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SIZE AND DISTRIBUTION STATISTICS, WENLOCK BRACHIOPODS FROM CANBERRA, AUSTRALIA

by

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ABSTRACT

The Wenlockian Walker Volcanics brachiopod fauna is listed systematically, and statistical data are presented on: 1. Community structure - distribution of specimens by locality and species, and occurrence of dominant species; 2. Size and shape - including a diagrammatic key to parameters measured, using photographs of specimens, for each species.

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Introduction

Little has yet been described of the fairly extensive shelly fauna in the Silurian rocks of the Canberra district, partly because preservation is generally poor and stratigraphic control imprecise. However, in a small area either side of the Molonglo River below Coppin's Crossing, west of the city, there are outcrops of a lenticular mudstone-limestone sequence within the dacitic Walker Volcanics. The mudstone has yielded a well-preserved fauna dominated by trilobites and brachiopods. The trilobites have been described by Chatterton & Campbell (1980) and Strusz (1980), and the brachiopods by Strusz (1982). A discussion of the stratigraphic position of the fauna may be found in the last paper, so will not be repeated here; but it has been deduced that the fauna is of Wenlock age, probably Late Wenlock (Homerian). This report presents statistical information supplementing Strusz (1982).

Systematic list, Walker Volcanics brachiopod fauna.

Class INARTICULATA

Superfamily Lingulacea

Family Lingulidae ..... gen. et sp. indet.

Family Craniopsidae ..... *Craniops?* sp. indet.

Superfamily Trimerellacea

Family Trimerellidae..... *Trimerella* sp. indet.

Class ARTICULATA

Superfamily Orthacea

Family Scenidiidae ..... *Skenidioides thrinax* Strusz 1982

Superfamily Enteletacea

Family Schizophoriidae ..... *Salopina mediocostata* Strusz 1982

Superfamily Plectambonitacea

Family Leptellinidae ..... *Leangella*? sp. indet.

Family Sowerbyellidae ..... *Aegiria (Epelidoaegiria) chilidifera* Strusz 1982

Superfamily Strophomenacea

Family Strophomenidae ..... *Katastrophomena* sp. indet.

Pentlandina sp. cf *loveni* (de Verneuil 1848)

Leptaena sp. indet.

Superfamily Stropheodontacea

Family Stropheodontidae ..... *Brachyprion* (*s.l.*) sp. indet.

Superfamily Davidsoniacea

Family Chilidiopsidae ..... *Morinorhynchus oepiki* Strusz 1982

Superfamily Chonetacea

Family Chonetidae ..... Protochonetes sp. cf. minimus (Sowerby 1839)

Protochonetes? sp. indet.

Superfamily Pentameracea

Family Pentameridae..... gen. et sp. indet.

Superfamily Atrypacea

Family Lissatrypidae ..... Australina (Australina) kausi Strusz 1982

Dubaria? sp. indet.

Atrypoidea sp. indet.

ATRYPIDINA, Superfamily incertae sedis

Family Anoplotheciidae ..... Coelospira cavata Strusz 1982

Superfamily Athyridacea

Family Nucleospiridae ..... Nucleospira sp. indet.

Superfamily Spiriferacea

Family Cyrtiidae ..... Endospirifer anxius Strusz 1982

Family Delthyridae ..... Howellella sp. aff. elegans (Muir-Wood 1925)

Family Reticulariidae ..... Reticulariopsis silurica Strusz 1982

Vadum coppinsense Strusz 1982

Community structure (Table 1, 2)

The fossils described in the above-mentioned papers were collected from four localities in a rather silty mudstone, probably volcanogenic, which appears to have been deposited rapidly, under relatively chaotic conditions, perhaps as a slump or mudflow. Although impossible to prove, it seems likely from the uniformity of the matrix that only one faunal community is represented. On the other hand, the composition of the fauna itself (by comparison with the data presented in Boucot, 1975) would suggest the mixing of two adjacent communities. Until a lot more data on community structure in the Silurian of Australia are available, this dilemma cannot be resolved.

Locality 178 is small and has yielded few fossils, and therefore cannot make a reliable contribution to data on community structure. From the remaining three localities, of nearly 2500 specimens (mostly dissociated valves), about 280 could not be specifically identified, most of them being spiriferaceans. Locality 101 provided the bulk of the material (75%).

Table 1 gives the distribution of specimens by locality and species, indicating the proportion of whole shells and separated ventral and dorsal valves. It can be seen that, overall, seven species dominate the fauna, although there are significant differences between localities (perhaps affected by the disparate sample sizes). The occurrence of those dominant species is shown in Table 2.

Size and shape data (Tables 3 to 13)

In Tables 3 to 13 are presented statistics for the size and shape of those species represented by sufficient numbers of specimens. All measurements, in millimetres, were made under a microscope with a dial micrometer. A distinction is made between actual measurements of complete specimens, calculated widths for somewhat incomplete specimens (on the assumption of bilateral symmetry), and estimated dimensions (on the assumption of approximation by a less complete specimen to the normal shape observed for that species). Actual measurements are given for selected specimens. A diagrammatic key to the parameters measured, using photographs of specimens, accompanies each table.

References

BOUCOT, A.J., 1975 - Evolution and extinction rate controls. Elsevier, Amsterdam, xv + 427 pp., 3pl.

CHATTERTON, B.D.E., & CAMPBELL, K.S.W., 1980 - Silurian trilobites from near Canberra and some related forms from the Yass Basin. Palaeontographica, Abteilung A., 167, 77-119, pls 1-16.

STRUSZ, D.L., 1980 - The Encrinuridae and related trilobite families, with a description of Silurian species from southeastern Australia. Palaeontographica, Abteilung A, 168, 1-68, pls 1-6.

STRUSZ, D.L., 1982 - Wenlock brachiopods from Canberra, Australia. Alcheringa, 6 (2), 105-42.

locality number:	101				177				178		285			
	shells	VV	DV	?	shells	VV	DV	?	VV	DV	shells	VV	DV	?
inarticulates				6				3						
Skenidioides		12	13	2		18	22	3					2	
Salopina	29	159	84	19		22	23	9				4	1	
Leangella?					1									
Aegiria	7	83	102	8	2	41	39	2				3	3	
Katastrophomena							1							
Pentlandina						3	3	2						
Leptaena			2			2						1		
Brachyprion						6	2							
Morinorhynchus		4	1			3	4	1						
Protochonetes	1	20	7	3		11		5				1		1
pentamerid						1								
Australina	74	64	61	5	13	10	7	3						
Dubaria?			1											
Atrypoidea	1	17	6	3										
Coelospira	21	92	36	12	3	58	15	7						
Nucleospira							1							
Endospirifer	7	162	85	7						2		52	23	
Howellella		1	1			9	7	2						
Reticulariopsis	1	28	12									5	3	
Vadum	31	220	116	3	1	29	12				2	11	9	
indeterminable:														
spiriferoids				166				43						22
strophomenoids				4										
other				34				8						1
total				204				51						23
column totals:	172	862	527	272	20	213	136	88		2	2	77	41	24
locality totals:	1833				457				2		144			
total number of specimens from all four localities: 2436														
% of total at each locality:	75.2				18.8				0.08		5.9			

Table I. Distribution and abundance of the described taxa.
Abbreviations: VV = ventral valves, DV = dorsal valves, ? = valve uncertain

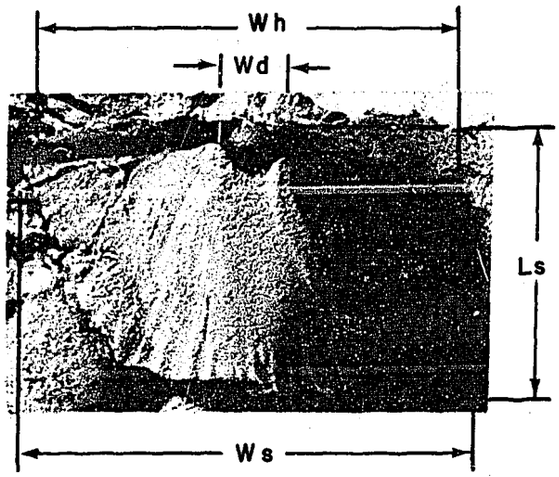
localities:	101	177	285	combined
Vadum coppinsense	20.2	9.2	15.3	17.8
Salopina mediocostata	15.9	11.8	3.5	14.4
Endospirifer anxius	14.2		52.1	13.8
Aegiria (E.) chilidifera	10.9	18.4	4.2	11.9
Coelospira cavata	8.8	18.2		10.0
Australina kausi	11.1	7.2		9.7
Skenidioides thrinax	1.5	9.4	1.4	3.0
total	82.6	74.2	76.5	80.6

Table 2. Percentage abundance at localities 101, 177 and 285 of the seven dominant species (separate valves counted as individuals), arranged in decreasing order of total abundance.

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20912*	20245	20906	20240	20900
Ls	2.40 ± 0.57	13	0.939	1.00 - 4.54				2.72	2.04
Ws	4.35 ± 0.34	38	1.044	(2.5) - (6.8)	4.12	4.50	3.05	5.53	4.37
Wh	4.27 ± 0.34	39	1.060	(2.5) - *6.82*	4.05	4.50	2.70	5.53	4.27
Ld	2.23 ± 0.24	24	0.533	1.40 - (3.3)	2.50	1.84	1.65		
Ls/Ws	0.52 ± 0.07	13	0.116	0.40 - 0.83				0.49	0.47
Wd/Wh	0.22 ± 0.02	9	0.029	0.18 - 0.27				0.18	0.25
Lc/Ld	0.37 ± 0.04	22	0.080	0.24 - 0.67	0.24	0.39	0.40		
Lds/Ld	0.80 ± 0.02	21	0.054	0.71 - 0.92	0.71	0.79	0.76		

*holotype; measurements in italics calculated from half-widths; measurements in brackets estimated.

CPC 20240
loc. 101
x 10
ventral internal mould



CPC 20245
loc. 101
x 10
dorsal internal mould

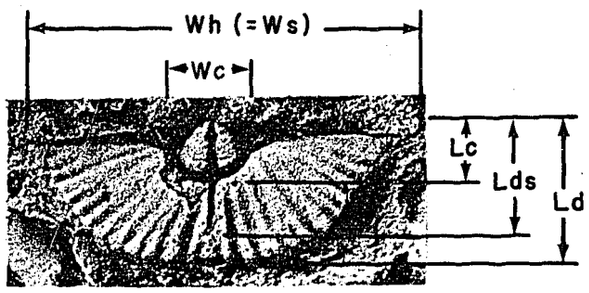
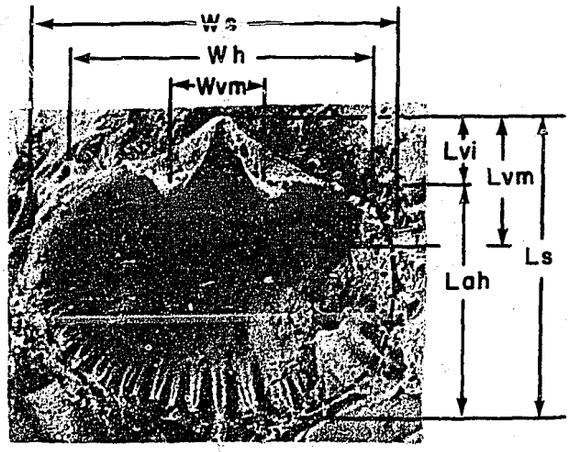


Table 3. *Skenidioides thrinax* Strusz, 1982

	statistics				CPC specimens					
	$\mu \pm t\sigma$	N	S	obs. range	20337*	20297	20314	20299	20328	20939
Ls	3.38 ± 0.21	47	0.699	1.42 - 4.66	4.11	3.70	3.93			
Ws	4.05 ± 0.17	94	0.834	1.75 - *5.86*	4.68	*5.16*	4.96	4.07	4.64	5.19
Wh	3.35 ± 0.15	91	0.719	1.35 - 4.80	3.45	*4.52*	4.08	3.22	4.18	3.63
Ld	2.79 ± 0.16	46	0.523	1.58 - 4.00	3.58			2.90	3.33	4.00
Ls/Ws	0.80 ± 0.02	47	0.068	0.69 - 0.95	0.88	0.72	0.79			
Lah/Ls	0.83 ± 0.02	20	0.053	0.71 - 0.96	0.79	0.81	0.81			
Wh/Ws	0.83 ± 0.01	91	0.061	0.69 - 0.96	0.74	0.88	0.82	0.79	0.90	0.70
Lvi/Wh	0.18 ± 0.02	39	0.048	0.05 - 0.30	0.18	0.18	0.20			
Lvm/Ls	0.40 ± 0.02	25	0.049	0.27 - 0.48		0.42	0.43			
Wvm/Ws	0.26 ± 0.02	26	0.037	0.20 - 0.37		0.20	0.23			
Ldm/Ld	0.64 ± 0.02	32	0.049	0.53 - 0.73				0.60	0.63	0.70
Wdm/Ws	0.29 ± 0.01	33	0.031	0.24 - 0.37				0.27	0.28	0.27

*holotype; measurements in italics calculated from half-widths.

CPC 20297
loc. 101
x 10
ventral interior
(latex)



CPC 20939
loc. 177
x 10
dorsal interior
(latex)

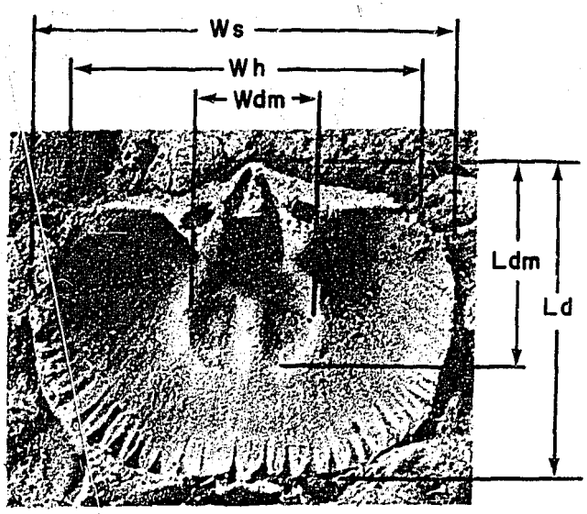
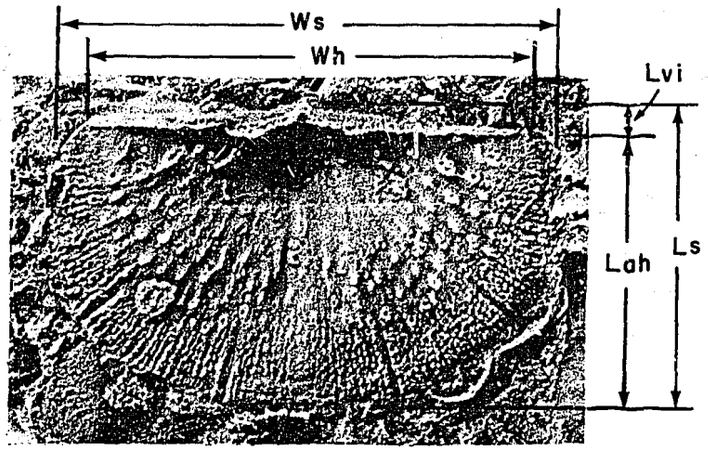


Table 4. *Salopina mediocostata* Strusz, 1982

	statistics				CPC specimens					
	$\mu \pm t\sigma$	N	S	obs. range	20387*	20345	20359	20395	20353	20412
Ls	3.71 ± 0.39	39	1.205	1.3 - 5.9	5.0	4.5	4.6			
Ws	5.83 ± 0.46	79	2.075	1.1 - 9.7	7.9	7.5	6.6	7.7	8.1	8.0
Wh	5.48 ± 0.47	70	1.960	1.1 - 8.7	*7.5*	7.4	6.5	*6.6*	(7.5)	7.9
Ld	3.36 ± 0.60	22	1.351	0.9 - 5.3				5.3		4.8
Ls/Ws	0.61 ± 0.10	38	0.313	0.53 - 0.83	0.63	0.60	0.70			
Lah/Ls	0.92 ± 0.01	36	0.027	0.84 - 0.96	0.92	0.91	0.87			
Wh/Ws	0.96 ± 0.01	69	0.032	0.86 - 1.00	0.95	0.99	0.98	0.86		0.99
Lvi/Wh	0.09 ± 0.01	11	0.012	0.07 - 0.11	0.11	0.08	0.11			
Ldi/Wh	0.07 ± 0.01	16	0.023	0.03 - 0.14	0.08			0.06		
Wb/Wh	0.38 ± 0.02	7	0.021	0.34 - 0.41					0.36	0.39
Wb/Lb	1.50 ± 0.08	11	0.112	1.30 - 1.69					1.35	1.55
Lds^1/Lah	0.19 ± 0.02	11	0.030	0.14 - 0.25					0.17	0.17
Lds^2/Lah	0.47 ± 0.02	11	0.032	0.43 - 0.53					0.46	0.43

*holotype; measurements in italics calculated from half-widths, measurements in brackets estimated.

CPC 20396
loc.101
x 8
ventral interior
(latex)



CPC 20384
loc. 101
x 8
dorsal interior
(latex)

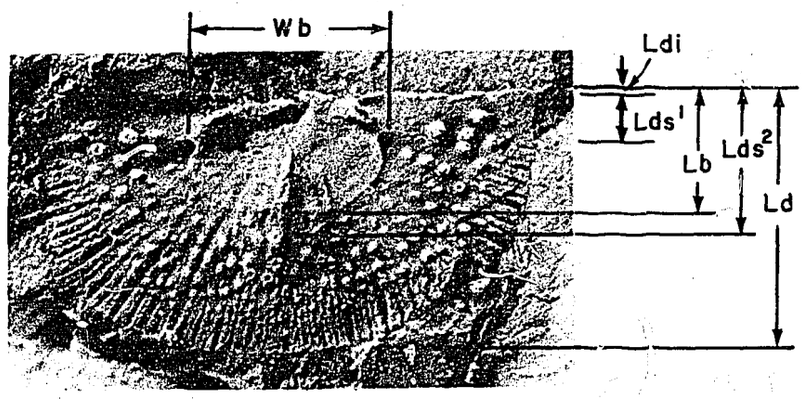
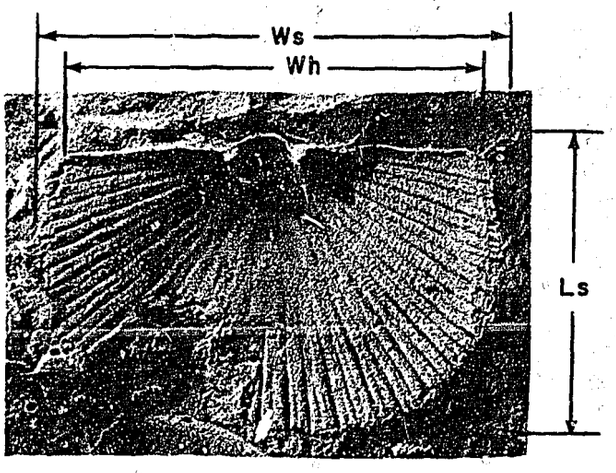


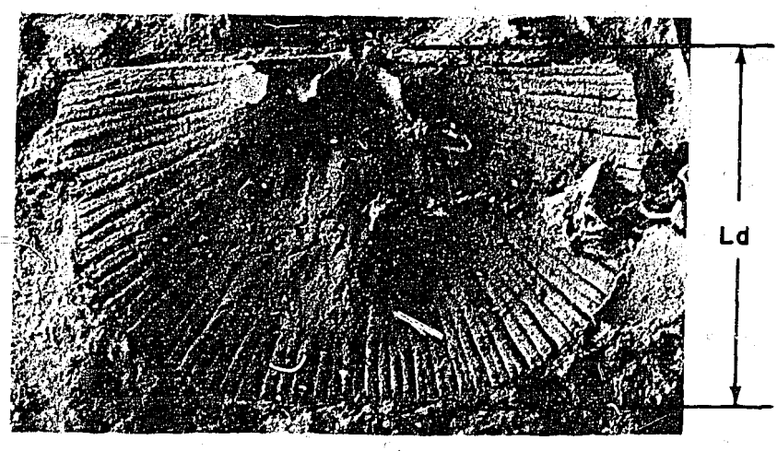
Table 5. *Aegiria (Epelidoaegiria) chilidifera* Strusz, 1982

CPC:	20419	20987*	20988	20992	20994
Ls					6.1
Ws	*11.3*	11.8	*11.0*	(11.5)	9.4
Wh		11.3	(10.0)	(10.0)	8.5
Ld	8.4	7.1	7.6	7.4	
Ls/Ws					0.65
Ld/Ws	0.74	0.60	0.69	0.64	
Wh/Ws		0.96	0.91	0.87	0.90

*holotype; measurements in italics calculated from half-widths, measurements in brackets estimated.



CPC 20994
loc. 177
x 6
ventral interior
(latex)

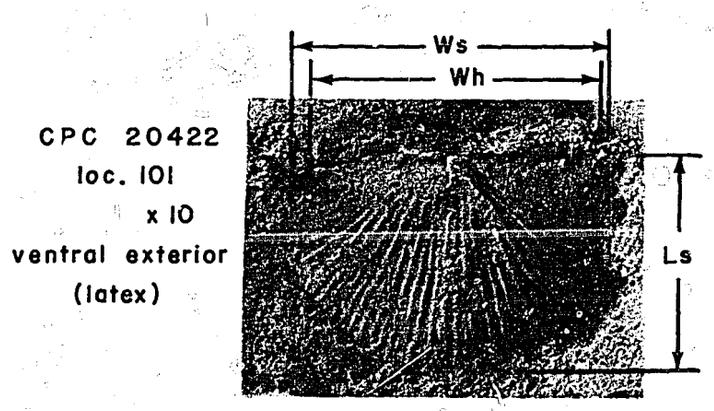


CPC 20987
holotype
loc. 177
x 6
dorsal interior
(latex)

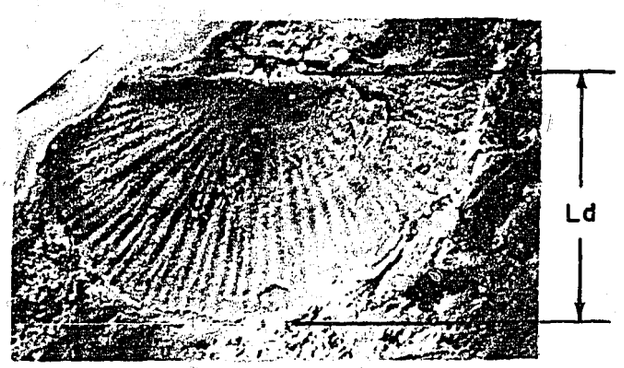
Table 6. *Morinorhynchus oepiki* Strusz, 1982

	statistics				CPC specimens		
	$\mu \pm t\sigma$	N	S	obs. range	20422	20427	20431
Ls	2.74 ± 0.39	7	0.424	2.4 - 3.7	2.9		3.7
Ws	4.04 ± 0.39	11	0.585	*3.0 - 5.0*	4.0	3.9	4.9
Wh	3.98 ± 0.39	11	0.585	*3.0 - 5.0*	3.8	3.9	4.6
Ld	2.53 ± 0.82	3	0.330	2.1 - 2.9		2.6	
Ls/Ws	0.66 ± 0.06	7	0.061	0.58 - 0.76	0.73		0.76
Wh/Ws	0.97 ± 0.02	11	0.029	0.92 - 1.00	0.95	1.00	0.94

measurements in italics calculated from half-widths.



CPC 20422
loc. 101
x 10
ventral exterior
(latex)

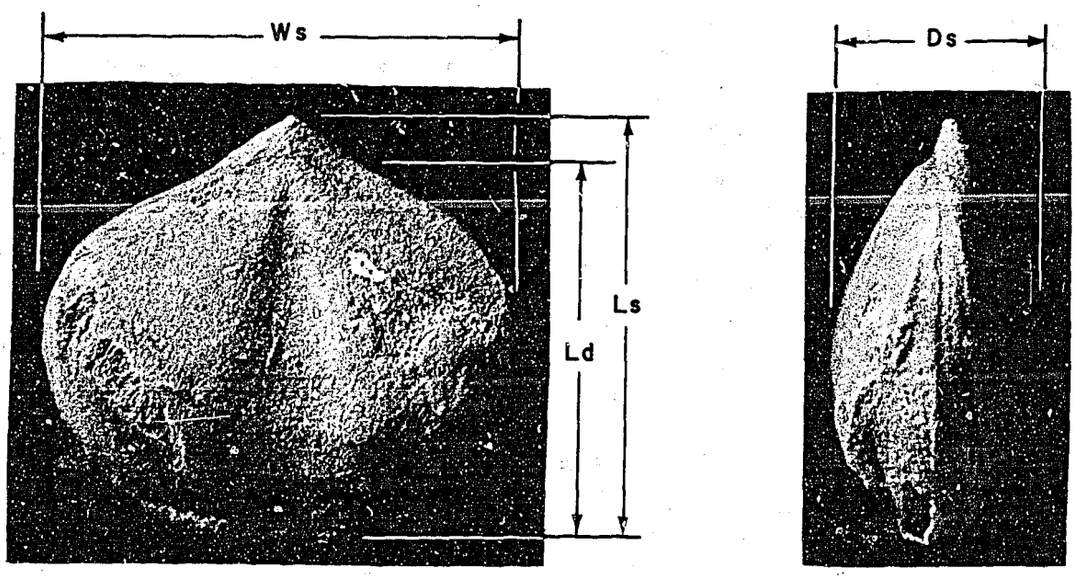


CPC 20429
loc. 101
x 10
shell in
dorsal aspect
(latex)

Table 7. *Protochonetes* sp. cf. *minimus* (Sowerby)

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20518*	20438	20519	20520	20521
Ls	5.17 ± 0.15	67	0.595	2.9 - 6.2	5.4	4.9	6.2	5.2	5.9
Ws	5.98 ± 0.16	104	0.[illegible]	3.2 - *8.1*	5.9	6.0	7.5	5.9	7.3
Ld	4.76 ± 0.13	67	0.532	3.7 -6.0	4.9	4.4	5.9	4.6	5.4
Ds	2.29 ± 0.40	15	0.732	0.9 - 4.2	2.6		2.9	2.9	4.2
Ls/Ws	0.86 ± 0.20	67	0.080	0.67 - 1.06	0.92	0.82	0.83	0.88	0.81
Ds/Ws	0.37 ± 0.07	15	0.122	0.18 - 0.60	0.44		0.39	0.49	0.58
Ld/Ls	0.91 ± 0.01	31	0.023	0.85 - 0.95	0.91	0.90	0.95	0.88	0.92

*holotype; measurements in italics calculated from half-widths.



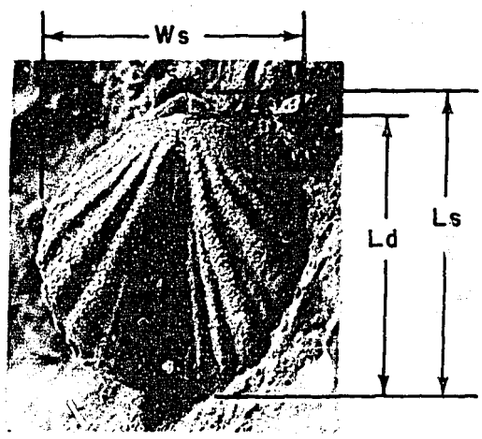
CPC 20518 holotype, loc. 101,
ca x 10

dorsal aspect lateral aspect

Table 8. *Australina (Australina) kausi* Strusz, 1982

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20601*	20606	20624	20637	21028
Ls	2.60 ± 0.11	78	0.480	1.5 - 4.0	4.0	2.4	3.2	2.6	2.3
Ws	2.59 ± 0.11	105	0.569	1.6 - 4.3	*4.3*	2.2	2.8	2.6	*2.5*
Ld	2.30 ± 0.15	36	0.435	1.6 - 3.1			2.9	2.3	2.1
Ls/Ws	1.00 ± 0.12	78	0.103	0.79 - 1.35	0.93	1.09	1.14	1.00	0.92
Ld/Ls	0.89 ± 0.02	9	0.030	0.84 - 0.93			0.97	0.88	0.91

*holotype; measurements in italics calculated from half-widths.

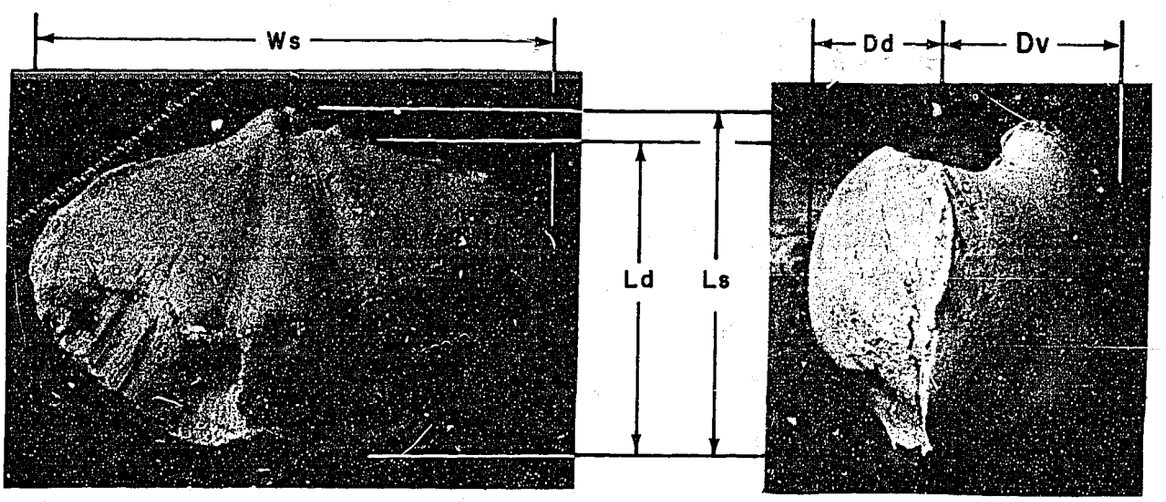


CPC 20624
loc. 101
ca x 12
dorsal aspect
(latex)

Table 9. *Coelospira cavata* Strusz, 1982

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20706*	20642	20644	20691	20700
Ls	8.54 ± 0.49	51	1.744	2.4 - 11.9	(8.2)	9.9	10.9		(5.8)
Ws	10.87 ± 0.53	91	2.542	3.4 - 15.6	12.2	9.9	13.2	13.2	9.0
Ld	6.22 ± 0.54	40	1.695	2.3 - 8.7	7.8			8.2	
Ls/Ws	0.75 ± 0.03	47	0.103	0.56 - 1.00	0.67	1.00	0.83		0.64
Ld/Ls	0.88 ± 0.15	3	0.060	0.81 - 0.95	0.95				
Dv/Ws	0.37 ± 0.03	10	0.046	0.30 - 0.47	0.36	0.39			
Dd/Ws	0.21 ± 0.09	3	0.034	0.18 - 0.25	0.25				

*holotype; measurements in brackets are estimated values.



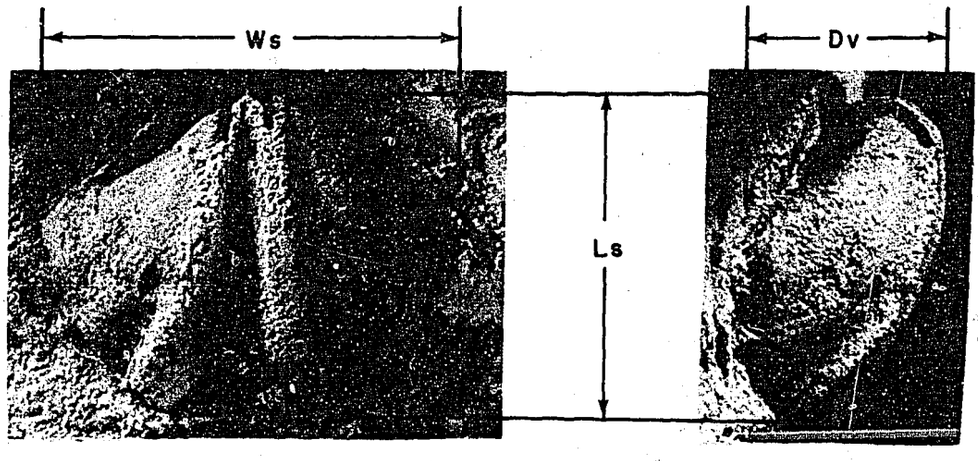
CPC 20706, holotype, loc. 101
steinken, x 5

dorsal aspect lateral aspect

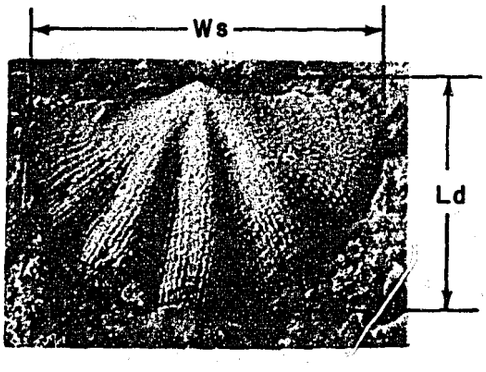
Table 10. *Endospirifer anxius* Strusz, 1982

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20724	21040	21048	21046	21050
Ls	3.65 ± 0.20	6	0.189	2.7 - 3.8	3.5	3.7	3.8		
Ws	5.46 ± 1.08	11	1.610	3.1 - *9.3*	*5.3*	*6.3*	5.3	3.9	*9.3*
Ld	3.04 ± 1.33	5	1.069	2.1 - 5.1				2.5	5.1
Ls/Ws	0.63 ± 0.06	6	0.060	0.57 - 0.72	0.66	0.59	0.72		
Ld/Ws	0.58 ± 0.08	5	0.064	0.51 - 0.68				0.64	0.55
Dv/Ls	0.62 ± 0.21	3	0.083	0.55 - 0.74			0.74		

measurements in italics calculated from half-widths



CPC 21048, loc. 177, x 10
internal mould, ventral and lateral aspects



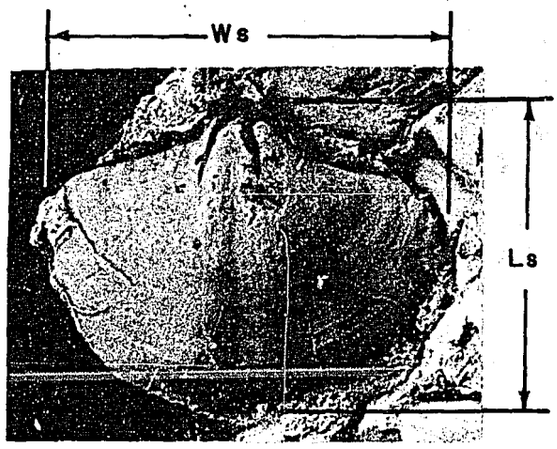
CPC 21046, loc. 177, x 12
dorsal exterior (latex)

Table II. *Howellella* sp. aff. *elegans* (Muir-Wood)

	statistics				CPC specimens				
	$\mu \pm t\sigma$	N	S	obs. range	20735*	20745	20731	20736	21100
Ls	6.63 ± 0.78	12	1.229	4.7 - 8.6	4.7	6.4			
Ws	8.30 ± 0.83	24	1.954	4.6 - *12.2*	*7.0*	*8.9*	4.6	*12.0*	7.2
Ld	4.78 ± 0.79	11	1.168	3.1 - 7.2			3.1	7.2	5.6
Ls/Ws	0.73 ± 0.05	12	0.084	0.48 - 0.82	0.67	0.72			

*holotype; measurements in italics calculated from half-widths.

CPC 20745
loc. 101
x6
ventral internal mould



CPC 20737
loc. 101
x6
dorsal internal mould

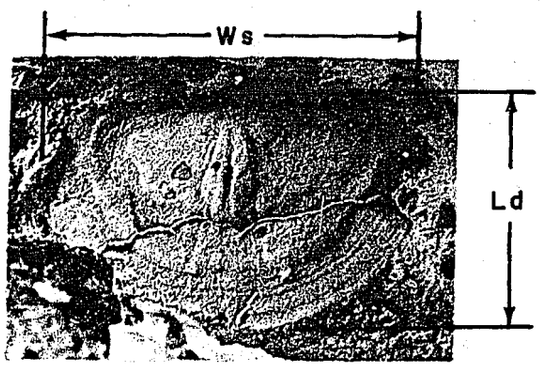
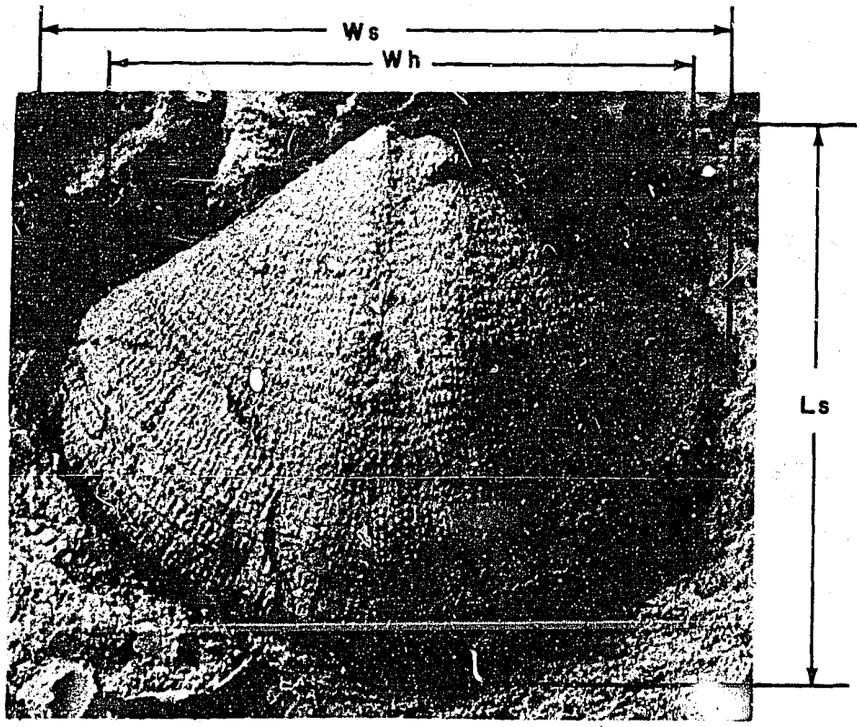


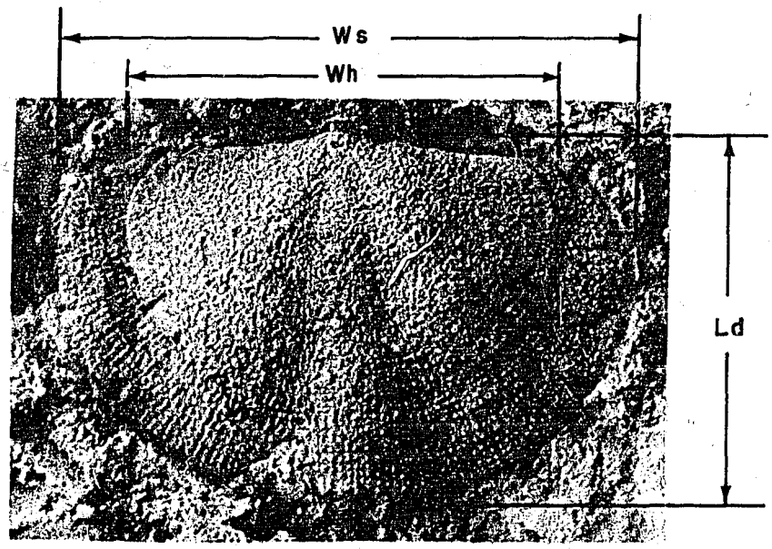
Table 12. *Reticulariopsis silurica* Strusz, 1982

	statistics				CPC specimens					
	$\mu \pm t\sigma$	N	S	obs. range	20765*	20767	20838	20761	20829	20858
Ls	3.11 ± 0.17	84	0.788	1.5 - 4.9				3.2	2.2	(2.9)
Ws	4.54 ± 0.17	159	1.091	2.0 - 8.6	3.8	5.1	5.2	4.7	*3.9*	4.4
Wh	3.98 ± 0.38	26	0.931	1.7 - 5.5	*3.1*	4.1	*4.1*	3.7	2.8	3.1
Ld	2.86 ± 0.13	81	0.386	1.4 - 4.1	2.4	3.2	3.8			2.4
Ls/Ws	0.68 ± 0.02	84	0.079	0.45 - 0.89				0.68	0.56	0.66
Wh/Ws	0.82 ± 0.03	26	0.061	0.71 - 0.93	0.82	0.80	0.79	0.79	0.72	0.70

*holotype; measurements in italics calculated from half-widths; figures in brackets estimated.



CPC 20762
loc. 101
ca x 10
ventral exterior
(latex)



CPC 20767
loc. 101
ca x 10
dorsal exterior
(latex)

Table 13. *Vadum coppinsense* Strusz, 1982