. A full discussion of the taxa tentatively identified here is in preparation. Specimens have been picked from the same residues as those prepared for conodont extraction. For further information on the samples and their treatment, see Jeppsson (this volume). 13,581 jaw elements from Vattenfallet have been examined, but only a few of these were fused. 16 separate species are distinguished (Fig. 26), 10 of which were not described by Hinde (1882). He named 26 different species from about 1 kg of soft "*Pterygotus*" marl, but in my opinion about 20 of these are synonyms.

Taxonomy, nomenclature and terminology

Various authors have proposed that a parataxonomic system should be used for disaggregated jaw elements and that clusters should be named separately. A proposal of this kind by Moore & Sylvester-Bradley (1957) was rejected by the 15th International Congress of Zoology in 1958 (Kielan-Jaworowska 1968), and thus the only valid nomenclatorial basis is that which follows current I.C.Z.N. rules (e.g. article 23). Similar problems have been widely discussed with regard to conodonts, and the success in attempting to apply strictly biological criteria for taxonomy suggests that the same success can be achieved for polychaetes.

In this study I have mainly used the morphology of the first maxillae (MI) to distinguish different species, although some of the other jaw elements of each

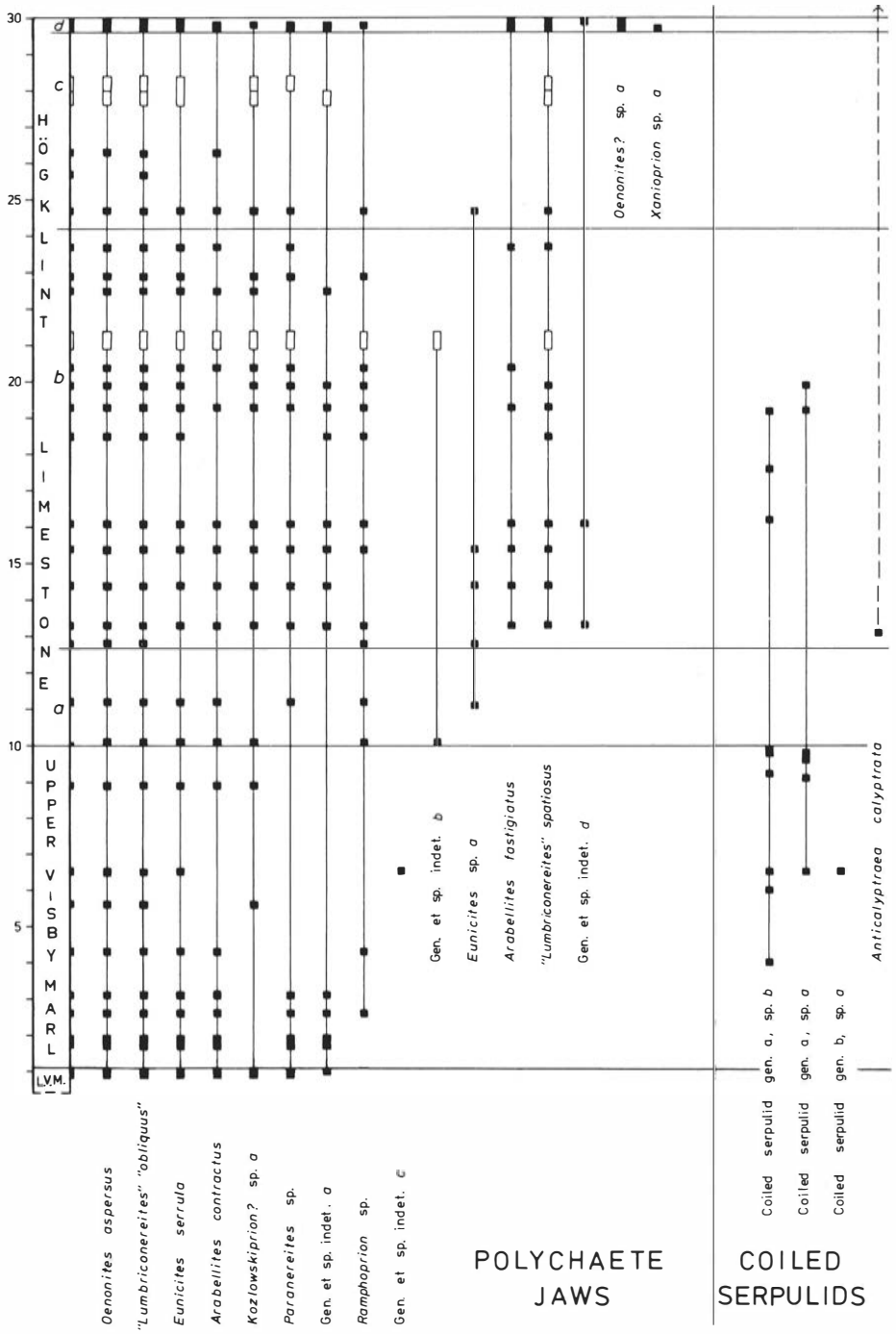
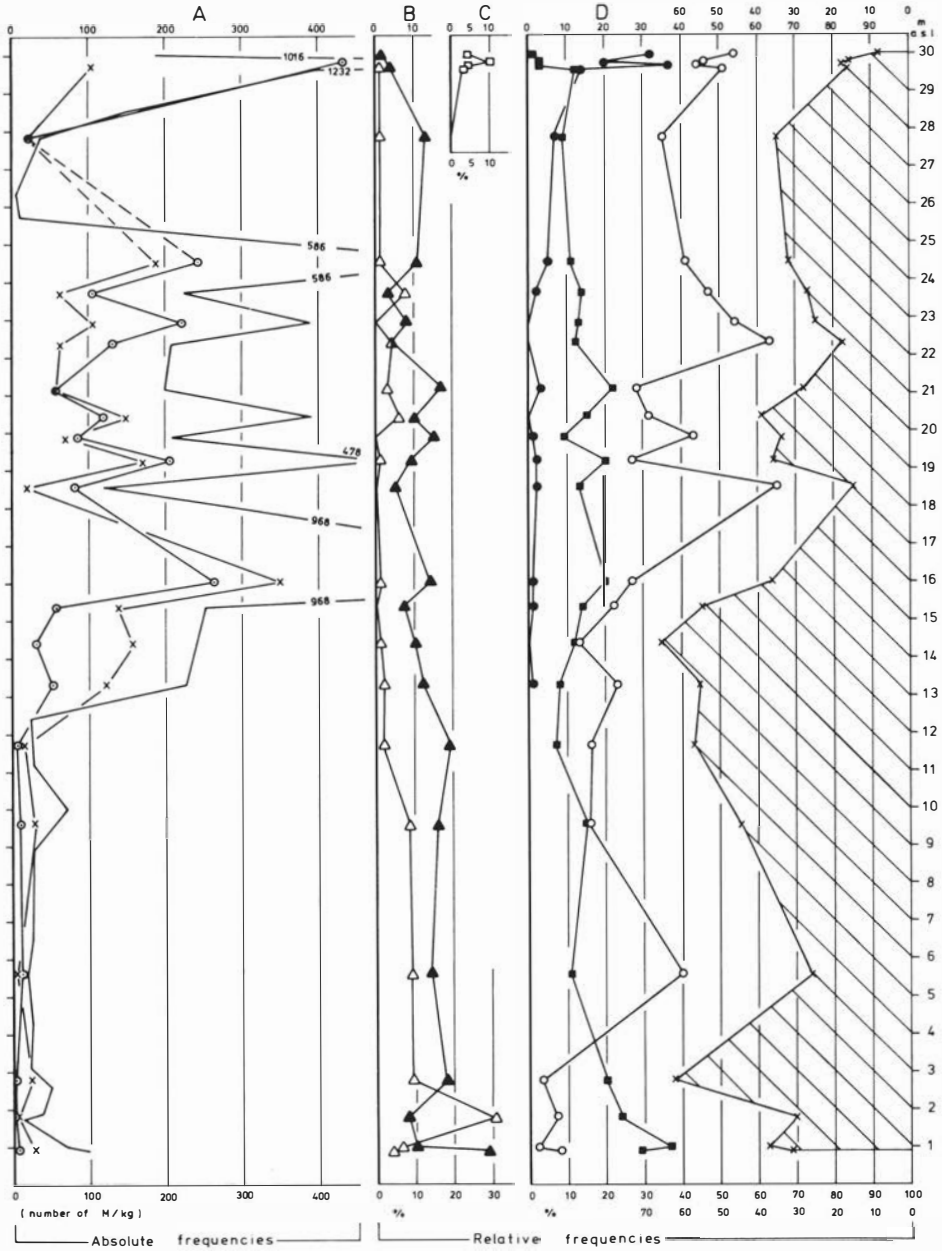

30
25
20
15
10
5
d
c
b
a
HÖGKLINT
LIMESTONE
UPPER VISBY MARL
LVM.
Oenonites aspersus
"Lumbriconereites" "obliquus"
Eunicites serrula
Arabellites contractus
Kozlowskiprion? sp. a
Paranereites sp.
Gen. et sp. indet. a
Ramphoprion sp.
Gen. et sp. indet. c
Gen. et sp. indet. b
Eunicites sp. a
Arabellites fastigiatus
"Lumbriconereites" spatiosus
Gen. et sp. indet. d
Oenonites? sp. a
Xanioprion sp. a
POLYCHAETE JAWS
Coiled serpulid gen. a, sp. b
Coiled serpulid gen. a, sp. a
Coiled serpulid gen. b, sp. a
Anticalyptraea calyptrata
COILED SERPULIDS

Fig. 26.


A
B
C
D
1016
1232
586
586
478
968
968
(number of M / kg)
Absolute frequencies
%
%
Relative frequencies
m a s l
Total sum of absolute frequencies:
"Lumbriconereites" "obliquus" (n MI/kg)
Eunicites serrula (nM/kg)
Arabellites contractus
Remaining species (10)
Oenonites? sp a
"Lumbriconereites" spatiosus
"Lumbriconereites" "obliquus"
Oenonites aspersus
Eunicites serrula (note that this curve is reversed relative to the others)

species have also been identified using the same methods as those employed in reconstructing conodont apparatuses. Further work is required to identify the remaining jaw elements of these species.

I have not yet studied the type specimens of the species involved, and thus it is impossible at this stage to determine which of the many names used for single jaw elements has priority. Since the elements in my samples from the "*Pterygotus*" Beds can be compared easily with those figured in Hinde's (1882) paper, I have tentatively used his names where possible. As this is one of the oldest papers on scolecodonts it is reasonable to assume that most of Hinde's species names have priority, although some of the generic names that he used (Hinde 1879, 1880, 1882) will probably be replaced by others when full taxonomic revisions are made.

Descriptive terms used here are those in the "glossary of descriptive terms" of Jansonius & Craig (1971:257). I use 'cluster' in the sense of Pollock (1969:929) rather than 'assemblage' since the latter has been used with different meanings by different authors.

Annotated faunal list

Arabellites contractus Hinde, 1880 (Fig. 28:2A–B); *A. fastigiatus* Hinde, 1882 (Fig. 28:1A–B). The type species of *Arabellites* Hinde, 1879, is *A. hamatus* Hinde, 1879, and according to Hinde (1880, 1882) the two species here identified from Vattenfallet are congeneric. However, there may be some doubt as to whether both *contractus* and *fastigiatus* should be included in this genus. At present MII and MIV of *Arabellites* can not be identified at the species level and they are here referred to as *A.* sp. indet.

Kozlowskiprion? sp. *a* (Fig. 28:9). The MI of this species are similar to those of *K. longicavernosus* described by Kielan-Jaworowska (1966:98).

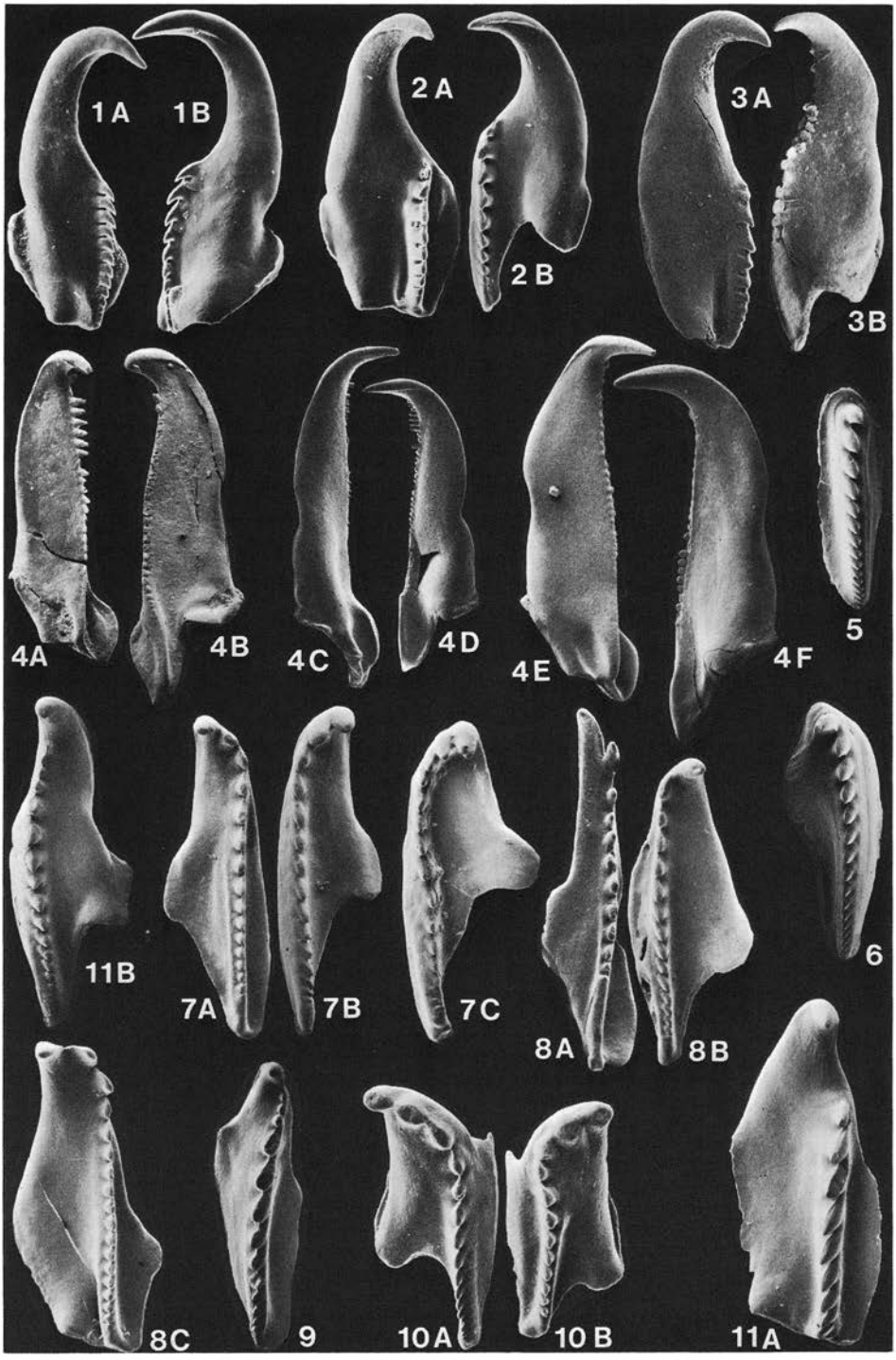
"*Lumbriconereites*" "*obliquus*" (Eichwald, 1854) (Fig. 28:7A–C). It is doubtful whether Hinde was correct in placing this species in the genus *Lumbriconereites*, and whether he correctly identified specimens with those of Eichwald's species. The jaws of the type specimen of the type species of *Lumbriconereites* Ehlers, 1868 are poorly preserved (Jansonius & Craig 1971:273), making a comparison between them and the specimens described by Hinde very difficult. The specific name *obliquus* Pander, 1856 was used by

Fig. 27. Absolute and relative frequencies of jawed polychaete species at Vattenfallet. Adjacent samples having a low absolute frequency have been grouped together. The data are based on counts of MI except for *Eunicites* and Gen. et sp. indet. *b* and *c*, for which all maxillae have been counted. In B, C and D, samples containing less than 35 specimens have been grouped with the nearest sample below or above.

POLYCHAETE JAWS FROM VATTENFALLS-PROFILEN 1					*Oenonites aspersus*		*"Lumbriconereites" obliquus*								*Eunicites serrula*	*Arabellites contractus*		*Kozlowskiprion? sp. a*		*Paraneretes sp.*	*Gen. et sp. indet. a*		*Ramphoprion sp.*	
SAMPLE NUMBER	LEVELS IN M A.S.L.	AMOUNT DISSOLVED MTRL (GRAM)	NUMBER OF ELEMENTS PER KILOGRAM	TOTAL NUMBER OF ELEMENTS	l MI	r MI	l MI	r MI	l MII	r MII	l MIII	r MIII	l MIV	r MIV	bp	cr	M	l MI	r MI	l MI	r MI	MI	l MI	r MI	l MI	r MI
G. HOLM Pteryg. RM	29.6-30.0	?	?	784	5	8	220	263	4	10	4	5	57	–	28	2	5	–	3	–	–	1	–	–
LJUS KST RM	29.6-30.0	500	306	152	1	–	26	25	–	4	1	1	9	–	8	–	–	–	–	–	–	–	–	–
HERRMAN. RM	29.6-30.0	930	1688	1570	10	14	229	204	28	49	16	14	56	4	154	5	6	1	3	29	2	–	–	2
VALDARIA. RM	29.6-30.0	? 2000	1696	3392	34	48	582	502	58	94	26	40	240	–	207	18	32	5	5	6	–	6	–	–
LJUS SK RM	29.6-30.0	385	875	337	9	9	40	37	2	2	6	5	9	2	24	1	–	–	–	3	2	–	–	–
SGU	28.0-28.4	475	240	114	4	2	9	17	1	1	–	1	4	–	25	–	–	3	2	4	–	–	–	–
SGU	27.65-28.00	400	60	24	1	1	2	4	–	–	–	–	–	–	3	–	–	1	1	–	–	1	–	–
SGU	26.28-26.37	500	6	3	1	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
SGU	25.6-25.8	270	26	7	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SGU	24.6-24.7	145	979	142	7	2	15	20	1	4	4	3	1	1	27	–	1	–	2	3	–	–	–	3
SGU	23.70	285	393	112	7	2	13	17	3	2	2	–	3	2	17	–	5	–	–	1	–	–	–	–
SGU	22.90	195	677	132	2	8	18	25	4	2	1	1	3	–	20	–	–	1	–	3	–	–	2	–
SGU	22.40-22.50	245	384	94	4	2	13	19	3	2	1	–	4	–	9	2	–	1	–	–	–	1	–	–
SGU	20.9-21.4	180	339	61	5	3	3	7	2	1	–	1	–	–	10	–	1	–	1	3	–	–	1	–
SGU	20.40	185	849	157	5	6	9	13	5	7	1	5	3?	–	28	1	3	1	–	3	–	–	2	–
G 70-1 LJ	19.87	500	312	156	6	4	15	27	1	13	–	–	5	–	35	–	–	1	1	4	–	2	4	4
G 70-2 LJ	19.24-19.29	2500	785	1962	57	51	264	246	52	73	16	14	58	12	428	3	10	3	1	25	–	2	34	31
G 70-3 LJ	18.52-18.57	500	198	99	6	2	20	19	–	9	1	–	–	–	9	–	–	–	–	–	–	1	2	–
G 70-5 LJ	16.0-16.10	500	1518	759	51	46	57	76	18	22	3	5	12	13	175	2	2	4	3	22	2	1	2	12
G 70-6 LJ	15.33-15.41	2500	393	982	51	39	49	90	19	30	6	1	13	6	342	1	1	4	8	25	–	1	5	2
G 70-7 LJ	14.38-14.48	500	366	183	4	10	5	10	6	8	–	1	2	–	78	1	–	–	5	3	1	–	–	–
G 70-8 LJ	13.33	2500	352	879	23	22	63	65	15	25	9	10	9	1	309	6	5	5	5	23	3	–	9	13
G 70-9 LJ	12.38-12.43	500	50	25	1	–	–	2	2	1	–	–	1	–	–	–	–	–	–	–	–	–	1	–
G 70-21 LJ	11.20-11.23	2500	44	110	1	4	4	7	1	1	2	–	1	–	46	–	1	–	–	2	–	–	2	1
G 70-20 LJ	10.02-10.04	3670	112	412	17	21	19	24	6	9	6	6	8	–	121	12	8	8	19	–	–	–	5	7
G 70-22 LJ	8.94	500	40	20	1	1	1	1	–	4	–	–	–	–	5	–	1	1	2	–	–	–	–	–
G 70-19 LJ	6.49-6.54	500	40	20	1	–	1	4	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–
G 70-18 LJ	5.59	500	48	24	1	–	3	3	–	1	–	–	1	–	–	–	–	1	–	–	–	–	–	–
G 70-17 LJ	4.26-4.33	500	46	23	2	–	2	1	–	1	–	–	1	–	3	2	1	–	–	–	–	–	1	1
G 70-16 LJ	3.06-3.16	500	48	24	3	1	–	–	1	1	–	1	1	–	5	1	–	–	–	4	1	–	–	–
G 76-8 LJ	2.58-2.62	2000	100	199	10	6	1	2	6	8	2	2	2	–	57	2	7	–	–	8	1	–	6	6
G 70-15 LJ	1.86-1.96	1300	75	98	9	3	2	2	–	2	2	–	–	–	10	11	10	–	–	1	1	–	–	–
G 76-7 LJ	1.73-1.78	2000	19	37	2	4	–	1	–	–	–	–	–	–	12	1	1	–	–	3	–	1	–	–
G 70-14 LJ	0.99-1.06	840	142	119	10	13	1	–	1	1	3	2	–	–	23	3	7	–	1	4	–	1	–	–
G 76-6 LJ	0.94-0.99	2000	184	368	31	24	4	12	1	5	1	2	1	2	60	4	3	21	25	9	–	–	–	–
				13580	382	356	1694	1745	240	392	113	120	504	43	2284	79	110	61	87	187	13	18	76	82

TABLE 2. Frequencies of various polychaete jaw elements in the samples from Vattenfallet. The sample "Valdaria RM" was processed at the Riksmuseum and the other samples by L. Jeppsson. Abbreviations in sample numbers: RM=Riksmuseum; SGU=Geological Survey of Sweden (Liljevall's samples); LJ=L. Jeppsson, Lund. Note the small sample weight in some samples from Högklint *b* and *c*.

Gen. et sp. indet. c	Gen. et sp. indet. b	Eunicites sp. a	Arabellites fastigiatus		"Lumbriconereites" spatiosus				Gen. et sp. indet. d	Oenonites? sp. a		Xanioprion sp. a	Oenonites sp. indet.			Arabellites sp. indet.				Sp. a	Gen. et sp. indet.	Mandibel sp. indet.				Anterior and lateral teeth
M	M	M	l MI	r MI	l MI	r MI	l bp	bp	cr	MI?	l MI	r MI	bp	l MII	r MII	cr	l MII	r MII	l MIV	r MIV	bp?	M?	MIII?	MIV	A	B	C	
–	–	–	1	3	60	59	1	–	–	1	–	2	–	11	13	–	–	–	–	–	–	–	5	–	1	–	–	12
–	–	–	1	–	12	18	2	1	–	–	1	3	–	1	–	–	–	–	–	–	–	3	9	–	2	–	–	25
–	–	–	2	2	93	94	11	6	–	–	51	44	–	66	51	–	1	–	–	–	–	54	59	53	17	2	–	138
–	–	–	9	6	442	469	8	–	–	–	36	56	–	50	74	–	2	8	1	3	1	25	96	40	18	–	–	145
–	–	–	1	–	7	15	8	2	–	–	2	3	1	14	5	–	–	–	–	–	–	7	39	72	–	1	–	9
–	–	–	–	–	3	2	–	–	–	–	–	–	–	2	3	–	–	–	–	–	–	–	2	10	2	1	–	16
–	–	–	–	–	–	1	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	1	–	2	–	–	4
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	1	1	–	–	–	–	–
–	–	1	–	–	2	2	–	–	–	–	–	–	–	1	4	–	–	–	1	–	–	–	18	4	2	–	–	13
–	–	–	1	–	–	1	–	–	–	–	–	–	–	3	3	1	–	1	–	–	–	–	5	3	3	–	–	17
–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	3	–	1	–	–	1	–	1	6	5	4	1	–	17
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	–	–	–	–	7	11	3	–	–	10
–	1	–	–	–	–	1	–	–	–	–	–	–	–	1	2	–	1	1	–	–	–	–	3	2	1	–	–	10
–	–	–	1	–	–	–	–	–	–	–	–	–	–	6	3	–	1	2	1	1	3	–	9	3	4	1	1	29
–	–	–	–	–	–	1	–	–	–	–	–	–	–	2	1	–	1	–	–	–	–	2	7	4	7	1	–	8
–	–	–	8	4	6	21	3	3	2	–	–	–	–	25	48	1	5	4	1	1	1	23	115	77	63	13	6	152
–	–	–	–	–	1	–	–	–	–	–	–	–	–	3	2	1	1	–	–	–	–	–	5	4	6	–	–	7
–	–	–	12	11	3	2	1	–	–	1	–	–	–	32	28	5	3	1	–	–	–	1	28	27	28	4	–	44
–	–	1	1	–	4	4	–	2	–	–	–	–	–	23	38	1	–	–	–	–	1	–	52	48	29	–	6	79
–	–	1	–	1	–	–	–	1	–	–	–	–	–	7	4	–	–	1	1	1	–	–	7	12	6	–	–	7
–	–	–	8	13	1	4	–	5	–	1	–	–	–	16	19	2	2	1	1	–	–	–	44	22	41	4	3	72
–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	7
–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	6	–	1	–	–	–	–	1	2	8	6	–	–	11
–	1	–	–	–	–	–	–	–	–	–	–	–	–	5	11	2	2	2	3	2	1	–	27	14	19	–	3	24
–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	1	–	–	–	–
1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	3	3	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	2	–	8	–	1	–	–	2
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	2	–	–	–	–	1	–	1	–	–	2
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	2
–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	15	–	1	2	1	2	–	–	17	9	12	1	1	6
–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	6	–	4	4	1	2	2	–	7	6	–	–	–	7
–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	1	–	1	–	1	–	–	–	1	–	–	–	–	3
–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	6	–	4	2	2	2	2	–	8	8	5	–	–	2
–	–	–	–	–	–	–	–	–	–	–	–	–	–	27	24	3	–	6	3	1	2	–	49	15	7	6	–	20
1	2	12	45	40	634	694	34	20	2	3	90	108	1	329	375	16	31	38	17	16	15	118	645	463	290	35	20	900


1A
1B
2A
2B
3A
3B
4A
4B
4C
4D
4E
4F
5
11B
7A
7B
7C
8A
8B
6
8C
9
10A
10B
11A

Hinde without having studied the type material. Therefore I use *"L." "obliquus"* only as a tentative name. The possibility that some of the MII, MIV, basal plates, and carriers which I include here might belong to other species cannot be excluded.

"Lumbriconereites" spatiosus Hinde, 1882 (Fig. 28:10A–B).

Oenonites aspersus Hinde, 1879 (Fig. 28:4A–F). Hinde referred the MI of this species to *O. aspersus* and the MII to *Arabellites anglicus*. As both species names were published in the same paper either may be used and I provisionally use the name that was based on the MI. Lange (1947) noted that the MI of *O. aspersus* were similar to those of the specimens he named *Paulinites paranaensis*. Two clusters from Gotland were described by Martinsson (1960) as strikingly similar to the MI and MII of *P. paranaensis*. In my opinion the clusters described by Martinsson as *P. burgensis* are even more closely related to *O. aspersus* than to *P. paranaensis*. In fact, *P. burgensis* and *O. aspersus* may well be conspecific. So far I have not been able to distinguish the MII and carriers of *O. aspersus* from those belonging to *Oenonites?* sp. *a*, so I have therefore referred all these elements of *Oenonites* to *O.* sp. indet.

Oenonites? sp. *a* (Fig. 28:3A–B). The MI show a slight similarity to the illustrations of the MI of *Arabellites hamatus* Hinde (1879, Pl. 18:12; 1882, Pl. 2:42–44).

Paranereites sp. The MI of this species are somewhat similar to those figured by Eisenack (1939:168, Fig. 13) as *Paranereites*.

Ramphoprion sp. (Fig. 28:8A–C). The left MI (Fig. 28:8C) is similar to that of *Ramphoprion* sp. *b* of Kielan-Jaworowska (1966:11).

Eunicites serrula (Hinde, 1880) (Figs. 28:5–6). This name is used here for a group of jaws of which some are similar to those figured by Hinde (1880, Pl.

Fig. 28. All figures are SEM photographs of specimens from Vattenfallet. Specimen numbers preceded by LO refer to the collections of the Department of Historical Geology and Palaontology, University of Lund, and those by An to collections of the Section of Palaeozoology, Swedish Museum of Natural History, Stockholm. All specimens from the *"Pterygotus"* Beds (29.0–30.0 m) are from a Riksmuseum sample crowded with *Valdaria testudo*. 1. *Arabellites fastigiatus:* A, left MI, ×60, 29.6–30.0 m, An 2644; B, right MI, ×60, 29.6–30.0 m, An 2645. 2. *Arabellites contractus:* A, left MI, ×60, 29.6–30.0 m, An 2646; B, right MI, ×60, 29.6–30.0 m, An 2647. 3. *Oenonites?* sp. *a*: A, left MI, ×37, 29.6–30.0 m, An 2648; B, right MI, ×45, 29.6–30.0 m, An 2649. 4. *Oenonites aspersus:* A, left MI, ×45, Sample G70–10 L.J. (13.33 m), LO 5082; B, right MI, X30, 29.6–30.0 m, An 2650; C, left MI, ×45, 29.6–30.0 m, An 2651; D, right MI, ×45, 29.6–30.0 m, An 2652; E, left MI, ×45, 29.6–30.0 m, An 2653; F, right MI, ×45, 29.6–30.0 m, An 2654. 5. *Eunicites serrula,* M?, ×30, Sample G70–20 L.J. (10.02–10.04) m, LO 5083. 6. *Eunicites serrula:* M?, ×30. Sample G70–20 L.J. (10.02–10.04 m), LO 5084. 7. *"Lumbriconereites" "obliquus":* A, left MI, ×40, 29.6–30.0 m, An 2655; B, right MI, ×50, 29.6–30.0 m, An 2656; C, left MI, ×150, Sample G70–20 L.J. (10.02–10.04 m), LO 5085. 8. *Ramphoprion* sp.: A, left MI, ×55, Sample G70–20 L.J. (10.02–10.04 m). LO 5086; B, right MI, ×75, Sample G70–20 L.J. (10.02–10.04 m), LO 5087; C, left MI, ×90, Sample G70–20 L.J. (10.02–10.04 m) LO5088. 9. *Kozlowskiprion?* sp., left MI, ×60, Sample G70–20 L.J. (10.02–10.04 m), LO 5089. 10. *"Lumbriconereites" spatiosus:* A, left MI, ×45, 29.6–30.0 m, An 2657; B, right MI, ×45, 29.6–30.0 m, An 2658. 11. Gen. et sp. indet. *a:* A, left MI, ×60, Sample G70–8 L.J. (13.33 m), LO 5090; B, right MI, ×15, 29.6–30.0 m, An 2659.

14:18–20; 1882, Pl. 1:11,12). Some of the jaws designated as MIV without any generic and specific name might also belong to *E. serrula*.

Eunicites sp. *a*. The jaws resemble those figured by Kielan-Jaworowska (1966:62) as *Pristioprion* sp. *b*.

Xanioprion sp. One basal plate is similar to the specimen figured by Szaniawski (1970, Pl. 4:2) as *X. borealis* Kielan-Jaworowska, 1962.

Gen. et sp. indet. *a* (Fig. 28:11A–B). Only the MI are as yet identified. They are somewhat similar to "*L.*" "*obliquus*" but differ in having a more prominent fang which forms a hook.

Gen. et sp. indet. *b*. Only two MI were found.

Gen. et sp. indet. *c*. The one jaw element found is somewhat comparable with that discussed and figured by Kielan-Jaworowska (1966:117, Pl. 15:1c–d) as *Kalloprion* sp. *a*.

Gen. et sp. indet. *d*. Three jaw elements (MI?) resemble the one figured by Stauffer (1933:1200) as *Paleonereites*.

Basal plates? sp. *a*. Under this designation I include elements that are presumably basal plates of one species, probably one of those listed above.

MIII?. Jaw elements that might be MIII from several species.

MIV. Most of these jaw elements probably belong to *Eunicites serrula*.

M?, Gen. et sp. indet. Specimens that have neither been identified taxonomically nor assigned to a type of element. The elements are of the same type and they all belong to the same species.

Mandibles. Three different types have been found. *A*, similar to those figured by Eisenack (1939:169) as *Palaeosigma*. *B*, similar to those figured by Stauffer (1933:1205) as *Northrites*. *C*, resembling *Northrites* but more slender.

Anterior and lateral teeth. A general "wastebasket" group in which different indeterminate anterior and lateral elements have been placed.

Eight clusters were found in the material from the section, of which seven, with two or four elements fused, are from Högklint *b*. Five of the clusters are identified as *O. aspersus* and the others as *A. fastigiatus* and "*L. obliquus*", respectively. A single cluster found on a bedding plane in the "*Pterygotus*" Beds by Lindström is referred to "*L.*" "*obliquus*". The nine elements in this cluster are not fused.

Discussion

The abundance of polychaete jaws in the Upper Visby Marl and Högklint *a* is relatively low, between 10 to 100 MI/kg (Fig. 27:A), and this low abundance is coupled with a fairly low taxonomic diversity (Fig. 26). There is a pronounced increase in abundance in Högklint *b*, where it varies from 125 to 968 MI/kg (Fig. 27:A). This high figure might not be a reflection only of the shallower

water depths, since variation in abundance can also depend on differences in the rate of sedimentation. Högklint *c* shows a high variation in abundance, from 6 to 540 MI/kg. The taxonomic diversity is somewhat lower than in Högklint *b*. Högklint *d* (*"Pterygotus"* Beds) shows a variation in abundance from 140 to 1200 MI/kg.

The relative frequencies of various species is shown in Fig. 27D. Data on *Eunicites serrula* may be incomplete because its jaw apparatus may include elements additional to MI, making a comparison between this and the other species somewhat tenuous. In order to distinguish the *E. serrula* curve easily from those of the other species, it has been drawn reversed. *"Lumbriconereites" "obliquus"* and *Eunicites serrula* are the most abundant taxa in the section (Fig. 27A), forming together 40 to 80 per cent of the total counts. It is interesting to note that the curves of these two species show a conspicuous correlation in that they change almost simultaneously and with about the same magnitude. This might indicate that the variation in absolute frequency reflects variations in the rate of deposition. The relative frequency curve of *"L." "obliquus"* is roughly reversed in comparison with that of *Oenonites aspersus* (Fig. 27D). The relative frequency of *Arabellites contractus* (Fig. 27B) is lower in the Högklint Beds than in the Upper Visby Marl and it thus appears that this species is relatively more common in deep water deposits than those of shallower water environments.

It is not always appreciated that the polychaetes represented by the jaw elements were large animals. In some modern nereid species the body of a complete individual is 20 to 50 times longer than its MI (Forney 1974). At Vattenfallet the largest MI element found belongs to *"Lumbriconereites" "obliquus"* and is about 9 mm long. The complete animal may have had a body length of up to half a metre.

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