

**A REVISION OF THE OVULIFEROUS
FRUCTIFICATIONS OF GLOSSOPTERIDS
FROM THE PERMIAN OF SOUTH AFRICA**

VOLUME II

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LIST OF TABLES

APPENDIX I

Table A.I.1. Catalogue numbers and localities for *Rigbya*.

Table A.I.2. Catalogue numbers and localities for *incertae sedis*

Table A.I.3. Catalogue numbers and localities for *Arberia*.

Table A.I.4. Catalogue numbers and localities for *Vereenia*.

Table A.I.5. Catalogue numbers and localities for *Bifaria*.

Table A.I.6. Catalogue numbers and localities for *Estcourtia*.

Table A.I.7. Catalogue numbers and localities for *Elatra*.

Table A.I.8. Catalogue numbers and localities for *Ottokaria*.

Table A.I.9. Catalogue numbers and localities for *Scutum*.

Table A.I.10. Catalogue numbers and localities for *Gladiopomum*.

Table A.I.11. Catalogue numbers and localities for *Plumsteadia*.

Table A.I.12. Catalogue numbers and localities for *Gonophylloides*.

Table A.I.13. Catalogue numbers and localities for *Dictyopteridium*.

Table A.I.14. Catalogue numbers and localities for *Lidgettonia*.

APPENDIX II

Table A.II.1. Quantitative data collected for *Rigbya arberioides* & *incertae sedis*.

Table A.II.2. Quantitative data collected for *Arberia* spp. & *Vereenia leeuquiliensis*.

Table A.II.3. Quantitative data collected for *Bifaria*, *Estcourtia* & *Elatra*.

Table A.II.4. Quantitative data collected for *Ottokaria* spp.

Table A.II.5. Quantitative data collected for *Scutum leslii*.

Table A.II.6. Quantitative data collected for *Gladiopomum* spp.

Table A.II.7. Quantitative data collected for *Plumsteadia* spp.

Table A.II.8. Quantitative data collected for *Gonophylloides* spp.

Table A.II.9. Quantitative data collected for *Dictyopteridium* spp.

Table A.II.10. Quantitative data collected or referenced for *Lidgettonia* spp.

PLATES

Table P.1. Alphabetical list of glossopterid ovulate fructifications with chapter and plate references.

APPENDIX I

CATALOGUE NUMBERS AND LOCALITIES OF ORIGIN OF ALL SPECIMENS REFERRED TO IN THIS INVESTIGATION

RIGBYACEAE

Table A.I.1. Catalogue numbers and localities for *Rigbya*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>R. arberioides</i>	BP/2/11847a BP/2/13047 BP/2/1644a BP/2/8173 BP/2/8174 BP/2/8178a&b BP/2/8179 BP/2/8180 BP/2/8181a&b BP/2/8182 BP/2/8183 BP/2/8184 BP/2/8185a&b BP/2/8187a&b BP/2/8188 BP/2/8191 BP/2/8193 BP/2/8196 BP/2/8205 BP/2/8207 NM/1641a NM/1642a&b NM/1647a NM/1648 NM/1649 NM/1650 NM/1651 NM/1653 NM/1656 NM/1658 NM/1660 NM/1666 NM/1669a spn1 NM/1670a	Mooi River	20 14	BPI NM
	BP/2/11386c BP/2/11727 BP/2/11844a&b BP/2/11845a&b BP/2/11846 BP/2/11847b BP/2/11848a	Bulwer	7	BPI

Table A.I.2. Catalogue numbers and localities for *incertae sedis*

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>incertae sedis</i> (previously known as <i>Arberia allweyensis</i> ; Anderson & Anderson, 1985)	PRE/F/8380a&b	Lawley	1	PRE

ARBERIACEAE

Table A.I.3. Catalogue numbers and localities for *Arberia*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>A. hlobanensis</i>	BP/2/15893 BP/2/15914(cp)	Hlobane	1	BPI
<i>A. madagascarensis</i>	GSP/H/102	Hammanskraal	1	GSP
<i>A. allweyensis</i>		Lawley	1	PRE

Table A.I.4. Catalogue numbers and localities for *Vereenia*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>V. leeukuilensis</i>	BP/2/14282 BP/2/14283 BP/2/14284 BP/2/14285 BP/2/14286a BP/2/14287a	Vereeniging	6	BPI

DICTYOPTERIDIACEAE

Table A.I.5. Catalogue numbers and localities for *Bifariala*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>B. intermittens</i>	BP/2/13692b BP/2/13939 BP/2/13963 BP/2/13964 BP/2/13966b BP/2/13967a&b BP/2/13979 BP/2/13980 BP/2/13982 BP/2/13987 BP/2/13989 BP/2/13993 BP/2/13994 BP/2/13998 BP/2/14001 BP/2/14002 BP/2/14003 BP/2/14004 BP/2/14008 BP/2/14010 BP/2/14011 BP/2/14012a BP/2/14014 BP/2/14015 BP/2/14018 BP/2/14019 BP/2/14026a&b BP/2/14031 BP/2/14034 BP/2/14049 VM/03/3205/59 VM/03/3205/60 VM/03/3205/61 VM/03/3205/62 VM/03/3205/63 VM/03/3205/64 VM/03/3205/65 VM/03/3205/67 VM/03/3205/68 VM/03/3205/69 VM/03/3205/70	Vereeniging	30 11	BPI VM

Table A.I.6. Catalogue numbers and localities for *Estcourtia*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>E. conspicua</i>	BP/2/8137a BP/2/8172a&b NM/1276a&b	Mooi River	3	BPI NM

Table A.I.7. Catalogue numbers and localities for *Elatra*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>E. leslii</i>	BP/2/15701	Vereeniging	1	BPI
	BP/2/-	Hammanskraal	34	BPI
	BP/2/7080		16	GSP
	BP7092		3	PRE
	BP7092 spn2			
	BP7093b			
	BP7102			
	BP7124			
	BP7127			
	BP7129 spn1			
	BP7129 spn2			
	BP7132a			
	BP7140a spn1			
	BP7140a spn2			
	BP7158			
	BP7163			
	BP7176a			
	BP7214 Rspn2			
	BP7214			
	BP7220 spn1			
	BP7220 spn2			
	BP7221a			
	BP7222a			
	BP7318			
	BP7348 spn1			
	BP7395			
	BP7396			
	BP7400 spn1			
	BP7400 spn2			
	BP7401			
	BP7402			
	BP7426			
	BP7433			
	BP15701			
	BP16188			
	GSP/HI/3			
	GSP/HI/37a			
	GSP/HI/37b spn1			
	GSP/HI/37b spn2			
	GSP/HI/60			
	GSP/HI/124			
	GSP/HI/154			
	GSP/HI/155			
	GSP/HI/157			
	GSP/HI/213			
	GSP/HI/258 spn1			
	GSP/HI/258 spn2			
	GSP/HII/65			
	GSP/HII/82			
	GSP/HII/133b			
	GSP/HII/175			
	PRE/F/15a spn1			
	PRE/F/28			
	PRE/F/36a R			

Table A.I.8. Catalogue numbers and localities for *Ottokaria*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>O. buriadica</i>	BP/2/13599a BP/2/13599b BP/2/13630 BP/2/13632 BP/2/13633 BP/2/13635a&b BP/2/13636 BP/2/13638 BP/2/13639a BP/2/13639b VM/03/3205/122 VM/03/3205/124 VM/03/3205/127 VM/03/3205/135	Vereeniging	10 4	BPI VM
<i>O. hammanskraalensis</i>	BP/2/7221b BP/2/7291 BP/2/7415 GSP/HI/152 spn1 GSP/HI/152 spn2	Hammanskraal	3 2	BPI GSP
<i>O. transvaalensis</i>	BP/2/13069 BP/2/13600a BP/2/13600b BP/2/13603 BP/2/13605 BP/2/13606 BP/2/13607a BP/2/13607b BP/2/13611 BP/2/13613? BP/2/13615 BP/2/13621 BP/2/13622 BP/2/13624 BP/2/13634 BP/2/13643 BP/2/13645 BP/2/13646 BP/2/13674 VM/03/3205/117 VM/03/3205/126 VM/03/3205/128 VM/03/3205/129 VM/03/3205/130 VM/03/3205/132	Vereeniging	19 6	BPI VM

Table A.I.9. Catalogue numbers and localities for *Scutum*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>S. lesliei</i>	BP/2/- BP/2/16136a BP/2/16139 BP/2/16152a	Ermelo	4	BPI
	BP/2/1424 BP/2/13539 BP/2/13543 BP/2/13729a BP/2/13730a BP/2/13731 BP/2/13732 BP/2/13733 BP/2/13735 BP/2/13736 BP/2/13737 BP/2/13739 BP/2/13740 BP/2/13741 BP/2/13744 BP/2/13745 BP/2/13746 BP/2/13747 BP/2/13749 BP/2/13750 BP/2/13751 BP/2/13753 BP/2/13758 BP/2/13760 BP/2/13762 BP/2/13763 BP/2/13765 BP/2/13769 BP/2/13774 BP/2/13783 BP/2/13799 BP/2/13800 BP/2/13803 BP/2/13808a BP/2/13810 BP/2/13814 BP/2/13820 BP/2/13822 BP/2/13826 BP/2/13829 BP/2/13834 BP/2/13837a BP/2/13865 BP/2/13866 BP/2/13867 BP/2/13868 BP/2/13872 BP/2/13874 BP/2/13880 BP/2/13883a&b BP/2/13884 BP/2/13885	Vereeniging	56 18	BPI VM

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
	BP/2/13888a BP/2/13889a BP/2/13890 BP/2/13891a VM/03/3205/85 VM/03/3205/86 VM/03/3205/87 VM/03/3205/90 VM/03/3205/96 VM/03/3205/98 VM/03/3205/99 VM/03/3205/97 VM/03/3205/101 VM/03/3205/103 VM/03/3205/105 VM/03/3205/108 VM/03/3205/110 VM/03/3205/111 VM/03/3205/112 VM/03/3205/115 VM/03/3205/164 VM/03/3205/165			

Table A.I.10. Catalogue numbers and localities for *Gladiopomum*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>G. dutoitides</i>	BP/2/13754 BP/2/13936 BP/2/13937 BP/2/13941 BP/2/13945 BP/2/13971 VM/03/3205/64	Vereeniging	6 1	BPI VM
	BP/2/16037	Hlobane	1	BPI
<i>G. acadarensense</i>	BP/2/16329a&b BP/2/16330a BP/2/16331a&b BP/2/16332 spn1 BP/2/16332 spn2 BP/2/16333a&b BP/2/16334 BP/2/16335a BP/2/16337 BP/2/16341 BP/2/16342a BP/2/16343a&b BP/2/16344a&b BP/2/16345 BP/2/16346 BP/2/16347a&b BP/2/16348 BP/2/16349 BP/2/16350 BP/2/16351a&b	Cedara	23 1	BPI GSP

	BP/2/16352a BP/2/16353 BP/2/16354a&b BP/2/16355a&b GSP/-			
<i>G. elongatum</i>	BP/2/28880a&b BP/2/28876a	Rietspruit	2	BPI

Table A.I.11. Catalogue numbers and localities for *Plumsteadia*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>P. lerouxii</i>	BP/2/13550 BP/2/14149a&b BP/2/14151 BP/2/14152 BP/2/14153 BP/2/14156 BP/2/14157 BP/2/14158 BP/2/14159 BP/2/14160 BP/2/14162 BP/2/14165 BP/2/14166 BP/2/14169 BP/2/14170a&b BP/2/14171 BP/2/14173a BP/2/14174 BP/2/14175a&b BP/2/14176b BP/2/14178 BP/2/14179 BP/2/14181a BP/2/14182 BP/2/14183 BP/2/14186 BP/2/14189 BP/2/14190 BP/2/14191a&b BP/2/14205 BP/2/14210 BP/2/14211 BP/2/14220 BP/2/14221 VM/03/3205/167 VM/03/3205/50 VM/03/3205/52	Vereeniging	34 3	BPI VM
<i>P. gibbosa</i>	NM/1266 spn1 NM/1266 spn2 NM/1266 R	Mooi River	3	NM
	BP/2/11188a&b	Inhluzane	11	BPI
	BP/2/12985b R BP/2/12521a&b BP/2/12536 BP/2/12537 BP/2/12984a	Loskop	14	BPI

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
	Rspn1 BP/2/12984a Rspn3 BP/2/12984a BP/2/12987 BP/2/13000a&b BP/2/12995b BP/2/12994a&b BP/2/13004a&b BP/2/13011a BP/2/13008a spn2			

Table A.I.12. Catalogue numbers and localities for *Gonophylloides*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>G. strictum</i>	BP-?	Hammanskraal	1	BPI
	BP/2/14222a&b BP/2/14223 BP/2/14224 BP/2/14225 BP/2/14228a&b BP/2/14230a BP/2/14231a&b BP/2/14233 BP/2/14235b BP/2/14236 BP/2/14245 VM/03/3205/78 VM/03/3205/79 VM/03/3205/82	Vereeniging	11 3	BPI VM
<i>G. waltonii</i>	BP/2/14238 BP/2/14239b VM/03/3205/80 VM/03/3205/81	Vereeniging	2 2	BPI VM

Table A.I.13. Catalogue numbers and localities for *Dictyopteridium*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>D. flabellatum</i>	BP/2/12525a spn1 BP/2/12525a spn2 BP/2/12525a spn3 BP/2/12525a spn4 BP/2/12525b BP/2/12529a BP/2/12529a spn2 BP/2/12533 BP/2/12534 BP/2/12539 BP/2/12968	Loskop	18	BPI

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
	BP/2/12969 BP/2/12970 BP/2/12971 BP/2/12972 BP/2/12973 BP/2/12974a BP/2/12985a&b			
<i>D. natalensis</i>	BP/2/8147a BP/2/8148b BP/2/8151b BP/2/8152b BP/2/8154a spn2 BP/2/8154b BP/2/8159a BP/2/8160a&b BP/2/8162 BP/2/8167a BP/2/8167b spn2 BP/2/8168a&b BP/2/8169 BP/2/8171 BP/2/12544 BP/2/13049 BP/2/13100a&b NM/1241a spn2 NM/1254 NM/1244a&b NM/1243b NM/1242a&b NM/1246a NM/1247b NM/1274a NM/1260 NM/1257 NM/1256(9) NM/1251b NM/1280a NM/1280b NM/1273b NM/1261 NM/1252a&b NM/1250a NM/1249a&b NM/1248a&b NM/1672 NM/1258 NM/1274b NM/1275b NM/1683a&b	Mooi River	25 17	BPI NM
<i>cf. D. sporiferum</i>	BP/2/13056	Mooi River	1	BPI

LIDGETTONIACEAE

Table A.I.14. Catalogue numbers and localities for *Lidgettonia*.

SPECIES	CATALOGUE NUMBERS	LOCALITY	NUMBER OF SPECIMENS	INSTITUTIONS
<i>L. lidgettonioides</i>	As per Lacey <i>et. al.</i> (1975), Anderson & Anderson (1985)	Mooi River Bulwer Bergville	50 2 5	BPI, NM BPI BPI
<i>L. africana</i>	As per Thomas (1958), Lacey <i>et. al.</i> (1975), Anderson & Anderson (1985)	Mooi River Lidgetton Loskop Estcourt	50 10 20 4	BPI, NM
	BP11103a BP11106b BP11107b BP11108b BP11112b BP11116b BP11146a	Inhluzane	7	BPI
	BP/2/13950a&b spn2 BP/2/19351a&b BP/2/28274 BP/2/28356a BP/2/28934a&b BP/2/28935a&b spn1 BP/2/28935a&b spn2 BP/2/28935a&b spn3	Lawley	8 1	BPI PRE
	PRE/F/8393a&b spn1			
<i>L. elegans</i>	As per Lacey <i>et. al.</i> (1975)	Mooi River	16	BPI, NM

QUANTITATIVE DATA SUMMARY

Rigbyaceae Table A.II.1. Quantitative data collected for *Rigbya arberioides* & *incertae cedis*.

CHARACTER	<i>Rigbya arberioides</i> (combined)	<i>Rigbya arberioides</i> (Mooli River)	<i>Rigbya arberioides</i> (Bulwer)	<i>insertae sedis</i> (prev. <i>Arberia allweyensis</i>)
TOTAL LENGTH	5.4 (11.6) 16.3 {n=27; SD:3.3}	8.1 (12.4) 16.3 {n=22; SD:2.8}	5.4 (7.3) 11 {n=4; SD: 2.6}	12
TOTAL WIDTH	8.5 (14.3) 22.6 {n=14; SD:3.4}	10.8 (14.9) 22.6 {n=12; SD:3.1}	8.5 (10.4) 12.3 {n=2}	18
LENGTH:WIDTH	0.5 (0.7) 1.1 {n=14; SD:0.2}	0.5 (0.8) 1.1 {n=12; SD:0.2}	0.6 {n=2}	0.7
PEDICEL LENGTH (to first branch or divergence of lamina)	12 (35.4) 58 {n=20; SD:12.5}	12 (33.3) 58 {n=15; SD:12.9}	32 (41.6) 56 {n=5; SD: 9.8}	
PEDICEL WIDTH (basal)	0.6 (1.0) 1.7 {n=26; SD:0.3}	0.5 (1.0) 1.6 {n=20; SD:0.2}	0.6 (1.0) 1.7 {n=6; SD: 0.4}	
PEDICEL WIDTH (distal)	0.9 (1.7) 3.2 {n=24; SD:0.6}	0.9 (1.5) 2 {n=21; SD:0.3}	1.7 (2.6) 3.2 {n=5; SD: 0.6}	
LENGTH OF FAN-SHAPED LAMINA	2 (3.6) 4.9 {n=11; SD:1.0}	2 (3.5) 4.9 {n=9; SD:1.2}	3.8 (4.1) 4.5 {n=3}	7 to 8
ANGLE OF LAMINAL DIVERGENCE	26 (47.8) 68 {n=15; SD:15.0}	31 (60.1) 71 {n=14; SD:15.5}	44.7 {n=1}	111
PRIMARY DICHOTOMY	25 (60.1) 94 {n=14; SD:19.1}	25 (60.1) 94 {n=14; SD:19.1}	*	72
PRIMARY BRANCH ANGLES (no clear laminal dichotomy)	13 (40.6) 69 {n=18; SD:19.7}	13 (33) 69 {n=12; SD:19.1}	38 (55.7) 67 {n=6; SD: 9.9}	
SECONDARY BRANCH ANGLE	25 (45.3) 84 {n=13; SD:18.1}	25 (45.3) 84 {n=13; SD:17.4}	*	40 (60) 79 {n=2}
TERTIARY BRANCH ANGLE	17 (38.9) 64 {n=12; SD:14.4}		*	
SINGLE ORDER BRANCH WIDTHS	0.5 (0.8) 1.2 {n=80; SD:0.2}	0.5 (0.8) 1.2 {n=75; SD:0.2}	0.5 (0.9) 1.2 {n=5; SD: 0.3}	
SINGLE ORDER BRANCH LENGTHS	0.6 (3) 5.8 {n=40; SD:1.3}			
# SINGLE ORDER BRANCHES	6 (7.2) 9 {n=13; stdev:1}			
PRIMARY BRANCH WIDTHS	1.3 (1.8) 2.6 {n=15; SD:0.4}	1.5 (1.8) 2.6 {n=15; SD:0.4}	*	4.6 {n=2}
PRIMARY BRANCH LENGTHS	0.8 (2.1) 4 {n=15; SD:1}			1.1 {n=2}
SECONDARY BRANCH WIDTHS	0.4 (1.2) 1.6 {n=29; SD:0.3}	0.4 (1.2) 1.6 {n=29; SD:0.3}	*	2.6 (2.9) 3.1 {n=3}
SECONDARY BRANCH LENGTHS	0.5 (1.6) 2.7 {n=26; SD:0.7}			2.9 (3.2) 3.7 {n=4}
TERTIARY BRANCH WIDTHS	0.2 (0.8) 1 {n=23; SD:0.2}	0.2 (0.8) 1 {n=23; SD:0.2}	*	
TERTIARY BRANCH LENGTHS	1.1 (3.4) 6.8 {n=26; SD:1.5}			
NUMBER OF TERMINAL SCALES	5 (7.1) 9 {n=17; SD:1.1}	6 (7.4) 9 {n=13; SD:1.0}	5 (6) 7 {n=4}	at least 4
TERMINAL SCALE LENGTH (including seed scar)	2.5 (4.8) 7.6 {n=114; SD:1.1}	2.7 (5.0) 8.1 {n=100; SD:1.0}	2.5 (3.8) 5.8 {n=15; SD: 1.2}	2.5 (2.8) 3.3 {n=3}
TERMINAL SCALE WIDTH	0.8 (2.1) 3.5 {n=114; SD:0.5}	0.8 (2.1) 3.5 {n=101; SD:0.5}	1.2 (1.8) 2.6 {n=13; SD: 0.4}	4 (4.3) 4.5 {n=4; stdev:0.3}
SEED SCAR LENGTH	0.8 (1.5) 2.5 {n=34; SD:0.4}	1.1 (1.5) 2.5 {n=32; SD:0.4}	0.8 (1.3) 2.1 {n=3}	
SEED SCAR WIDTH	0.9 (1.3) 1.8 {n=30; SD:0.2}	0.9 (1.3) 1.8 {n=30; SD:0.2}	1.5 {n=1}	

Arberiaceae **Table A.II.2. Quantitative data collected for *Arberia* spp., *Vereenia leeuquensis* & *insertae sedis*.**

CHARACTER	<i>Arberia madagascariensis</i>	<i>Arberia hlobanensis</i>	<i>Vereenia leeuquensis</i>
TOTAL LENGTH	33.7 [n=1]	40.7 [n=1]	35 (41) 45 {n=4; stdv: 4.5}
TOTAL WIDTH	*	22 [n=1]	9.3 (11.1) 12 {n=5; stdv: 1.1}
LENGTH:WIDTH	*	1.9 [n=1]	3.2 (3.6) 4.1 {n=4; 0.4}
PEDICEL LENGTH (to first branch)	12 [n=1]	17.6 [n=1]	7 (7.5) 8 {n=4; stdv: 0.4}
PEDICEL WIDTH	2.5 to 8.7 [n=1]	2 to 5 [n=1]	1.7 to 4.5 (5.2) 6 {n=4; stdv: 0.7}
GROSS ANGLE OF OUTER BRANCH DIVERGENCE (basal divergence of 1° axis)	40 {n=1}	36 {n=1}	
INTERIOR ANGLE OF PRIMARY DICHOTOMY	*	*	*
BRANCHING ANGLES	30 to 90	30 to 35 [n=1]	15 (28.9) 54 {n=20; stdv: 10.4}
TOTAL PRIMARY AXIS LENGTH	13.9 [n=1]	(pedicel)	*
PRIMARY AXIS WIDTH	10.1 {n=1}	(pedicel)	4 (4.9) 5.5 {n=6; stdv: 0.6}
PRIMARY AXIS L:W	1.4 {n=1}	*	*
NUMBER OF SINGLE-ORDER BRANCHES	*	*	up to 18
LENGTH OF PRIMARY LATERAL BRANCHES	*	13 to 19 [n=1]	*
BASAL WIDTH OF PRIMARY LATERAL BRANCHES	3.2 [n=1]	3.3 (3.6) 3.9 {n=2}	*
LENGTH OF SUBSIDIARY LATERAL BRANCHES (including single-order branches)	7.3 (8.6) 10.1 {n=4; stdv:1.2}	2.2 (5.3) 8.7 {n=8; stdv:2.7}	2.2 (5.1) 7.5 {n=34; stdv: 1.2}
BASAL WIDTH OF SUBSIDIARY LATERAL BRANCHES (including single-order branches)	2 (2.5) 2.8 {n=4; stdv:0.3}	1.8 {n=1}	1.1 (1.6) 2.3 {n=34; stdv: 0.3}
ULTIMATE BRANCH WIDTH (at seed attachment)	2.8 [n=1]	1.8 (2.9) 3.7 {n=3; stdv: 1}	1.3 (1.5) 1.7 {n=14; stdv: 0.2}
SINGLE-ORDER BRANCH L:W	*		1.7 (3.2) 4.8 {n=34; stdv: 1}
SINGLE-ORDER BRANCH L: PRIMARY AXIS W	*	*	0.7 (1) 1.7 {n=33; stdv:0.3}
DISTANCE BETWEEN ADJACENT BRANCHES	4 (4.6) 5.6 {n=3}	3.3 (5.3) 6.9 {n=3}	2.7 (3.9) 5.6 {n=22; stdv: 0.9}
TERMINAL SCALE LENGTH	4.5 [n=1]	4.4 (5) 6.3 {n=5; stdv: 0.9}	1.5 (2.3) 5 {n=19; stdv: 0.5}
TERMINAL SCALE WIDTH	2.7 [n=1]	4.3 (6.4) 8.1 {n=5; stdv: 1.7}	
SEEDS			

Dictyopteridiaceae **Table A.II.3. Quantitative data collected for *Bifariala*, *Estcourtia* & *Elatra*.**

CHARACTER	<i>Bifariala intermittens</i>	<i>Estcourtia vandijkii</i>	<i>Elatra leslii</i>
TOTAL LENGTH	16.2 (28.1) 42 {n=33; SD: 6.4}	21.3 {n=1}	25.3 (48) 79.3 {n=41; SD: 14.2}
TOTAL WIDTH	10.5 (14.9) 21.3 {n=40; SD:2.5}	13.1 (15.1) 17.1 {n=2}	13.2 (27) 39.3 {n=51; SD: 6.3}
TOTAL L:W	1.3 (1.9) 2.9 {n=33; SD:0.4}	1.4 {n=1}	1.1 (1.8) 2.4 {n=41; SD: 6.3}
PEDICEL WIDTH (at insertion)	1.6 (2.6) 4 {n=29; SD:0.6}	1.7 (2.6) 3.5 {n=2}	2.2 (5) 6.7 {n=28; SD: 0.8}
PEDICEL WIDTH (basal)	1.2 (2) 3.2 {n=22; SD:0.5}	*	1 (2.8) 4.6 {n=22; SD: 0.9}
PEDICEL LENGTH	2.8 (10.1) 22.3 {n=28; SD:4.3}	3.4 (3.7) 4 {n=2} (decurent flanges)	6.2 (11.7) 21.9 {n=30; SD: 4.1}
RECEPTACLE WIDTH:PEDICEL WIDTH	*	*	*
RECEPTACLE AREA	59 (159) 260 {n=34; SD:55.5}	86 (135) 184 {n=2}	147 (484) 718 {n=12; SD: 198.3}
RECEPTACLE WIDTH	6.5 (9.5) 13.8 {n=42; SD:1.9}	9.7 (11.1) 12.5 {n=2}	10 (20.4) 28.8 {n=51; SD: 4.7}
RECEPTACLE LENGTH	11 (21.7) 33.6 {n=36; SD:5.1}	18.5 {n=1}	13.7 (26) 45.8 {n=48; SD: 7.8}
RECEPTACLE L:W	1.6 (2.3) 3.8 {n=36; SD:0.5}	1.5 {n=1}	0.8 (1.3) 2.1 {n=48; SD: 0.3}
LENGTH OF APICAL SPINE	*	*	*
BASAL WIDTH OF APICAL SPINE	*	*	*
BASAL LOBE DEPTH (receptacle)	*	*	*
PERIPHERAL GROOVE	*	*	*
MEDIAL WING WIDTH	1.4 (2.5) 4 {n=38; SD:0.7}	1.9 (2) 2.1 {n=2}	1.3 (2.9) 5.2 {n=45; SD: 1.2}
MEDIAL WING LOBE WIDTH	*	*	*
APICAL WING WIDTH	2.5 (5.3) 8.4 {n=38; SD:1.5}	2.1 {n=1}	6.5 (20.8) 37.3 {n=40; SD: 8.7}
APICAL WING LOBE WIDTH	*	*	*
BASAL WING WIDTH	0.5 (0.8) 1 {n=5; SD:0.2}	0.4 (0.6) 0.8 {n=2}	*
BASAL WING LOBE WIDTH	*	*	*
WING WIDTH: RECEPTACLE WIDTH	0.2 (0.5) 0.8 {n=21; SD:0.2}	0.2 {n=2}	*
MEDIAL WIDTH SCUT/WING	2.1 (4.1) 6.3 {n=20; SD:1.3}	*	*
BASAL WIDTH SCUT/WING	1.5 (3.6) 5.6 {n=22; SD:1.1}	*	3.5 (4.6) 5.5 {n=5; SD=0.71}
SCUT/WING W:RECEPTACLE W	0.3 (0.4) 0.8 {n=21; SD:0.1}	*	*
APPROX. # SEED SCARS	31 (57.5) 93 {n=17; SD:19.6}	131 (205.5) 280 {n=2}	40 (55.3) 85 {n=10; SD: 17.7}
SEED SCAR DENSITY (per 25 mm ²)	5 (8.6) 15 {n=17; SD:2.5}	38 {n=2}	1.5 (3.3) 7 {n=10; SD: 1.6}
SEED SCAR LENGTH (p)	1 (1.8) 3 {n=43; SD:0.4}	0.7 (1.0) 1.1 {n=4; SD: 0.2}	1.1 (2) 2.6 {n=46; SD: 0.5}

CHARACTER	<i>Bifariaia intermittens</i>	<i>Estcourtia vandijkii</i>	<i>Elatra leslii</i>
SEED SCAR LENGTH (m)	1.6 (2.5) 3.8 {n=145; SD:145}	0.9 (1.1) 1.4 {n=8; SD: 0.2}	2.1 (4) 5.5 {n=66; SD: 4}
SEED SCAR WIDTH	0.7 (1.5) 2 {n=130; SD:0.2}	0.8 (0.9) 1.1 {n=8; SD: 0.1}	1.4 (2.4) 3.3 {n=58; SD: 0.5}
LEAF LENGTH	142.6 {n=1}	101.2 {n=1}	>124.3 {n=1}
LEAF WIDTH	22.4 {n=1}	19.7 (24.7) 29.6 {n=2}	26.3 {n=1}
MIDRIB WIDTH (RANGE)	2.2 to 0.8 {n=1}	3.7 to 0.3 {n=3}	6 to 0.8 {n=5}
FRUIT ATTACHMENT FROM LEAF BASE	approx. 10 mm	*	*
PETIOLE WIDTH	*	1.9 {n=1}	2.7 {n=1}
PETIOLE LENGTH	*	13 {n=1}	*
MID-LAMINAR VEIN ANGLE	37.7 {n=3}	46 (54.3) 70 {n=7; SD: 10.8}	24 (39.1) 50 {n=13; SD: 9.6}
MARGINAL VEIN ANGLE	63 {n=3}	46 (52.6) 64 {n=7; SD: 6}	44 (55.6) 79 {n=9; SD: 14.8}
MARGINAL VEIN DENSITY (per 10 mm)	22 {n=1}	11 (13.7) 16 {n=3; SD: 2.5}	22 (26.4) 32 {n=5; SD:4.3}
SCLEROTESTA LENGTH	*	*	*
SCLEROTESTA WIDTH	*	*	*
SEED WING LENGTH	*	*	*
SEED WING WIDTH	*	*	0.4 (0.5) 0.7 {n=5; SD: 0.1}
SEED LENGTH	*	*	4.2 (5.6) 7.6 {n=20; SD: 1.2}
SEED WIDTH	*	*	2.3 (4.0) 5.4 {n=21; SD: 0.9}

Dictyopteridiaceae **Table A.II.4. Quantitative data collected for *Ottokaria* spp.**

CHARACTER	<i>Ottokaria transvaalensis</i>	<i>Ottokaria hammanskraalensis</i>	<i>Ottokaria burriadica</i>
TOTAL LENGTH	14.3 (21.8) 29.6 {n=22; SD: 3.7}	18.9 (28.5) 40.3 {n=5; SD: 7.9}	21.6 (27.2) 30.9 {n=13; SD: 3.2}
TOTAL WIDTH	14.8 (21.2) 30.1 {n=21; SD: 2.9}	15.3 (28.2) 39.4 {n=5; SD: 9.0}	19.5 (25.6) 31.1 {n=12; SD: 3.4}
TOTAL L:W	0.7 (1.1) 1.3 {n=20; SD: 0.1}	0.9 (1.0) 1.2 {n=5; SD: 0.1}	0.9 (1.1) 1.4 {n=12; SD: 0.1}
PEDICEL WIDTH (at insertion)	3.4 (4.5) 6.8 {n=19; SD: 0.9}	4.3 (5.8) 7.1 {n=4; SD: 1.2}	5.7 (8.9) 13.2 {n=12; SD: 2.3}
PEDICEL WIDTH (basal)	2.8 (3.6) 4.5 {n=17; SD: 0.5}	2.5 (3.3) 4.2 {n=5; SD: 0.8}	4.1 (4.8) 5.8 {n=12; SD: 0.6}
PEDICEL LENGTH	9.5 (26.3) 44.7 {n=20; SD: 12.1}	13.1 (21.1) 31.5 {n=4; SD: 7.7}	26.6 (41.8) 55.6 {n=11; SD: 8.8}
RECEPTACLE WIDTH: PEDICEL WIDTH	2.2 (3.1) 4.5 {n=17; SD: 0.7}	3.3 (3.6) 3.9 {n=3}	1.6 (2.4) 3.1 {n=11; SD: 0.5}
RECEPTACLE AREA	88 (166.4) 231 {n=19; SD: 45.1}	290 (386) 440 {n=3; SD: 83.4}	200 (384.8) 573 {n=13; SD: 101.8}
RECEPTACLE WIDTH	9.4 (13.7) 17 {n=19; SD: 2.2}	11.3 (19.8) 25.4 {n=4; SD: 6.2}	15 (20.8) 25.6 {n=13; SD: 3.1}
RECEPTACLE LENGTH	10.7 (15.6) 20.1 {n=21; SD: 2.7}	14.7 (20.4) 23.4 {n=4; SD: 4.0}	17.2 (22.9) 27.9 {n=13; SD: 3.2}
RECEPTACLE L:W	0.9 (1.2) 1.4 {n=20; SD: 0.2}	0.9 (1.1) 1.3 {n=4; SD: 0.2}	1.0 (1.1) 1.4 {n=13; SD: 0.1}
MEDIAL WING WIDTH	2.4 (3.6) 4.6 {n=23; SD: 0.5}	2.8 (3.3) 3.7 {n=4; SD: 0.4}	1.9 (2.7) 3.6 {n=14; SD: 0.6}
MEDIAL WING LOBE WIDTH	1.6 (2.5) 3.7 {n=72; SD: 0.6}	0.9 (1.3) 1.5 {n=5; SD: 0.2}	1.4 (2.3) 3.7 {n=25; SD: 0.6}
APICAL WING WIDTH	2.4 (3.4) 5 {n=24; SD: 0.6}	2.8 (3.3) 3.9 {n=3; SD: 0.6}	1.9 (3.1) 5.2 {n=11; SD: 1.0}
APICAL WING LOBE WIDTH	1.3 (2.3) 3.6 {n=62; SD: 0.2}	1.2 (1.9) 2.5 {n=6; SD: 0.5}	1.5 (2.2) 2.7 {n=11; SD: 0.5}
BASAL WING WIDTH	2.3 (3.3) 4.2 {n=19; SD: 0.6}	2.6 {n=2}	1.4 (2.4) 4.7 {n=9; SD: 1.0}
BASAL WING LOBE WIDTH	*	*	1.5 (2.3) 2.7 {n=9; SD: 0.6}
WING WIDTH: RECEPTACLE WIDTH	0.2 (0.3) 0.4 {n=22; SD: 0.1}	0.1 (0.2) 0.3 {n=4; SD: 0.1}	0.1 (0.1) 0.2 {n=13; SD: 0.0}
MEDIAL WIDTH SCUT/WING	*	*	*
BASAL WIDTH SCUT/WING	*	*	*
SCUT/WING W: RECEPTACLE W	*	*	*
APPROX. # SEED SCARS	35 (62.2) 87 {n=5; SD: 22.3}	*	79 (105) 138 {n=3; SD: 30.1}
SEED SCAR DENSITY (per 25 mm ²)	8 (9.8) 11 {n=6; SD: 1.2}	*	5 (5.7) 6 {n=3; SD: 0.6}
SEED SCAR LENGTH (p)	1.6 (2.0) 2.8 {n=21; SD: 0.3}	*	*
SEED SCAR LENGTH (m)	1.4 (2.2) 3.2 {n=38; SD: 0.3}	2.1 (2.5) 2.8 {n=7; SD: 0.3}	2 (2.7) 3.3 {n=13; SD: 0.4}
SEED SCAR WIDTH	0.9 (1.5) 2 {n=35; SD: 0.3}	1.9 (2.1) 2.2 {n=4; SD: 0.1}	1.4 (1.8) 2.5 {n=11; SD: 0.4}
LEAF LENGTH	*	*	*
LEAF WIDTH	*	*	41.4 {n=1}
MIDRIB WIDTH (RANGE)	*	*	*

CHARACTER	<i>Ottokaria transvaalensis</i>	<i>Ottokaria hammanskraalensis</i>	<i>Ottokaria buriadica</i>
FRUIT ATTACHMENT FROM LEAF BASE	*	*	*
PETIOLE WIDTH	*	*	8.2 {n=1}
PETIOLE LENGTH	*	*	22.3 {n=1}
MID-LAMINAR VEIN ANGLE	*	*	23 (23.3) 24 {n=3; SD: 0.6}
MARGINAL VEIN ANGLE	*	*	55 (58) 61 {n=2; SD: 4.2}
MARGINAL VEIN DENSITY (per 10 mm)	*	*	24 {n=1}
SCLEROTESTA LENGTH	*	*	*
SCLEROTESTA WIDTH	*	*	*
SEED WING LENGTH	*	*	*
SEED WING WIDTH	*	*	*
SEED LENGTH	*	7.1	*
SEED WIDTH	*	3.3	*

Dictyopteridiaceae Table A.II.5. Quantitative data collected for *Scutum leslii*.

CHARACTER	<i>Scutum leslii</i> (Vereeniging)	<i>Scutum leslii</i> (Ermelo)
TOTAL LENGTH	12.9 (24.6) 38.4 {n=58; SD: 6.1}	26.7 (35.6) 44.4 {n=2}
TOTAL WIDTH	11 (21.9) 31.5 {n=63; SD: 4.2}	22 (27.5) 31.8 {n=3}
TOTAL L:W	0.9 (1.1) 1.8 {n=55; SD: 0.2}	1.2 (1.4) 1.5 {n=2}
PEDICEL WIDTH (at insertion)	1.2 (2.3) 4.2 {n=29; SD: 0.7}	1.3 (2.4) 3.5 {n=2}
PEDICEL WIDTH (basal)	1 (1.8) 3.3 {n=10; SD: 0.7}	3.1 {n=1}
PEDICEL LENGTH	3.5 (9.9) 36 {n=32; SD: 5.7}	6.5 (11.9) 17.3 {n=2}
RECEPTACLE WIDTH:PEDICEL WIDTH	3.3 (5.1) 7.3 {n=21; SD: 1.3}	*
RECEPTACLE AREA	38 (159.4) 470 {n=52; SD: 101.2}	114 {n=1}
RECEPTACLE WIDTH	5.4 (11.2) 20 {n=65; SD: 3.4}	9.8 (17.6) 22.8 {n=4; SD: 5.6}
RECEPTACLE LENGTH	7.2 (17.5) 33.9 {n=62; SD: 6.3}	17 (27.2) 37.4 {n=2}
RECEPTACLE L:W	1.1 (1.5) 2.1 {n=60; SD: 0.3}	1.7 (1.8) 1.9 {n=2}
LENGTH OF APICAL SPINE	*	*
BASAL WIDTH OF APICAL SPINE	*	*
BASAL LOBE DEPTH (receptacle)	*	*
PERIPHERAL GROOVE	*	*
MEDIAL WING WIDTH	2.3 (5.8) 9 {n=66; SD: 1.4}	4.7 (5.6) 6.5 {n=4; SD: 0.8}
MEDIAL WING LOBE WIDTH	*	*
APICAL WING WIDTH	2.3 (4.7) 7.3 {n=45; SD: 1.3}	3.9 (4.2) 4.3 {n=3; SD: 0.2}
APICAL WING LOBE WIDTH	*	*
BASAL WING WIDTH	1.8 (4.2) 7 {n=47; SD: 1}	4.8 (4.9) 5 {n=2}
BASAL WING LOBE WIDTH	*	*
WING WIDTH: RECEPTACLE WIDTH	0.1 (0.6) 1.2 {n=64; SD: 0.2}	0.2 (0.4) 0.6 {n=4; SD: 0.2}
MEDIAL WIDTH SCUT/WING	*	*
BASAL WIDTH SCUT/WING	*	*
SCUT/WING W:RECEPTACLE W	*	*
APPROX. # SEED SCARS	35 (101.9) 300 {n=26; SD: 69.4}	*
SEED SCAR DENSITY (per 25 mm ²)	8 (16.5) 35 {n=31; SD: 5.5}	11 {n=1}
SEED SCAR LENGTH (p)	0.7 (1.3) 2.5 {n=230; SD: 0.3}	1 (1.4) 1.9 {n=20; SD: 0.2}
SEED SCAR LENGTH (m)	1 (2) 3.2 {n=156; SD: 0.5}	1.3 (2.0) 2.6 {n=13; SD: 0.4}

CHARACTER	<i>Scutum leslii</i> (Vereeniging)	<i>Scutum leslii</i> (Ermelo)
SEED SCAR WIDTH	0.6 (1.1) 1.7 {n=103; SD: 0.2}	1.1 (1.4) 1.7 {n=11; SD: 0.2}
LEAF LENGTH	45.8 (105.3) 258 {n=11; SD: 62.8}	*
LEAF WIDTH	14.6 (26.2) 44.3 {n=14; SD: 8.8}	*
MIDRIB WIDTH (RANGE)	5 to 0.3	*
FRUIT ATTACHMENT FROM LEAF BASE	*	*
PETIOLE WIDTH	basal width: 2.1-5.8	*
PETIOLE LENGTH	length 29.7 to 49.5	*
MID-LAMINAR VEIN ANGLE	24 (48) 75 {n=27; SD: 15.6}	*
MARGINAL VEIN ANGLE	56 (67.5) 79 {n=28; SD: 7.2}	*
MARGINAL VEIN DENSITY (per 10 mm)	18 (26.4) 32 {n=11; SD: 5.1}	*
SCLEROTESTA LENGTH	2 (3) 4.8 {n=17; SD: 0.8}	*
SCLEROTESTA WIDTH	1.5 (2.4) 4.5 {n=17; SD: 0.8}	*
SEED WING LENGTH	6.4 (12.1) 23.5 {n=41; SD: 4}	*
SEED WING WIDTH	1.9 (3.6) 5.1 {n=53; SD: 0.8}	*
SEED LENGTH	*	*
SEED WIDTH	*	*

Dictyopteridiaceae **Table A.II.6. Quantitative data collected for *Gladiopomum* spp.**

CHARACTER	<i>Gladiopomum acadarens</i>	<i>Gladiopomum duttioides</i>	<i>Gladiopomum elongatum</i>
TOTAL LENGTH	31 (48.8) 67.9 {n=16; SD:9.8}	33.1 (46.1) 57.2 {n=9; SD: 8.4}	39.5 (57.2) 74.9 {n=2}
TOTAL WIDTH	15.6 (24.2) 31.7 {n=16; SD:3.7}	15.1 (21.8) 27.3 {n=9; SD: 5.2}	17.8 (21.6) 25.3 {n=2}
TOTAL L:W	1.2 (2.1) 3.3 {n=14; SD:0.6}	1.7 (2.1) 2.3 {n=10; SD:0.3}	2.2 {n=1}
PEDICEL WIDTH (at insertion)	1.5 (3.2) 6.6 {n=18; SD:1.3}	1.2 (2.4) 4 {n=8; SD:1.1}	3.5 {n=1}
PEDICEL WIDTH (basal)	1.5 (2.3) 3.8 {n=10; SD:0.7}	*	*
PEDICEL LENGTH	7.4 (18.0) 26.2 {n=16; SD:4.7}	7.7 (12.3) 16.3 {n=7; SD: 3.2}	12 {n=1}
RECEPTACLE WIDTH;PEDICEL WIDTH	*	*	*
RECEPTACLE AREA	134 (270.5) 523 {n=12; SD:121.0}	73 (270.3) 402 {n=9; SD:143.7}	195 (335) 475 {n=2}
RECEPTACLE WIDTH	4.7 (8.4) 15.4 {n=24; SD:2.7}	7.1 (10.3) 13.8 {n=9; SD:2.9}	8.7 {n=2}
RECEPTACLE LENGTH	21 (34.1) 50 {n=17; SD:34.1}	15.7 (30.2) 40.6 {n=9; SD: 9.9}	32.7 (47.7) 62.6 {n=2}
RECEPTACLE L:W	3.3 (4.0) 5.4 {n=17; SD:0.7}	2.2 (2.9) 3.9 {n=9; SD:0.5}	3.8 (5.5) 7.2 {n=2}
LENGTH OF APICAL SPINE	3.8 (5.9) 9.2 {n=3; SD:2.9}	3.7 (6.3) 9.5 {n=6; SD:2.4}	5.3 {n=1}
BASAL WIDTH OF APICAL SPINE	1.6 (2.7) 3.9 {n=4; SD:1.0}	1.4 (2.5) 3.4 {n=6; SD: 0.9}	2.2 {n=1}
BASAL LOBE DEPTH (receptacle)	*	*	*
PERIPHERAL GROOVE	*	*	*
MEDIAL WING WIDTH	7 (9.2) 10.8 {n=21; SD:1.0}	5.3 (6.7) 9.5 {n=9; SD: 1.6}	5.8 (8.5) 11.2 {n=2}
MEDIAL WING LOBE WIDTH	*	*	*
APICAL WING WIDTH	3.5 (4.5) 6.4 {n=6; SD:1.1}	*	4.8 {n=2}
APICAL WING LOBE WIDTH	*	*	*
BASAL WING WIDTH	3.7 (6.0) 9 {n=10; SD:1.7}	3.9 (4.9) 5.8 {n=7; SD: 0.7}	4.4 (5.1) 5.8 {n=2}
BASAL WING LOBE WIDTH	*	*	*
WING WIDTH: RECEPTACLE WIDTH	0.8 (1.3) 2.3 {n=21; SD:0.4}	0.4 (0.7) 0.9 {n=9; SD:0.2}	0.7 (1.0) 1.3 {n=2}
MEDIAL WIDTH SCUT/WING	*	*	*
BASAL WIDTH SCUT/WING	*	*	*
SCUT/WING W:RECEPTACLE W	*	*	*
APPROX. # SEED SCARS	61 (104.9) 172 {n=10; SD:37.0}	37 (77.7) 129 {n=8; SD: 39.2}	58 (89) 120 {n=2}
SEED SCAR DENSITY (per 25 mm ²)	7 (8.5) 12 {n=13; SD:1.7}	4.4 (9) 11.4 {n=8; SD:3}	6.3 (6.9) 7.4 {n=2}
SEED SCAR LENGTH (p)	1.2 (2.0) 3.7 {n=43; SD:0.5}	1.2 (1.7) 2.1 {n=25; SD:0.3}	1.4 (2.2) 3.1 {n=11; SD: 0.6}
SEED SCAR LENGTH (m)	1.9 (2.8) 3.8 {n=68; SD 0.4}	1.9 (2.5) 3 {n=45; SD:0.3}	2.1 (3) 4.1 {n=11; SD: 0.6}

CHARACTER	<i>Gladiopomum acadarense</i>	<i>Gladiopomum dutiotides</i>	<i>Gladiopomum elongatum</i>
SEED SCAR WIDTH	1.2 (1.6) 2.1 {n=30; SD:0.2}	1.1 (1.5) 1.8 {n=19; SD:0.2}	1.3 (1.6) 1.8 {n=16; SD: 0.1}
LEAF LENGTH	*	229+ {n=1}	*
LEAF WIDTH	*	26 {n=1}	*
MIDRIB WIDTH (RANGE)	*	5 to 1 {n=1}	*
FRUIT ATTACHMENT FROM LEAF BASE	*	*	*
PETIOLE WIDTH	*	7 {n=1}	*
PETIOLE LENGTH	*	*	*
MID-LAMINAR VEIN ANGLE	*	50 {n=1}	*
MARGINAL VEIN ANGLE	*	*	*
MARGINAL VEIN DENSITY (per 10 mm)	*	16 {n=1}	*
SCLEROTESTA LENGTH	*	*	*
SCLEROTESTA WIDTH	*	*	*
SEED WING LENGTH	*	*	*
SEED WING WIDTH	*	*	*
SEED LENGTH	*	*	*
SEED WIDTH	*	*	*

Dictyopteridiaceae **Table A.II.7. Quantitative data collected for *Plumsteadia* spp.**

CHARACTER	<i>Plumsteadia lerouxii</i>	<i>Plumsteadia gibbosa</i> (Loskop)	<i>Plumsteadia gibbosa</i> (Mooi River)	<i>Plumsteadia gibbosa</i> (Inhluzane)
TOTAL LENGTH	17.4 (28.5) 42.3 {n=33; SD:6.2}	18.7 (26.4) 36.3 {n=9; SD:6.4}	17.6 (19.2) 21.2 {n=3; SD: 1.8}	11.9 (20.5) 26.7 {n=11; SD: 5.2}
TOTAL WIDTH	4.2 (8) 11.1 {n=35; SD:1.8}	8.7 (10.7) 12.8 {n=7; SD:1.5}	9.5 (9.9) 10.5 {n=3; SD: 0.5}	5.1 (8.4) 11.3 {n=10; SD: 1.7}
TOTAL L:W	3.2 (3.7) 5.2 {n=33; SD: 0.6}	1.9 (2.7) 3.3 {n=3; SD:0.6}	1.7 (2.0) 1.9 {n=3; SD: 0.3}	2.0 (2.4) 2.7 {n=10; SD: 0.2}
PEDICEL WIDTH (at insertion)	2.2 (2.5) 2.8 {n=3}	2 (2.9) 4 {n=5; SD:0.8}	1.8 {n=1}	2.7 {n=1}
PEDICEL WIDTH (basal)	1.2 (1.4) 1.7 {n=3}	1.3 (1.9) 2.3 {n=3; SD:0.5}	*	*
PEDICEL LENGTH	2.3 (3.2) 3.8 {n=4}	3.4 (5.7) 8 {n=4; SD:2.1}	1.3 {n=1}	<2
RECEPTACLE WIDTH:PEDICEL WIDTH	*	*	*	*
RECEPTACLE AREA	73 (152.5) 334 {n=24; SD: 68.9}	95 (166) 295 {n=9; SD:70.8}	105 (116.9) 119 {n=3; SD: 1.1}	*
RECEPTACLE WIDTH	4 (6.7) 10.5 {n=12; SD: 1.9}	5.8 (8.3) 10 {n=13; SD:1.3}	9.5 (9.7) 10.2 {n=3; SD: 0.4}	*
RECEPTACLE LENGTH	26.9 (32.1) 42.3 {n=6; SD: 5.5}	16.4 (24.3) 35.4 {n=10; SD:6.2}	17.9 {n=2}	*
RECEPTACLE L:W	3.5 (5.0) 6.7 {n=6; SD: 1.3}	2 (2.9) 3.5 {n=10; SD:0.6}	1.8 (1.8) 1.9 {n=2; SD: 0.1}	*
LENGTH OF APICAL SPINE	*	*	*	*
BASAL WIDTH OF APICAL SPINE	*	*	*	*
BASAL LOBE DEPTH (receptacle)	*	*	*	*
PERIPHERAL GROOVE	*	*	*	*
MEDIAL WING WIDTH	0.6 (1.3) 2.4 {n=11; SD:0.5}	0.8 (1.7) 2.6 {n=10; SD:0.6}	1.2 {n=1}	*
MEDIAL WING LOBE WIDTH	*	*	*	*
APICAL WING WIDTH	*	0.9 (1.8) 3.6 {n=5; SD:1.1}	*	*
APICAL WING LOBE WIDTH	*	*	*	*
BASAL WING WIDTH	*	1.5 (1.5) 1.6 {n=3}	*	*
BASAL WING LOBE WIDTH	*	*	*	*
WING WIDTH: RECEPTACLE WIDTH	0.1 (0.2) 0.5 {n=10; SD:0.1}	0.1 (0.2) 0.4 {n=10; SD:0.1}	0.1 {n=1}	*
MEDIAL WIDTH SCUT/WING	*	*	*	*
BASAL WIDTH SCUT/WING	*	*	*	*
SCUT/WING W:RECEPTACLE W	*	*	*	*
APPROX. # SEED SCARS	80 (229.3) 387 {n=7; SD: 100}	62 (105.5) 149 {n=2}	*	*
SEED SCAR DENSITY (per 25 mm ²)	23 (30.6) 40 {n=9; SD:6.7}	15 (17.9) 21 {n=7; SD:2.4}	11 (12) 13 {n=2; SD: 1.4}	12
SEED SCAR LENGTH (p)	0.6 (0.9) 1.4 {n=26; SD:0.2}	*	*	*

CHARACTER	<i>Plumsteadia lerouxii</i>	<i>Plumsteadia gibbosa</i> (Loskop)	<i>Plumsteadia gibbosa</i> (Mooi River)	<i>Plumsteadia gibbosa</i> (Inhluzane)
SEED SCAR LENGTH (m)	0.8 (1.3) 2.4 {n=48; SD:0.8}	0.9 (1.4) 1.9 {n=47; SD:0.2}	1.5 (1.8) 2.3 {n=14; SD: 0.2}	1.8 (2.2) 2.8 {n=6; SD: 0.4}
SEED SCAR WIDTH	0.6 (1) 1.8 {n=47; SD:0.2}	0.6 (1) 1.4 {n=40; SD:0.2}	1 (1.2) 1.3 {n=13; SD: 0.1}	1.1 (1.3) 1.4 {n=5; SD: 0.1}
LEAF LENGTH	95 (132.3) 205.4 {n=4; SD: 50.3}	*	*	*
LEAF WIDTH	14.5 (26.7) 37.1 {n=20; SD:6.6}	*	*	*
MIDRIB WIDTH (RANGE)	2.1 (0.6) 4.2 {n=15; SD:0.6} to 0.5	1.9 to 1.3 {n=3}	*	*
FRUIT ATTACHMENT FROM LEAF BASE	12.7 (43.8) 80.6 {n=22; SD:15.6}	*	*	*
PETIOLE WIDTH	3.2 (3.4) 3.7 {n=3}	3.3 {n=2}	*	*
PETIOLE LENGTH	8.6 (9) 9.4 {n=2}	*	*	*
MID-LAMINAR VEIN ANGLE	66 (79.2) 89 {n=25; SD:6}	17 (21) 24 {n=9; SD:2.9}	*	*
MARGINAL VEIN ANGLE	72 (81.7) 89 {n=21; SD:4.8}	26 (33.5) 43 {n=10; SD: 5.7}	*	*
MARGINAL VEIN DENSITY (per 10 mm)	18 (21.8) 26 {n=16; SD:3}	5 (8.3) 10 {n=3}	*	*
SCLEROTESTA LENGTH	*	*	*	*
SCLEROTESTA WIDTH	*	*	*	*
SEED WING LENGTH	*	*	*	*
SEED WING WIDTH	*	*	*	*
SEED LENGTH	*	1.4 (1.7) 2 {n=10; SD:0.2}	*	*
SEED WIDTH	*	1.1 (1.3) 1.5 {n=10; SD:0.1}	*	*

Dictyopteridiaceae **Table A.II.8. Quantitative data collected for *Gonophylloides* spp.**

CHARACTER	<i>Gonophylloides strictum</i>	<i>Gonophylloides waltonii</i>
TOTAL LENGTH	14.3 (24) 34 {n=10; SD:6}	19.4 (19.7) 20 {n=2}
TOTAL WIDTH	11.3 (16.5) 27.8 {n=16.5; SD:4.6}	13.1 (14.8) 15.9 {n=3}
TOTAL L:W	1.2 (1.5) 2.5 {n=10; SD:0.4}	1.3 (1.4) 1.5 {n=2}
PEDICEL WIDTH (at insertion)	1.8 (1.9) 2 {n=2}	2.1 (3) 4.1 {n=4}
PEDICEL WIDTH (basal)	*	1.8 (2.1) 2.6 {n=3}
PEDICEL LENGTH	1.9 (3) 4 {n=2}	2.2 (8.3) 11.1 {n=4}
RECEPTACLE WIDTH:PEDICEL WIDTH	*	*
RECEPTACLE AREA	137 (314) 726 {n=11; SD:165.2}	150 (185) 220 {n=2}
RECEPTACLE WIDTH	9.7 (15.3) 25.4 {n=13; SD:4.6}	10.6 (13.9) 15.9 {n=3}
RECEPTACLE LENGTH	13.1 (22.8) 32.4 {n=9; SD:6.2}	17.4 (17.7) 18 {n=2}
RECEPTACLE L:W	1.2 (1.6) 2.8 {n=8; SD:0.5}	1.2 (1.4) 1.6 {n=2}
LENGTH OF APICAL SPINE	*	*
BASAL WIDTH OF APICAL SPINE	*	*
BASAL LOBE DEPTH (receptacle)	2 (4.8) 7.4 {n=9; SD:2.2}	1 (1.5) 2 {n=2}
PERIPHERAL GROOVE	0.6 (0.8) 0.9 {n=12; SD: 0.1}	*
MEDIAL WING WIDTH	0.7 (1.1) 1.4 {n=4; SD:0.3}	1.3 (1.4) 1.4 {n=2}
MEDIAL WING LOBE WIDTH	*	*
APICAL WING WIDTH	*	*
APICAL WING LOBE WIDTH	*	*
BASAL WING WIDTH	*	*
BASAL WING LOBE WIDTH	*	*
WING WIDTH: RECEPTACLE WIDTH	0.1 {n=1}	0.1 {n=1}
MEDIAL WIDTH SCUT/WING	*	*
BASAL WIDTH SCUT/WING	*	*
SCUT/WING W: RECEPTACLE W	*	*
APPROX. # SEED SCARS	79 (378.2) 955 {n=5; SD:344}	79 (117.5) 156 {n=2}
SEED SCAR DENSITY (per 25 mm ²)	24 (44) 66 {n=5; SD:16.3}	9 (16.8) 26 {n=4}
SEED SCAR LENGTH (p)	0.7 (0.9) 1.1 {n=11; SD:0.1}	1 (1.3) 1.5 {n=18}
SEED SCAR LENGTH (m)	0.6 (1) 1.7 {n=29; SD:0.3}	1.4 (2) 2.7 {n=16}

CHARACTER	<i>Gonophylloides strictum</i>	<i>Gonophylloides waltonii</i>
SEED SCAR WIDTH	0.5 (0.8) 1.1 {n=25; SD:0.1}	0.9 (1.2) 1.5 {n=14}
LEAF LENGTH	over 180 mm	*
LEAF WIDTH	18.6 (33.3) 43.7 {n=5; SD:9.1}	*
MIDRIB WIDTH (RANGE)	3.3 (4.8) 5.9 {n=6; SD:1.4} to 0.3	*
FRUIT ATTACHMENT FROM LEAF BASE	*	*
PETIOLE WIDTH	*	*
PETIOLE LENGTH	*	*
MID-LAMINAR VEIN ANGLE	53 (59.9) 64 {n=7; SD: 3.6}	*
MARGINAL VEIN ANGLE	63 (71.7) 80 {n=9; SD:6.6}	*
MARGINAL VEIN DENSITY (per 10 mm)	18 (25.2) 34 {n=5; SD:7}	*
SCLEROTESTA LENGTH	*	*
SCLEROTESTA WIDTH	*	*
SEED WING LENGTH	*	*
SEED WING WIDTH	*	*
SEED LENGTH	*	*
SEED WIDTH	*	*

Dictyopteridiaceae **Table A.II.9. Quantitative data collected for *Dictyopteridium* spp.**

CHARACTER	cf. <i>Dictyopteridium sporiferum</i>	<i>Dictyopteridium natalensis</i>	<i>Dictyopteridium flabellatum</i>
TOTAL LENGTH	43.2	17.4 (21.6) 29.7 {n= 26; SD:3.3}	21 (42) 54.2 {n=9; SD:10.1}
TOTAL WIDTH	12.4	5.5 (8.1) 12.4 {n=34; SD:1.6}	8 (10.6) 12.5 {n=9; SD: 1.4}
TOTAL L:W	3.5	2.1 (2.7) 3.4 {n=26; SD:0.3}	2.5 (3.7) 5.2 {n=5; SD: 1}
PEDICEL WIDTH (at insertion)	2.1	1.4 to 3.5 {n=6}	2.7 (2.6) 2.7 {n=2; SD: 0.1}
PEDICEL WIDTH (basal)	*	*	*
PEDICEL LENGTH	*	1.2 (2) 2.5 {n=4; SD:0.5}	2.5 {n=1}
RECEPTACLE WIDTH:PEDICEL WIDTH	*	*	*
RECEPTACLE AREA	270	70 (112.2) 180.7 {n=16; SD:31.6}	90.3 (266.4) 413 {n=8; SD:118.5}
RECEPTACLE WIDTH	9	4.7 (6.9) 9.7 {n=29; SD:1.4}	5.7 (8.7) 12.6 {n=18; SD: 1.9}
RECEPTACLE LENGTH	42	16.4 (20.8) 28.2 {n=19; SD:3.3}	20.8 (39.3) 51.7 {n=9; SD: 9.2}
RECEPTACLE L:W	4.7	2.1 (3.1) 3.7 {n=19; SD:0.4}	3.3 (4.8) 6.7 {n=9; SD: 1.1}
LENGTH OF APICAL SPINE	*	*	*
BASAL WIDTH OF APICAL SPINE	*	*	*
BASAL LOBE DEPTH (receptacle)	*	*	*
PERIPHERAL GROOVE	*	*	*
MEDIAL WING WIDTH	1.8	0.4 (0.8) 1.5 {n=31; SD:0.3}	1 (1.9) 3.3 {n=13; SD: 0.8}
MEDIAL WING LOBE WIDTH	*	*	*
APICAL WING WIDTH	*	0.4 (0.6) 1 {n=11; SD:0.2}	0.9 (1.3) 1.9 {n=5; SD: 0.4}
APICAL WING LOBE WIDTH	*	*	*
BASAL WING WIDTH	1.3	0.3 (0.4) 0.5 {n=2; SD:0.1}	*
BASAL WING LOBE WIDTH	*	*	*
WING WIDTH: RECEPTACLE WIDTH	0.2	0.1 (0.1) 0.2 {n=27; SD:0.03}	0.1 (0.3) 0.5 {n=12; SD: 0.1}
MEDIAL WIDTH SCUT/WING	*	*	*
BASAL WIDTH SCUT/WING	*	*	*
SCUT/WING W:RECEPTACLE W	*	*	*
APPROX. # SEED SCARS	464	132 (190.8) 320 {n=12; SD:}	53 (350.6) 1289 {n=11; SD: 433.4}
SEED SCAR DENSITY (per 25 mm ²)	43	32 (44.4) 63 {n=27; SD:7}	42 (61.7) 78 {n=7; SD: 12.3}
SEED SCAR LENGTH (p)	*	*	*
SEED SCAR LENGTH (m)	0.9 {n=9}	0.5 (0.1) 1.4 {n=204; SD: 0.2}	0.4 (0.8) 1.2 {n=59; SD: 0.2}

CHARACTER	cf. <i>Dictyopteridium sporiferum</i>	<i>Dictyopteridium natalensis</i>	<i>Dictyopteridium flabellatum</i>
SEED SCAR WIDTH	0.7 {n=7}	0.4 (0.7) 1 {n=155; SD: 0.1}	0.4 (0.5) 0.8 {n=32; SD: 0.1}
LEAF LENGTH	*	*	*
LEAF WIDTH	*	15 to over 170 {n=3}	*
MIDRIB WIDTH (RANGE)	*	1.9 to 0.5 {n=6}	*
PETIOLE WIDTH	*	2.1 to 3.7 {n=2}	*
PETIOLE LENGTH	*	6 {n=2}	*
MID-LAMINAR VEIN ANGLE	*	38 (47) 58 {n=12; SD: 6}	*
MARGINAL VEIN ANGLE	*	32 (47) 60 {n=12; SD: 9}	*
MARGINAL VEIN DENSITY (per 10 mm)	*	22 (24.3) 26 {n=4; SD: 1.7}	*
SCLEROTESTA LENGTH	*	*	*
SCLEROTESTA WIDTH	*	*	*
SEED WING LENGTH	*	*	*
SEED WING WIDTH	*	*	*
SEED LENGTH	*	*	*
SEED WIDTH	*	*	*

Lidgettoniaceae

Table A.II.10. Quantitative data collected or referenced for *Lidgettonia* spp.

CHARACTER	<i>Lidgettonia africana</i> (Lawley)	<i>Lidgettonia africana</i> (from Lacey et al., 1975)	<i>Lidgettonia africana</i> (Inhluzane)	<i>Lidgettonia lidgettonioides</i> (from Lacey et al., 1975)	<i>Lidgettonia elegans</i> (from Lacey et al., 1975)
NUMBER OF CUPULES	1 to 4	2 to 4, up to 7 {n=50}	2 {n=1}	2 to 4	2-3 {n=16}
CUPULE LENGTH (laterally comp.)	3.3 (4.5) 8.3 {n=9; SD: 1.5}	*		*	*
CUPULE WIDTH (laterally comp.)	2.9 (4.8) 6.6 {n=9; SD: 1}	*		3 to 8	*
CUPULE LENGTH:WIDTH (lat. comp.)	0.7 (1) 1.7 {n=9; SD: 0.3}	*		*	*
CUPULE LENGTH (dv comp.)	3.1 (3.7) 4.3 {n=3}	*	4 (4.6) 5.5 {n=8; SD:0.5}	*	2.4-3.4
CUPULE WIDTH (dv comp.)	3 (3.6) 3.7 {n=3}	3-7.5 {n=50}	4.8 (5.4) 6.5 {n=7; SD:0.6}	8.6 to 12.7	*
CUPULE LENGTH:WIDTH (dv comp.)	0.8 (1) 1.1 {n=3}	*	0.8 (0.9) 0.9 {n=7}	*	*
NUMBER OF CUPULE SEGMENTS	5 to 6, or margin entire	6-11 {n=50}	6 (7.3) 8 {n=7; SD:0.8}	4 to 8	2 to 3
PEDICEL LENGTH	3.3 (3.6) 3.8 {n=2}	2->7 mm	*	5.2-10	1.4-6.8
PEDICEL WIDTH	0.2 {n=1}	0.2-1	*	0.3 to 0.8	0.3-0.5
RECEPTACLE WIDTH	2 (2.4) 3 {n=5; SD: 0.4}	1.6-3	1.9 (2.1) 2.5 {n=6; SD:0.2}	*	1.2-1.5
RECEPTACLE LENGTH	1.8 (2.5) 3.5 {n=6; SD: 0.6}	*	2 (2.4) 2.8 {n=6; SD:0.3}	*	*
RECEPTACLE L:W	0.9 (1.1) 1.4 {n=5; SD: 0.2}	*	0.9 (1.1) 1.4 {n=6; SD:0.2}	*	*
RECEPTACLE AREA	3.8 {n=3}	*	2.9 (3.9) 4.8 {n=6; SD:0.8}	*	*
MEDIAL WING WIDTH	0.9 (1.9) 3.1 {n=15; SD: 0.7}	1.1-3	1.2 (1.6) 2 {n=13; SD:0.2}	3 to 6.5	0.7-2.5
DEPTH OF SCALLOPS	0.4 (0.8) 1.1 {n=10; SD: 0.2}	1.6	0.4 (0.6) 0.8 {n=7; SD:0.1}	1.4-2	0.3
DISTANCE BETWEEN WING POINTS	1.4 (1.6) 2.1 {n=9; SD: 0.4}	1.6-3	1.2 (1.6) 2.1 {n=13; SD:0.3}	3.9-5.4	1.1
APPROX. # SEED SCARS	5 (5.5) 7 {n=6; SD: 0.8}	c. 6-11	9 (11.2) 13 {n=6; SD:1.5}	c. 5-7	2 to 3
SEED SCAR LENGTH	0.8 (1.2) 1.5 {n=9; SD: 0.3}	*	0.7 (0.8) 1 {n=10; SD:0.1}	1.5	0.8-1 {n=16}
SEED SCAR WIDTH	0.7 (1) 1.4 {n=15; SD: 0.3}	0.4-1	0.4 (0.6) 0.7 {n=17; SD:0.1}	1.2	0.6-0.8 {n=16}
SCALE LEAF LENGTH	21.7 (22.4) 27.4 {n=7; SD: 4.3}	22-40 {n=50}	*	10 to 23	15.8 (25) 29.2 {n=16}
SCALE LEAF WIDTH	6.2 (9.3) 13.2 {n=6; SD: 2.7}	6 to 17 {n=50}	11.9 {n=1}	4.5-7	4.3 (6) 8 {n=16}
SCALE LEAF L:W	1.6 (2.6) 4 {n=6; SD: 1}	*	*	*	*
WIDTH SCALE LEAF BASE	1.3 (1.8) 2.4 {n=6; SD:0.4}	0.7-3 {n=50}	*	1.1-2	0.9 (1.5) 2 {n=16}

PROXIMAL VEIN ANGLE (medial)	11 (22)	26 {n=6; SD: 5.9}	11.5-49	24 (27.3) 33 {n=3; SD:4.9}	*	20-32
MARGINAL VEIN ANGLE	55 (67.5)	75 {n=8; SD: 7.3}	28-53	38 (46.7) 55 {n=3; SD:8.5}	*	37-42
MARGINAL VEIN DENSITY (per 5 mm)	11 (12.3)	14 {n=3}	12 to 14	14 {n=1}	*	12 to 14
TOTAL SEED LENGTH	*		1.6-3.7	2.3 {n=1}	4-4.3	3 (3.5) 4.5 {n=16}
TOTAL SEED WIDTH	*		2-3.6	2.7 {n=1}	3.3-3.7	3 (3.3) 4.3 {n=16}
SEED L:W	*		0.8 - 0.9	0.9 {n=1}	*	*
SCLEROTESTA LENGTH	*		1 to 2.5	2.2 {n=1}	*	*
SCLEROTESTA WIDTH	*		0.8 to 1.2	1.4 {n=1}	*	*
WING WIDTH	*		0.6-1	0.8 {n=1}	<0.4	0.9-1.3

GLOSSARY OF BASIC TERMS

Below is a list of some of the terms used in the description of the glossopterid fructifications and their subtending leaves.

FRUCTIFICATIONS

Acropetal: maturing/produced sequentially from the base to the apex.

Basipetal: maturing/produced sequentially from apex to base.

Campylodromous venation: several primary veins or their branches, originating at or near a single point and running in strongly recurved arches that converge apically (e.g. Leaf Architecture Working Group, 1999).

Capitulum (*pl. capitula*): a simple derivation of the Latin ‘*caput*’ meaning ‘head’, and applied here to members of the Dictyopterideaceae and Lidgettoniaceae, in reference to the receptacle and its wing.

Cicatrix (*pl. cicatrices*): from the Latin word for scar; used here for the central, often raised (in impressions) tubercle in the centre of a seed scar, which represents the point of hilar detachment from the fructification (used by Schopf, 1976);

Cupule: the Oxford English Dictionary defines a cupule as a cup-shaped organ, receptacle, etc. The word is derived from the Latin cupula, or cupola, which is a rounded dome. The term is broadly used in botanical, mycological and zoological fields, and has been used by some authors (e.g. Lacey *et al.*, 1975) to refer to the microfructi attached to scale leaves in the Lidgettoniaceae. Some authors have objected to the term on the grounds that it infers homologies with northern hemisphere pteridosperms. Here the fertile structures of the Lidgettoniaceae are called *capitula* to avoid confusion.

Dentate wing margin: a scalloped margin, where the section of wing corresponding to a marginal seed scar is broadly indented, the ‘teeth’ aligned with the junctions between seed scars; compare with a lobed wing.

Fertiliger: a term favoured by some authors for the fertile unit comprising a glossopterid fructification and its subtending leaf (introduced by Schopf, 1976, but not extensively used).

Fluting: shallow, rounded grooves in the wing, perpendicular to the receptacle margin and bounded by sharp creases (in impressions of the fertile surface), or ridges (in impressions of the sterile surface) that correspond to veins on the sterile surface of the receptacle.

Lobed wing: characteristic of *Ottokaria*, where the wing is divided into lobes that exhibit varying degrees of fusion; the mid-line of each lobe corresponds to the mid-line of a single marginal seed scar; compare with a *dentate wing margin*.
*Pedice*l: in this study refers to the stalk of the ovulate fructifications.

Polysperm: multiovulate fructification, bearing multiple seeds; term introduced by Schopf (1976) and used by Anderson & Anderson (1985) but not by many other authors.

Primary wing: *Bifaria*la *intermittens* and *Elatra leslii*, previously assigned to the genus *Hirsutum*, have been found to possess at least two superposed wings. The more robust, prominent wing, characterised in both taxa by a tapered base and elongated apex, has been referred to here as the 'primary wing'. In both *B. intermittens* and *E. leslii*, the primary wing was the only wing to have been included in the original diagnoses of the two species. The more obscure, apparently more fragile, secondary wing, is recognised as such for the first time in this study. The terms 'primary' and 'secondary' have been assigned on the basis of the prominence of the wing forms.

Receptacle: the central, seed-bearing part of both the capitate and cupulate fructifications (sensu McLoughlin, 1990a); the receptacle is bifacial, with seed scars on one surface and venation on the opposing surface.

Secondary wing: see 'Primary wing'.

Seed scar: an elliptical to circular, raised cushion-like structure, usually with a central depression containing a raised tubercle, representing a point of seed attachment; the cushion represents a hollow in which the seed base would have rested, and the tubercle represents the cicatrix, or vascular connection to the fructification.

Seed scar density: the number of seed scars counted within a 25 mm² area of the receptacle.

Wing: the flange of tissue along the periphery of the receptacle; may be variously fluted, lobed, scalloped, broad, narrow etc. depending on the taxon; always finely striated; fluting corresponds to veins on sterile surface of fructification and seed scars on fertile surface in capitate polysperms; thinner than the fleshy receptacle, apparently membranous and delicate in some cases.

LEAVES

Although glossopterid leaf taxonomy has only been touched upon, descriptions of the subtending *Glossopteris* leaves of attached fructifications have been included and certain descriptors used in the elucidation of the leaves need to be clarified (see text-fig. 3.1.5, p. 49).

Leaf sectors: three length-wise sectors or regions are referred to in leaf descriptions, viz. apical, medial and basal; the lamina has also been divided into three lateral regions, from midrib to margin, viz. proximal (adjacent to midrib), mid-laminal and marginal.

Marginal vein angle: the angle formed between the medio-longitudinal leaf axis and a line drawn through a vein near the margin of the leaf, in the medial section of the leaf.

Marginal vein density: the number of veins along a 5 mm section of the leaf margin.

Mesh: an area of leaf lamina bounded by anastomosing and bifurcating veins.

Mid-laminal vein angle: the angle formed by the medio-longitudinal leaf axis and a line drawn through a vein in the mid-laminal portion of the medial section of a leaf.

Midrib: the longitudinally orientated bundle of veins extending along part, or the entire medial length of some *Glossopteris* leaves, and which may resemble a strong, central mid-vein; there is no single, large vein but rather an aggregate of closely spaced veins; well developed hypodermal tissue is often associated with the midrib, emphasising its prominence.

TAXONOMIC ISSUES SURROUNDING THE GENUS HIRSUTUM

Under the impression that *Hirsutum* was an illegitimate and confusing generic title which had been discredited by several authors in the past (e.g. Mukherjee *et al.*, 1966; Rigby, 1978; Banerjee, 1984), Adendorff *et al.* (2002) unwittingly created a stir recently by reassigning the type species of this genus to *Gladiopomum dutoitides*. This publication was spurred on by the discovery of a number of exciting new morphological features amongst the fructifications historically grouped within Plumstead's (1958a) genus *Hirsutum*, and represents the first of three intended papers re-defining these taxa.

Some workers still defend the legitimacy of the name *Hirsutum* (e.g. Anderson & Anderson, 1985; Edith Taylor, IOPC 2004, Argentina, pers. comm.), and this Appendix has been included to explain why the decision was made to disband such a historic genus.

Strictly speaking, the name '*Hirsutum*' is illegitimate in terms of Article 20.2 of the ICBN (Tokyo Code, Greuter *et al.* 1994), which states that a descriptive term should not be used as a generic title. '*Hirsutum*' is an adjective used in formal taxonomic diagnoses (p. 338; Stearn, 1973), and therefore the name is nomenclaturally invalid. It is for this very reason that the name '*Lanceolatus*', another of Plumstead's (1952) glossopterid fructification taxa, has been declared illegitimate in terms of the code ('*Lanceolatus*' is cited as an example of an illegal name in the Tokyo Code; ICBN Art. 20.2, ex. 4).

Of course, nomenclatural correctness does not supersede the need for a taxonomic system that is useful, practical and consistent. There are several other reasons which weigh heavily in favour of discontinuing the use of this generic title. The following is a summary and discussion of the complex events which have created the taxonomic challenge with which we are faced today

(see section 3.2, p. 77 for more information about the morphological features mentioned here).

In 1952 Plumstead created the genus *Scutum*, erecting five species to accommodate the variation she noticed within this group. *Scutum dutoitides* was described as being longer and narrower than members of the other species, and as having a wing which was smoother and narrower, with poorly defined fluting and an entire margin. She noted that the wing in this species tapered away at the base, and was ‘finely striated in outward and upward curves looking like hairs’. Later she interpreted these striations as hair-like pollenate organs, and on this basis, Plumstead (1958a) placed all specimens residing in *Scutum dutoitides* in a new genus *Hirsutum*.

In the same paper Plumstead created a new species, *Hirsutum intermittens* to accommodate specimens of *Scutum dutoitides* which:

- were larger and broader;
- had a receptacle with a broad, square base and pointed apex;
- had a wing which tapered abruptly at the base;
- were closely associated with *Glossopteris intermittens*.

In creating *H. intermittens*, Plumstead (1958a) transferred all specimens with wings ‘finely striated in outward and upward curves looking like hairs’, out of the type species *H. dutoitides*. Yet, Plumstead’s primary reason for the creation of the genus *Hirsutum*, was to acknowledge the presence of this particular feature, which she interpreted to represent pollenate organs. At this point, the type species of the genus *Hirsutum* did not possess the key diagnostic characters specified by the generic diagnosis. Plumstead (1958a) had only *inferred* the presence of pollenate organs in the type species *H. dutoitides* based on similarities in the wing structure with the secondary or scutoid wing of *H. intermittens*, which did possess these striations on its primary wing. Plumstead (1958a) apparently considered these taxa to be distinguished only on differences in receptacle shape and dimensions, and she explained the lack of pollenate structures in some specimens of both taxa in terms of these structures

being ephemeral or transient. In fact the 'pollenate structures' were missing in every single one of the *H. dutoitides* specimens.

In effect, Plumstead (1958a) gave no valid reasons for the separation of the type species, *H. dutoitides* from *Scutum*. The only distinguishing feature she cited for the new genus was that the fertile organs bore hair-like pollenate organs. Since we know that none of the fructifications actually bore pollenate structures, the diagnosis was never valid. At the time, most authors viewed the diagnosis with suspicion, and challenged the wisdom in creating a new genus on the basis of this feature alone. Rigby (1978), Mukherjee *et al.* (1966) and Banerjee (1984) all concurred that *Hirsutum* was an unacceptable taxon, and they did not accept the evidence provided by Plumstead (1956a, 1958a) for the existence of pollen bearing organs. They effectively sank the genus, recognising the component species as members of *Scutum*.

But the fact of the matter is that Plumstead's (1958a) *H. dutoitides* does belong in a separate genus, and is a distinct taxonomic entity, even though for reasons other than those proposed in the original diagnosis. It could be argued that whatever Plumstead's reasons were for singling out these fructifications as a separate taxon, her recognition of this entity at a generic level should be honoured, and the name she chose retained, but with hefty emendation of the genus.

Perhaps with this in mind, Anderson & Anderson (1985) perpetuated use of the name *Hirstum*, and included *H. dutoitides*, *H. intermittens*, and two new species, *H. leslii* and *H. acadarensis* within the genus. Anderson & Anderson's (1985) revised diagnosis of *Hirsutum* characterised it as having a wing with an extended apex, tapered base, and a 'hirsute appearance'. The type species, *H. dutoitides* had none of these features, and there were no diagnostic characters unifying the group of fructifications the genus was purported to encompass. This study has revealed that members of *H. intermittens* and *H. leslii* have complex wing structures that set them apart from any other known glossopterid fructification, and which should free them from any obligation to the name *Hirsutum*.

However, there is one additional complication involving the relationship between *H. dutoitides* and *H. intermittens*. We have already discussed how *H. dutoitides* has certain features in common with *H. intermittens*. The secondary wing in *H. intermittens* (which Plumstead (1958a) referred to as the ‘real wing’) is virtually identical to the wing of *H. dutoitides*, which is presumably why Plumstead initially grouped these fructifications within the same genus. The complication involves the specimen that Plumstead (1958a) assigned as the type for *H. dutoitides*. Adendorff *et al.* (2002) reluctantly retained this specimen as the type for *Gladiopomum dutoitides*, despite the fact it was poorly preserved and the counterpart (showing the sterile surface of the fructification) had been misplaced.

After carefully studying the photographs of the counterpart in Anderson & Anderson (1985; p. 250, pl. 75, figs 1&2), and subsequent to the discovery of the elaborate wing structure of *Hirsutum intermittens*, I am now convinced that the type for *H. dutoitides* is a specimen of *H. intermittens* in which the secondary wing is fully exposed, and the primary wing is only visible in the apical part of the fructification, creating the effect of a particularly broad apical spine, the primary diagnostic feature of the genus *Gladiopomum*. Without damaging the type specimen, there is no way of confirming or disproving this point, but if it is in fact a specimen of *H. intermittens*, it has far-reaching implications regarding the description of the attached leaves in both species, which in turn will affect perceptions regarding the validity of leaf taxonomy in glossopterid studies.

This presents us with a sticky situation. If the type specimen of *H. dutoitides* is in fact a specimen of *H. intermittens*, then strictly speaking we should assign a new type specimen and a new specific epithet for *H. dutoitides*, and all those specimens currently residing within *H. intermittens* should be transferred to *H. dutoitides* under the existing type specimen. This taxonomic fiasco would contribute disastrously to an already very confusing situation.

I propose, for the sake of clarity and utility and in the spirit of meaningful taxonomy, that we should entirely disband the genus *Hirsutum* and assign its

various species to separate genera. The name *Bifariola* is proposed for the genus encompassing *Hirsutum intermittens* and *Hirsutum leslii* is a junior synonym of Appert's (1977) genus *Elatra*, although it should remain within a distinct species.

APPENDIX V

PUBLICATIONS PRODUCED

(Please find copies in back cover).

Adendorff, R., Bamford, M.K. and McLoughlin, S. 2003. *Liknopetalon*: a review of a rare gondwanan, Permian pteridophyte. Review of Palaeobotany and Palynology 126:83-101.

Adendorff, R., McLoughlin, S. and Bamford, M.K. 2002. A new genus of ovuliferous glossopterid fructifications from South Africa. Palaeontologia africana 38:1-17.

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PLATES

Table P.1. Alphabetical list of glossopterid ovulate fructifications with chapter and plate references.

TAXON	CHAPTER	PAGE	PLATES
<i>Arberia hlobanensis</i>	6.1	171	10 a, b; 11 h, i
<i>Arberia madagascarensis</i>	6.1	167	10 e, f; 11 j, k
<i>Bifariaia intermittens</i>	7.1	186	12 – 18
<i>Dictyopteridium flabellatum</i>	7.9	305	87 - 88; 89 e-g
<i>Dictyopteridium natalensis</i>	7.9	301	83 d-r; 84 - 86; 89 c, d
cf. <i>Dictyopteridium sporiferum</i>	7.9	299	83 a-c; 89 a, b
<i>Elatra leslii</i>	7.3	204	23 – 42
<i>Estcourtia conspicua</i>	7.2	195	19 – 22
<i>Gladiopomum acadarensis</i>	7.6	254	61 - 66; 69 a, b, e(ii)
<i>Gladiopomum dutoitides</i>	7.6	249	59 - 60; 68; 69 d, e(i)
<i>Gladiopomum elongatum</i>	7.6	257	67; 69 c, e(iii)
<i>Gonophylloides strictum</i>	7.8	284	79 - 80; 81 a-d; 82 b-d
<i>Gonophylloides waltonii</i>	7.8	287	81 e-l; 82 a
<i>incertae sedis</i> (prev. <i>Arberia allweyensis</i>)	5.2	157	10 c, d; 11 d, e, f
<i>Lidgettonia africana</i>	8.1	316	90 - 95; 100 a-c
<i>Lidgettonia elegans</i>	8.1	321	98 - 99; 100 f, g
<i>Lidgettonia lidgettonioides</i>	8.1	319	96 - 97; 100 d, e
<i>Ottokaria buriadica</i>	7.4	221	45 - 46; 47 a-c; 48 c
<i>Ottokaria hammanskraalsensis</i>	7.4	219	47 d, e; 48 b
<i>Ottokaria transvaalensis</i>	7.4	216	43 - 44; 48 a
<i>Plumsteadia gibbosa</i>	7.7	271	74 - 77; 78 a, b
<i>Plumsteadia lerouxii</i>	7.7	268	70 - 73; 78 c-f
<i>Rigbya arberioides</i>	5.1	151	2 – 9
<i>Scutum leslii</i>	7.5	234	49 – 58
<i>Vereenia leeukuilensis</i>	6.2	179	10 f-l; 11 a-c

Summary of plate contents

Plate 1: Intra-familial seed scar morphology.

Plates 2-9: *Rigbya arberioides*

Plates 10-11: *Aberia* spp. & *incertae sedis*

Plates 12-18: *Bifariaia intermittens*

Plates 19-22: *Estcourtia conspicua*

Plates 23-42: *Elatra leslii*

Plates 43-48: *Ottokaria* spp.

Plates 49-58: *Scutum leslii*

Plates 59-69: *Gladiopomum* spp.

Plates 70-78: *Plumsteadia* spp.

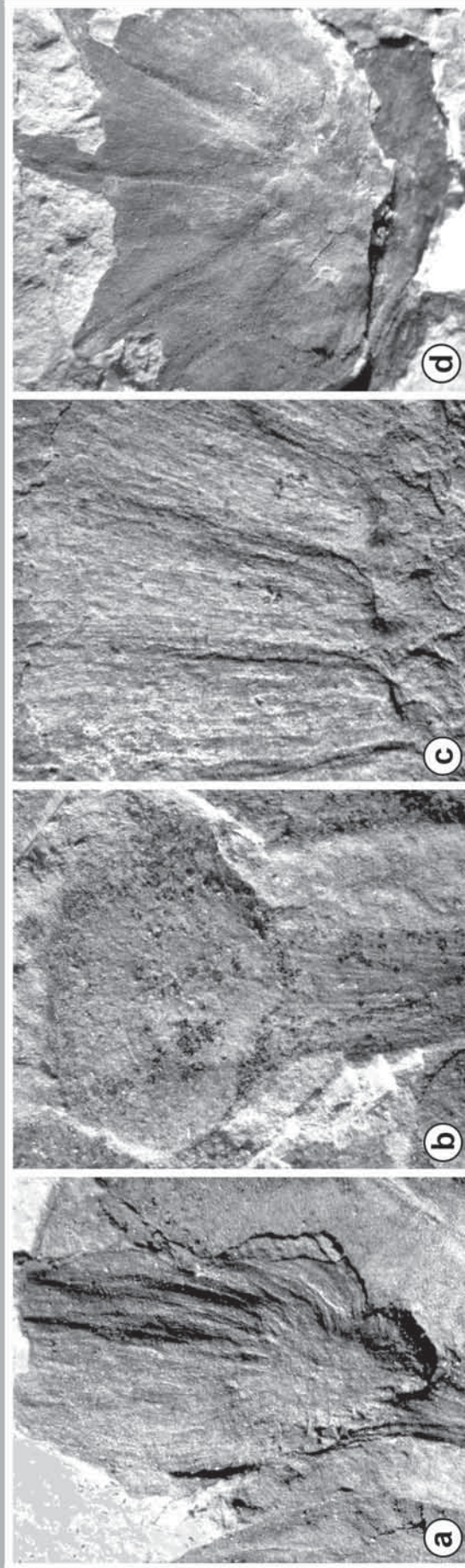
Plates 79-82: *Gonophylloides* spp.

Plates 83-89: *Dictyopteridium* spp.

Plates 90-100: *Lidgettonia* spp.

A NOTE REGARDING SCALE: All fructifications have been represented at approximately twice life-size, with some enlargements of important features. The scale bar towards the bottom of the plate applies to all photographs which do not have their own scale bar inserted somewhere on the photograph. However, in some cases, where there is an enlargement of the part and counterpart of a specimen, a scale bar may be included on only one of the photographs.

PLATE 1. Seed scar details of members from each of the four families of ovulate glossopterid fructifications recognised here. Note how each specimen has a seed scar with a finely striated distal wing or scale-like extension. In the Dictyopteridiaceae and Lidgettoniaceae, the wing is divided into units delimited by grooves passing on either side of each scar. Each unit is comparable to the arrangement of seed scar to distal scale/wing seen in the Arberiaceae and Rigbyaceae. (a) Rigbyaceae: *Rigbya arberioides* (BP/2/13047); (b) Arberiaceae: *Arberia hlobanensis* (BP/2/15893); (c) Dictyopteridiaceae: *Scutum leslii* (BP/2/13735); (d) Lidgettoniaceae: *Lidgettonia lidgettonioides* (NM/1576b). For scale comparisons, see relevant plates.



RIGBYACEAE

ARBERIACEAE

DICTYOPTERIDIACEAE

LIDGETTONIACEAE

PLATES 2 - 9: *Rigbya arberioides*

PLATE 2. *Rigbya arberioides* fructifications from Mooi River, displaying a variety of branching patterns; note the specimen in fig. (j), which undergoes a series of dichotomies, producing fourth-order branches; figs (s) & (t): enlargements of the specimen in fig (c), illustrating the presence of seed scars along the distal margin of the fan-shaped lamina; each scar is proximal to a longitudinally striated scale/ wing-like structure with a scalloped distal margin.

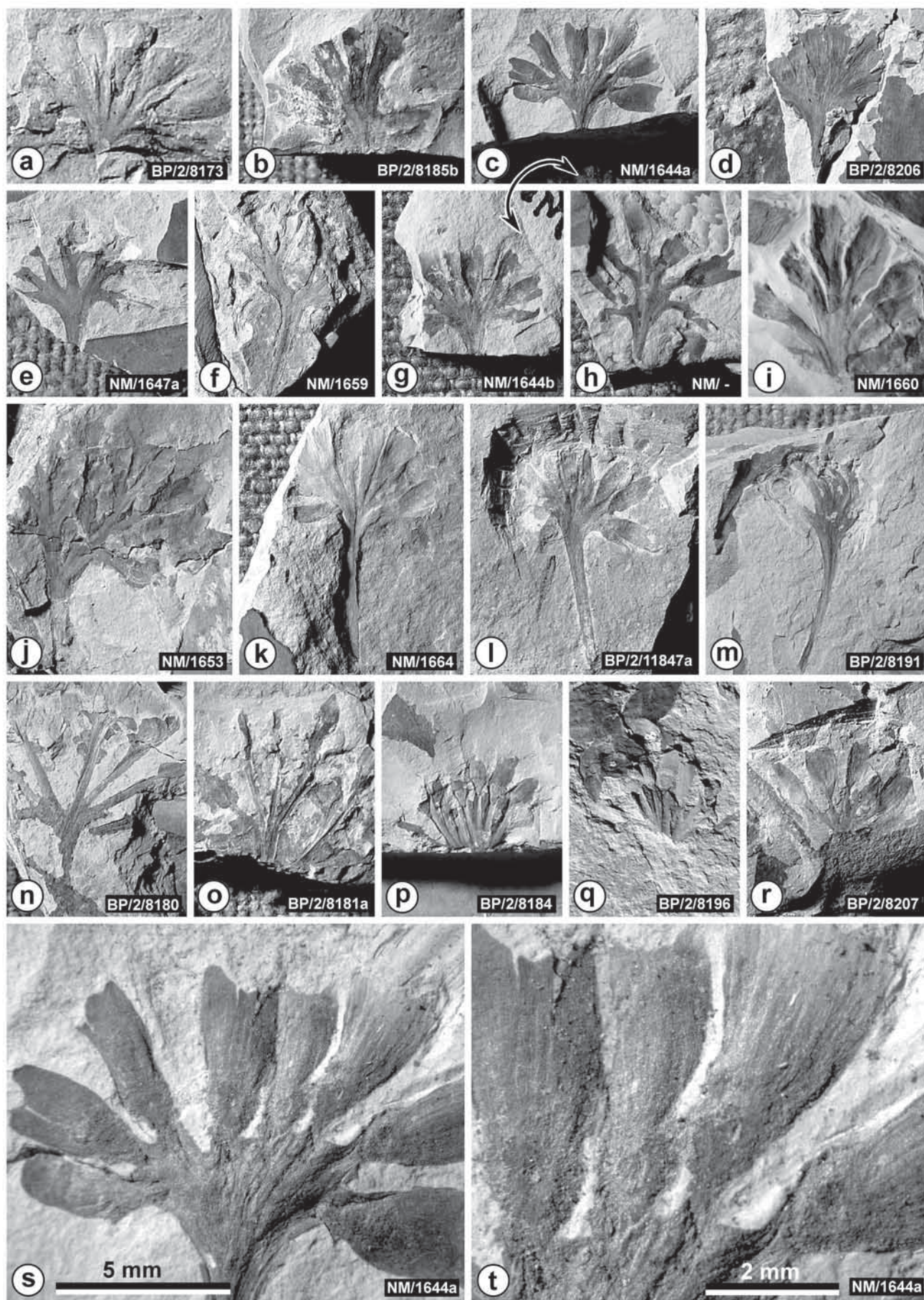


PLATE 2

PLATE 3. Further examples of *Rigbya arberioides*; figs (d) & (e) are enlargements of figs (a) & (b), and illustrate the bifacial nature of the fructifications; the sterile surface in (e) bears longitudinal striations that continue into the wing-like scales; the fertile surface bears a seed scar at the base of each scale.

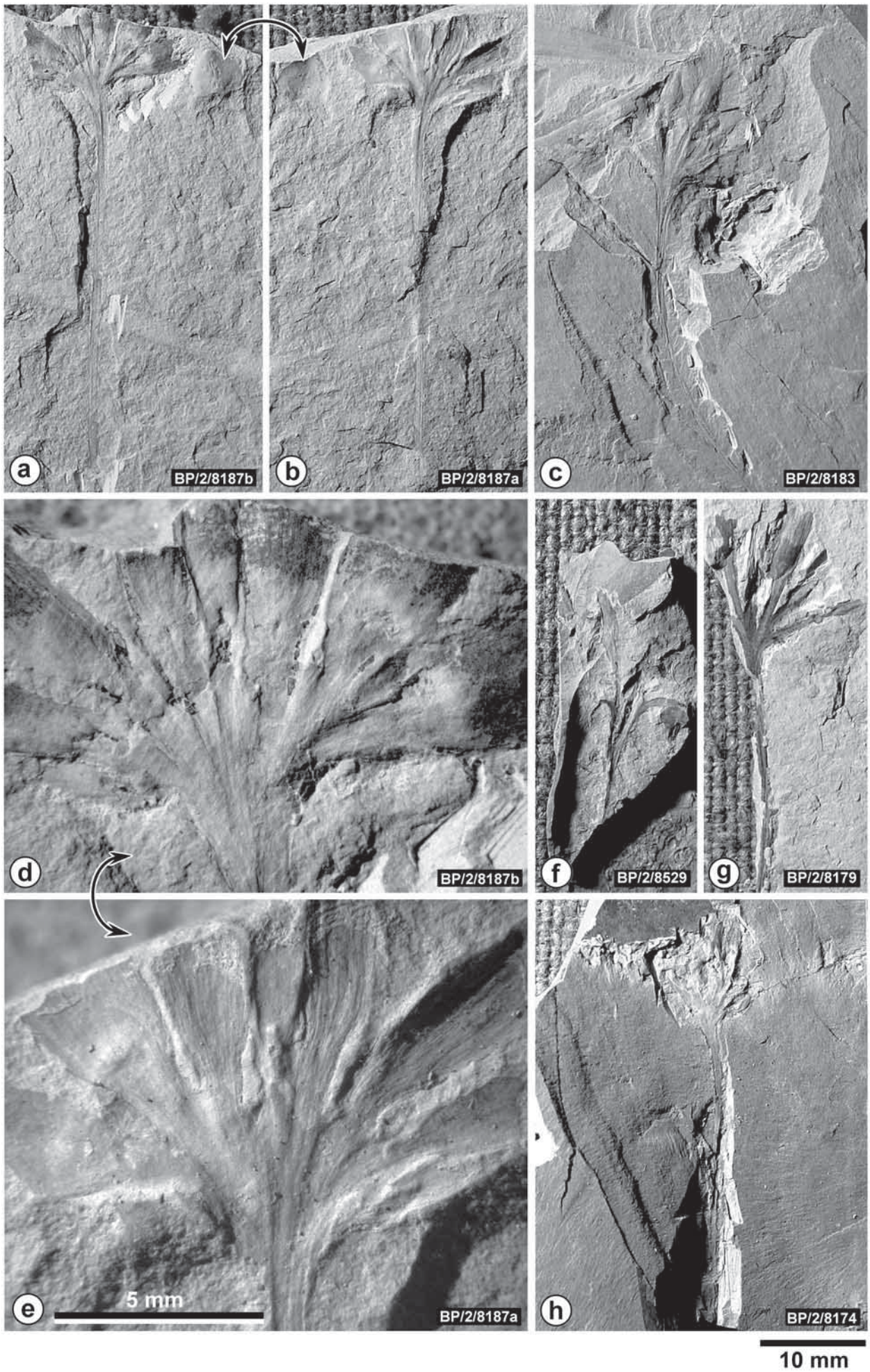
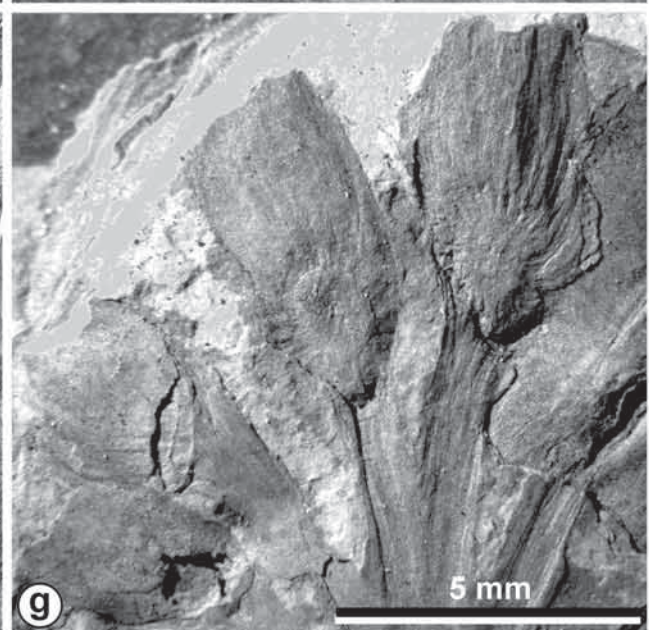
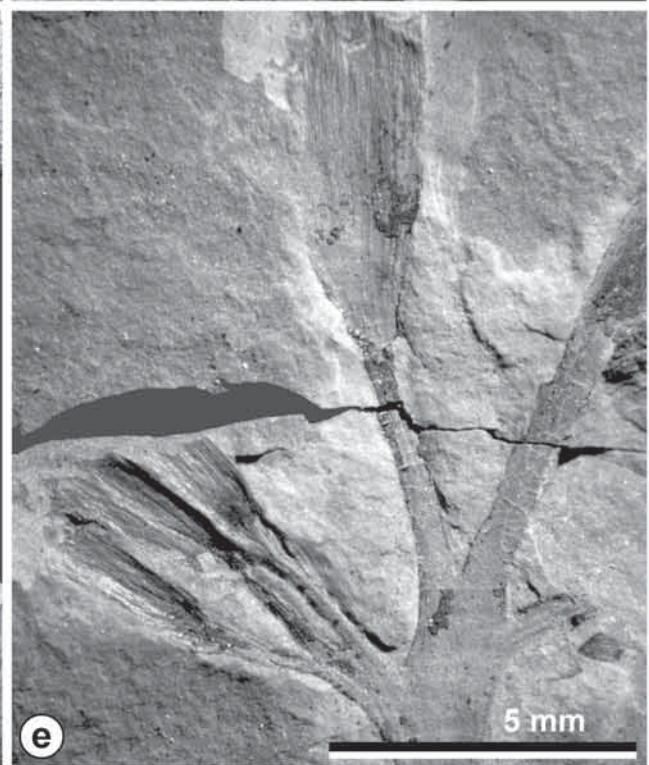
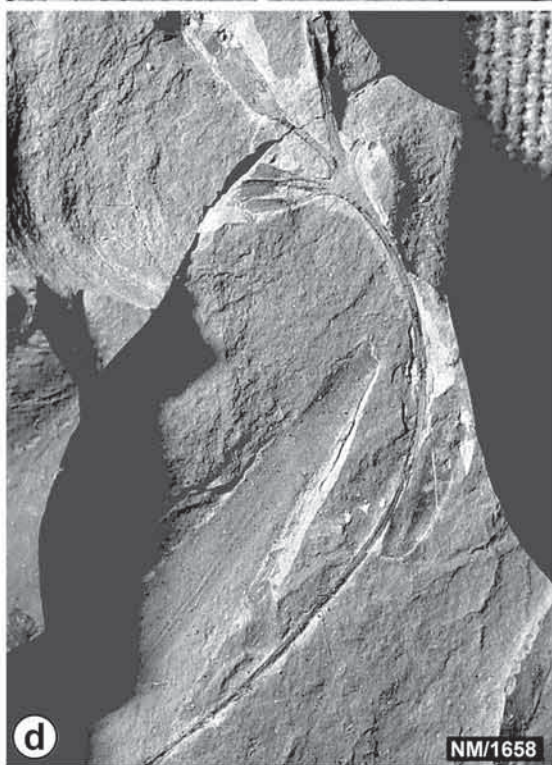
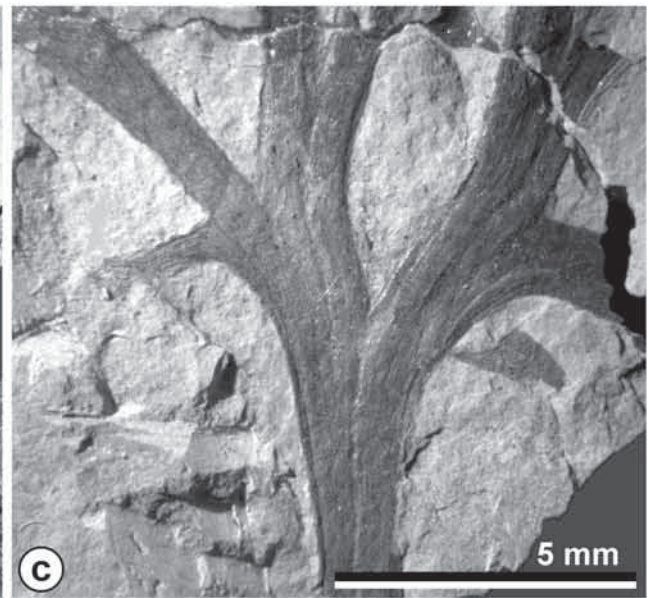
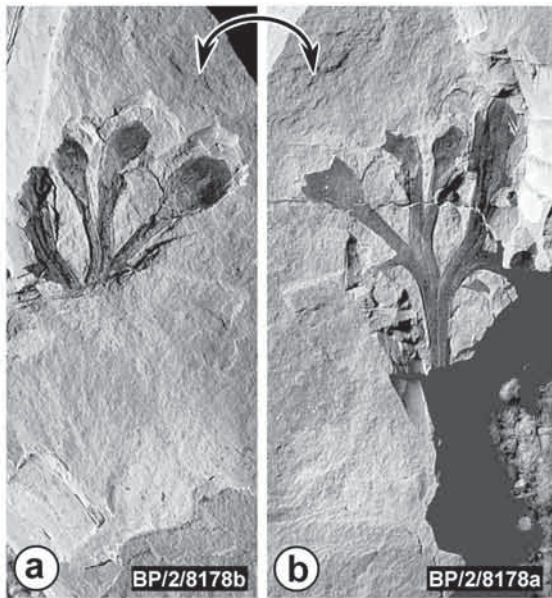


PLATE 3

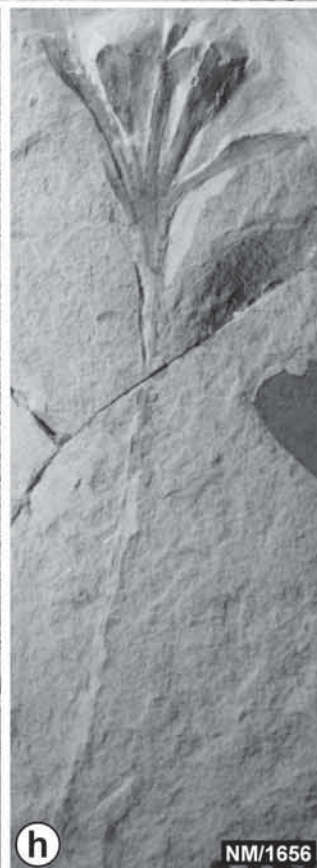
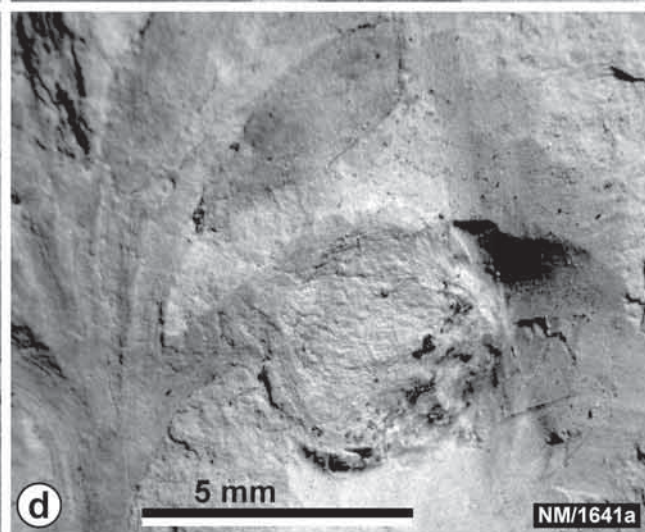
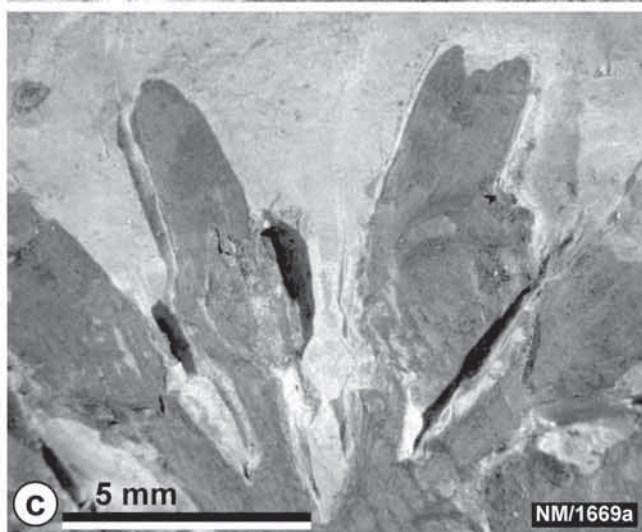
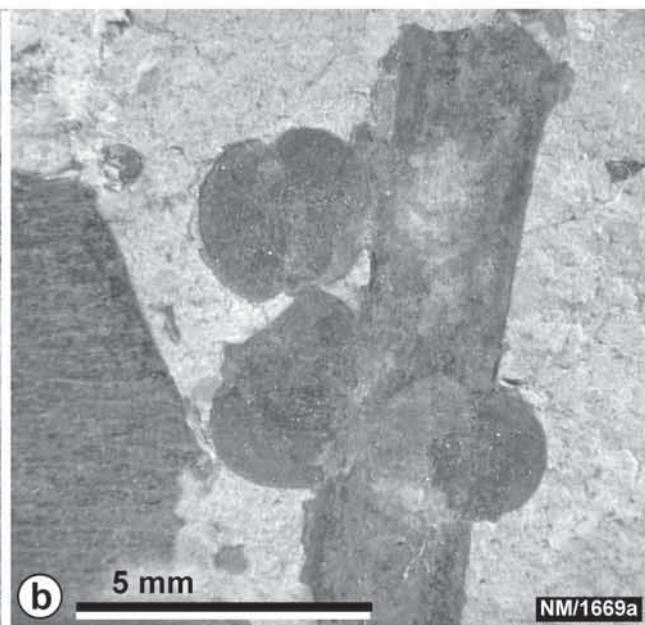
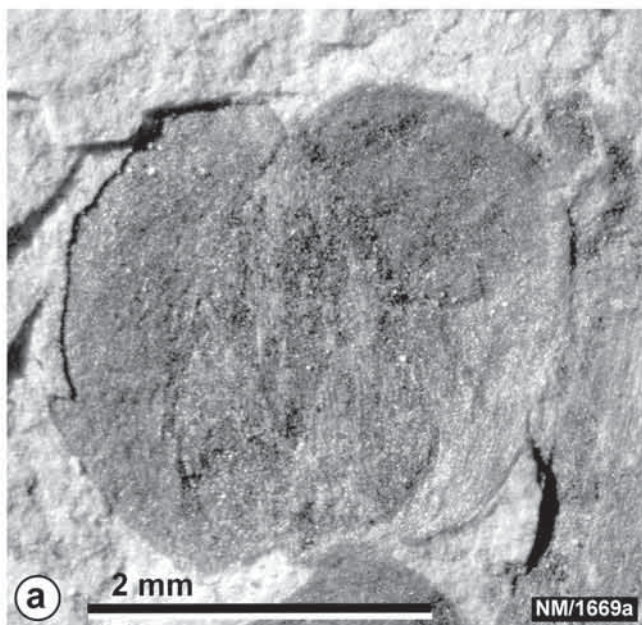
PLATE 4. Specimens of *Rigbya arberioides*; figs (a)-(c): part and counterpart of an incomplete fructification, with an enlargement of the primary dichotomy in (c); note the prominent striations on the pedicel, particularly the medial striation running from the dichotomy; each primary branch undergoes two further dichotomies, resulting in eight ultimate branches; figs (d) & (e): a particularly fascinating specimen, with the left side having suffered an injury early on in its development, or possibly a viral infection, resulting in stunting of all branches to the left of the primary dichotomy; figs (f) & (g): a specimen with an elliptical lamina and a single rank of branches along the periphery; the enlargement in fig. (g) illustrates the seed scar morphology very clearly; note the radially striated scars at the branch termini, each with a distal wing.



10 mm

PLATE 4

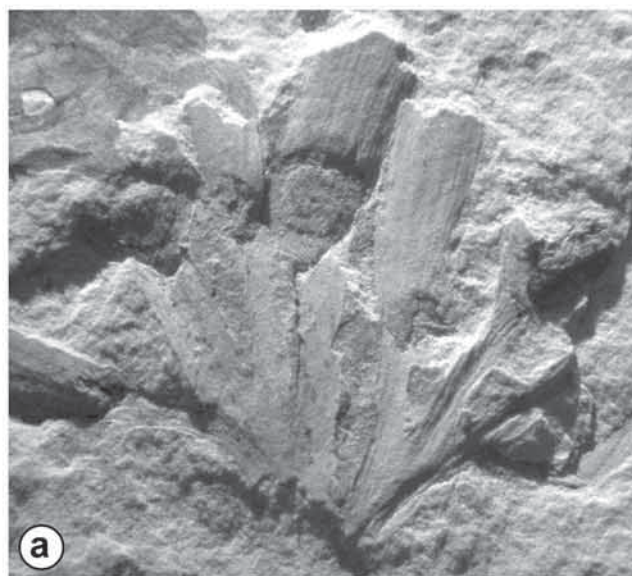
PLATE 5. Specimens of *Rigbya arberioides*. Figs (a) & (b): winged seeds closely associated with the holotype of *R. arberioides*; fig. (c): enlargement of the holotype in fig. (f); several of the branches have a seed attached at the base of the wing; fig. (d): enlargement of the attached seed in fig. (g); fig (e): specimen with a broad, fan-shaped lamina without differentiation of individual branches; fig. (h): fructification with a small fan-shaped lamina, and a single rank of long, thin terminal branches.



10 mm

PLATE 5

PLATE 6. Enlargements of *Rigbya arberioides* specimens. Fig. (a): a close-up of the specimen in pl. 2, fig. (q); the morphology of the seed scars is particularly well illustrated in this specimen; fig. (b): an enlargement of the specimen in pl. 2, fig. (p); this specimen has strange triangular seed scars, and although the terminal branches are clearly demarcated, they appear to be connected laterally by a thin lamina; fig. (c): enlargement of specimen in pl. 2, fig. (r) illustrating the smooth, striated sterile surface of a *R. arberioides* fructification.



(a)

5 mm

BP/2/8196



(b)

5 mm

BP/2/8184

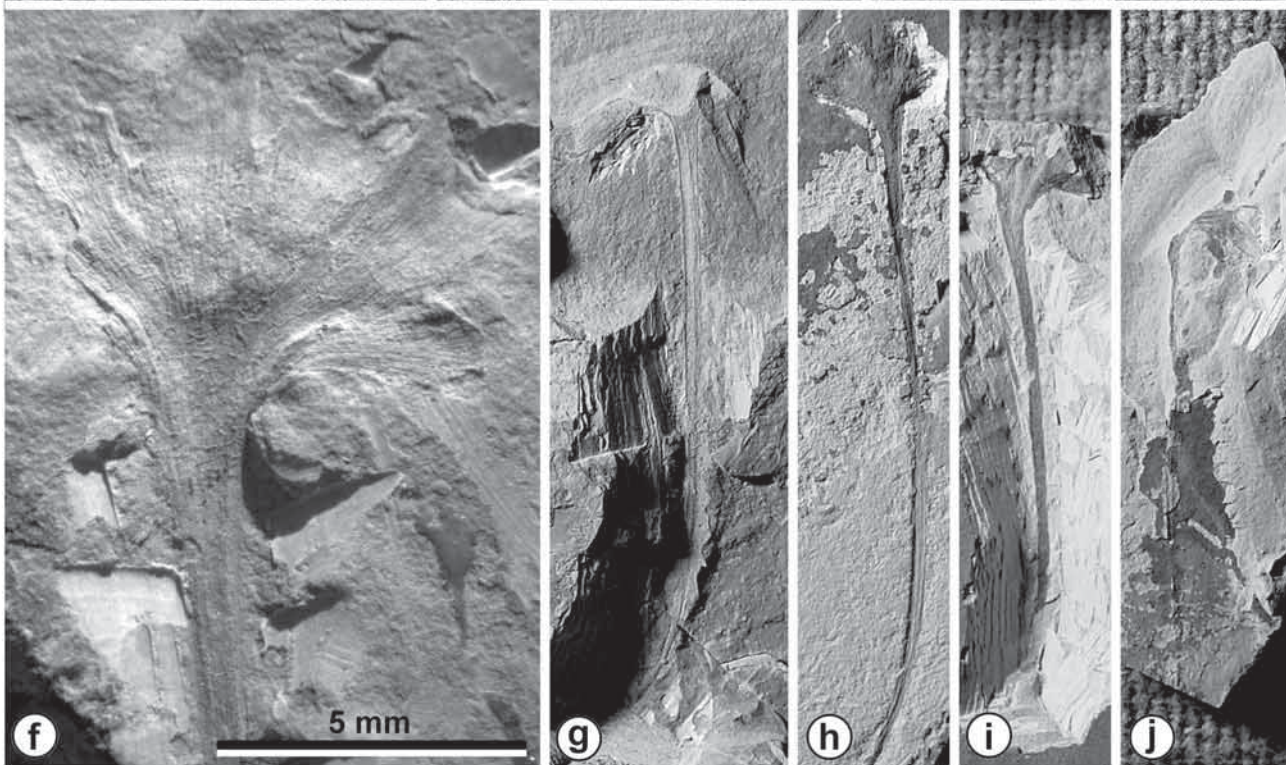
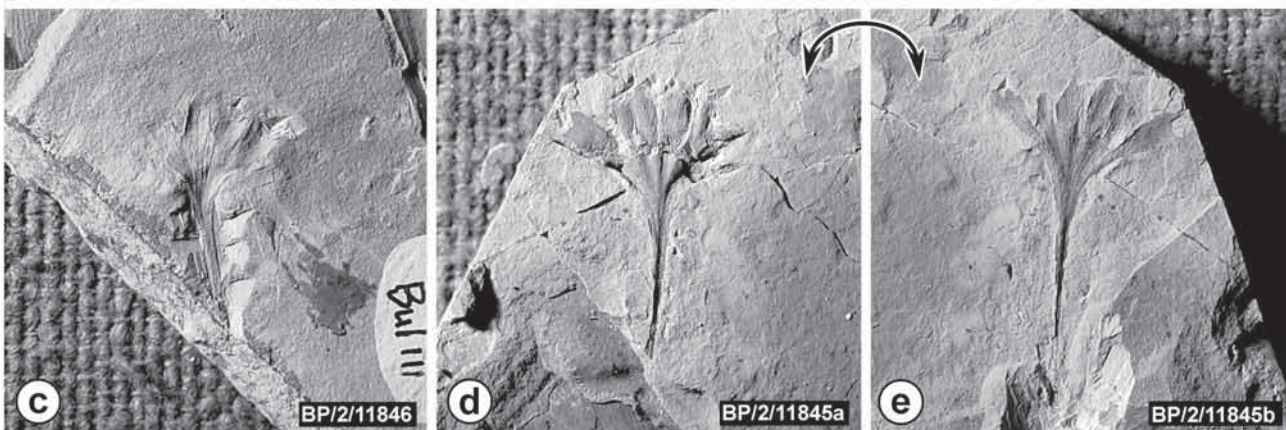
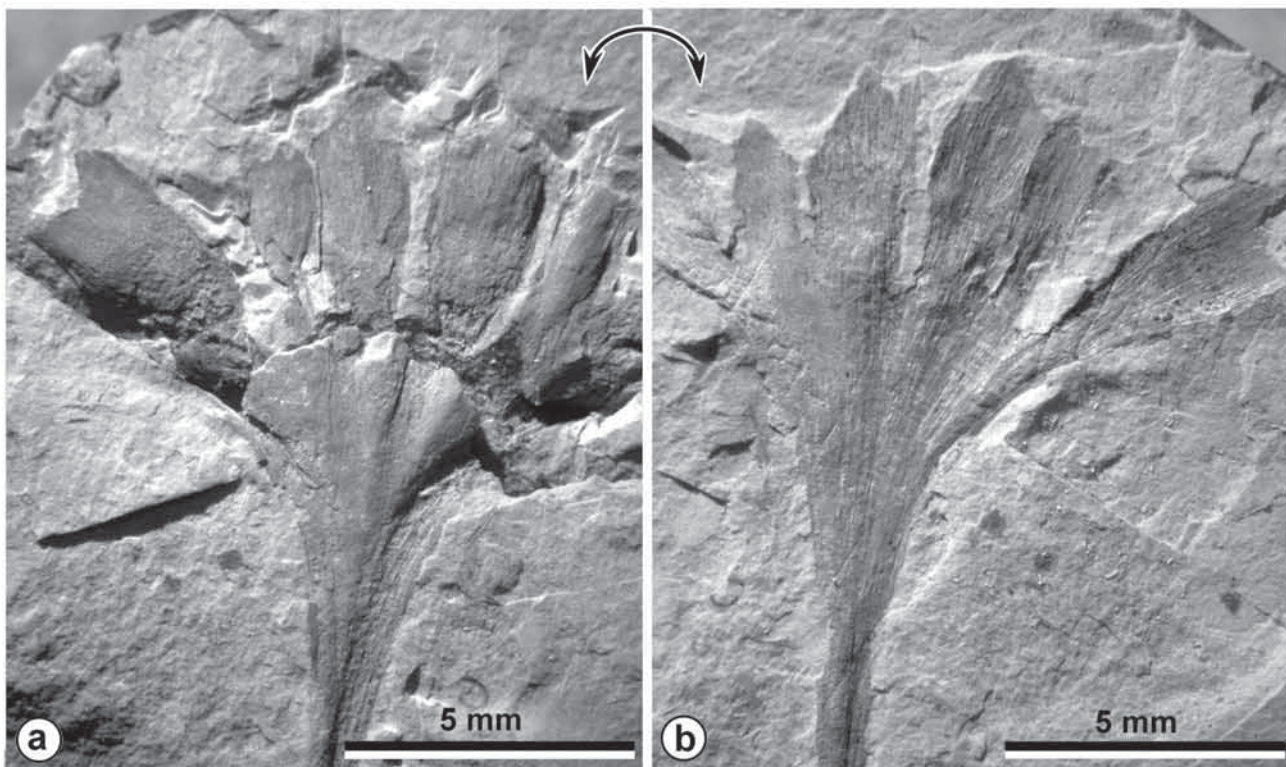


(c)

5 mm

BP/2/8207

PLATE 7. *Rigbya arberioides* from the Bulwer locality; note how all specimens from this locality have a very long pedicel, and a fan-shaped lamina bearing seed scars directly on the margin, without the development of branches. Figs (a) & (b): enlargements of the specimens in figs (d) & (e); note the smooth, striated sterile surface in (b), and the fertile surface bearing seed scars at the base of the scale/ wing-like structures in (a); figs (c) & (f): longitudinally striated sterile surface; figs (g)-(i): further examples of fructifications with very long pedicels.



BP/2/11847b

BP/2/11727a

BP/2/11848a

BP/2/11844b

PLATE 7

10 mm

PLATE 8. Drawings and a reconstruction of *Rigbya arberioides*.

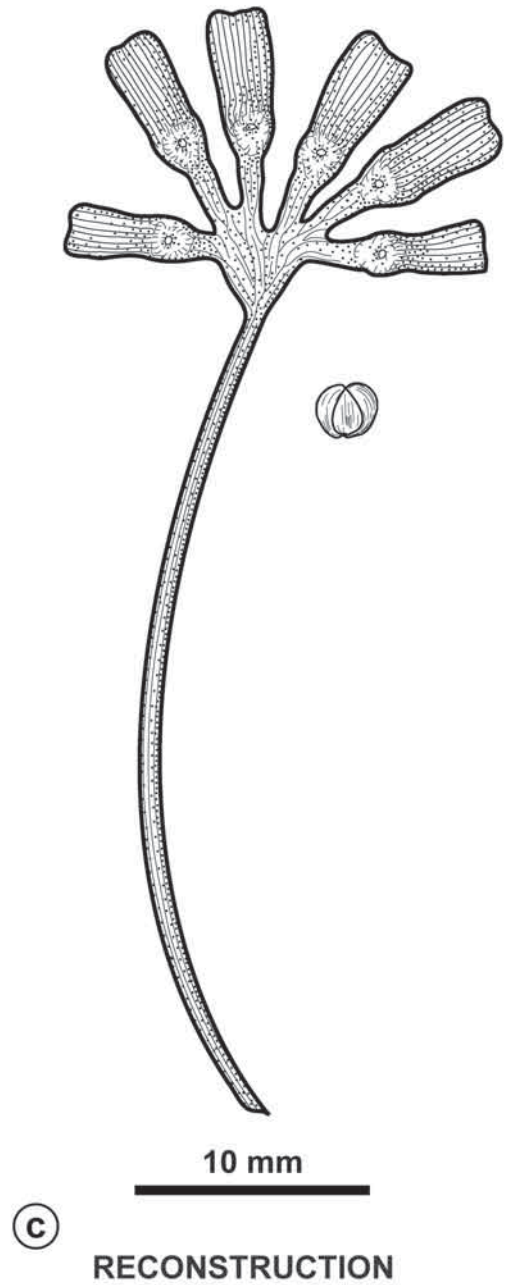
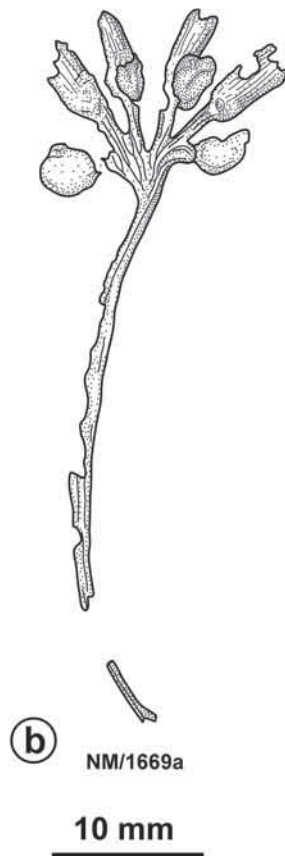
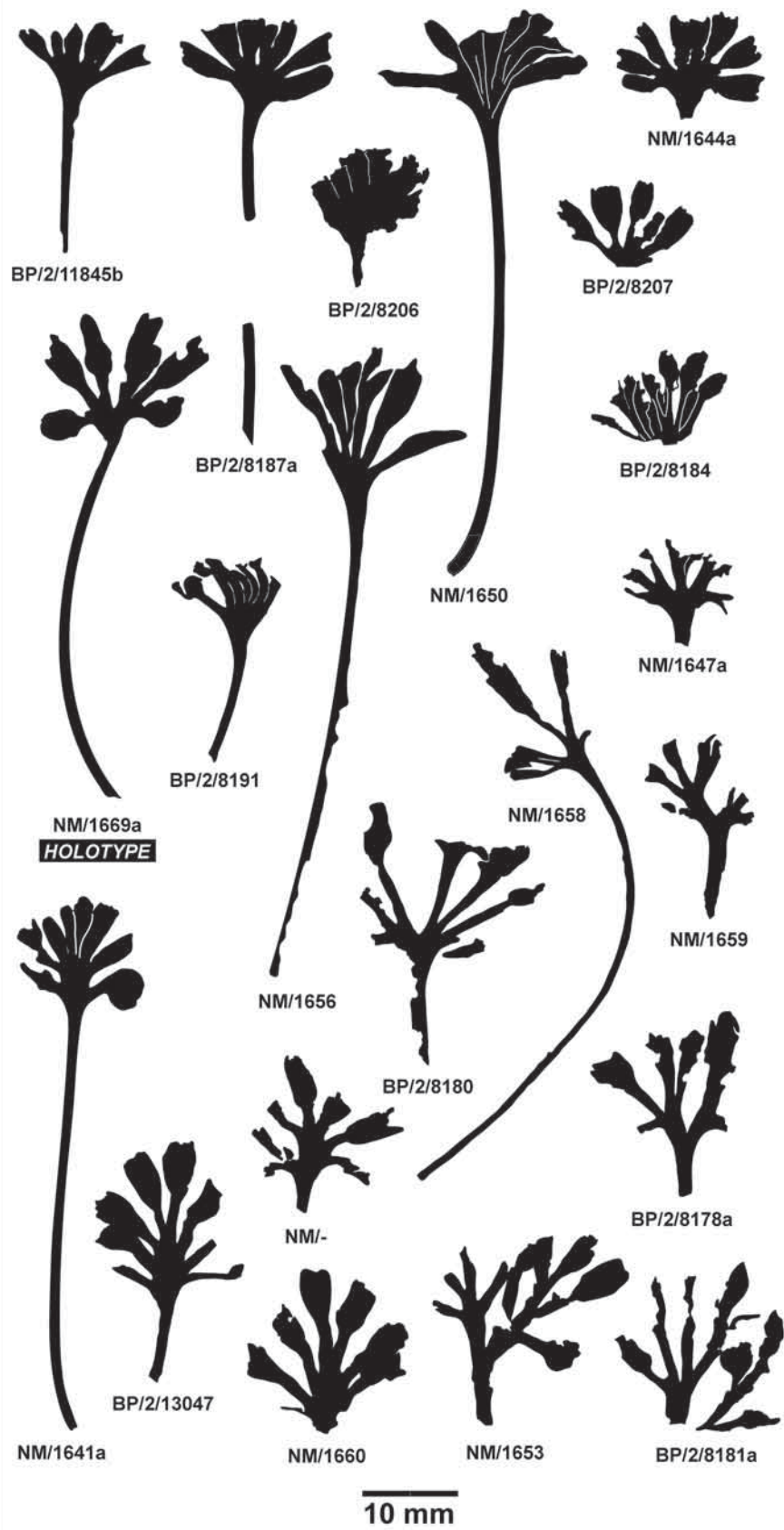
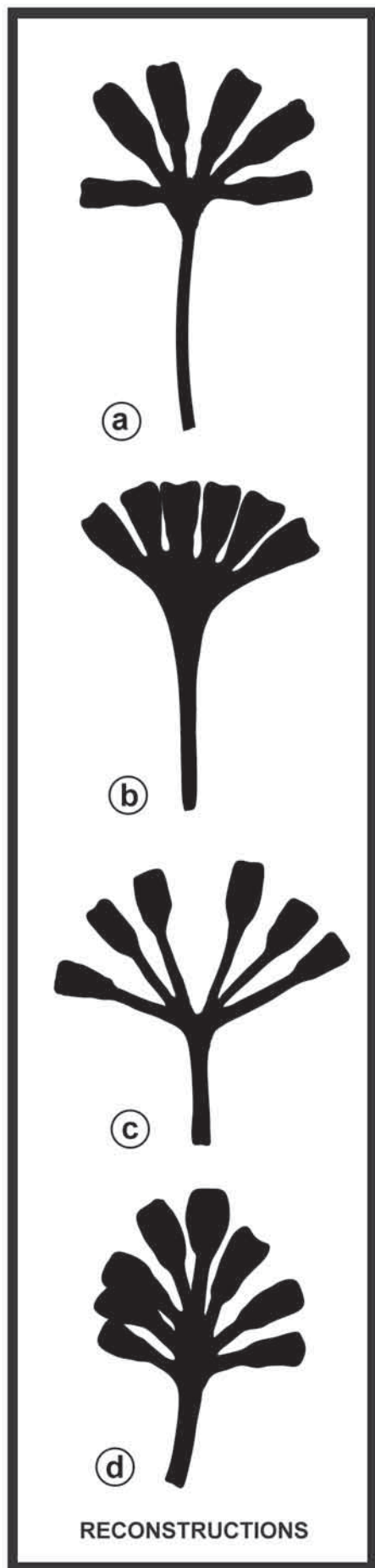


PLATE 9. Figs (a)-(d): primary morphological forms of *Rigbya arberioides* from Mooi River; fig. (a): small basal fan-shaped lamina gives rise to single order branches each terminating in a seed scar with a distal scale/wing; fig. (b): large basal fan-shaped lamina bearing seed scars with scale/wing directly along the distal margin, without development of individual branches; fig. (c): a primary dichotomy gives rise to two primary branches, each of which gives rise to three secondary branches terminating in a seed scar with distal scale/wing; fig. (d): and elliptical lamina gives rise to a series of single-order branches along the periphery, each terminating in a seed scar with distal scale/wing; fig. (e): silhouette drawings of fructifications from Mooi River, giving an indication of the diversity of branching patterns seen in these fructifications.



PLATES 10 - 11: *Arberia* spp. & *incertae sedis*

PLATE 10. Figs (a) & (b): part and counterpart of the holotype and only known specimen, of *Arberia hlobanensis*; the specimen may well have originally been attached to the associated axis, but was clearly not in organic attachment at the time of preservation; figs (c) & (d): part and counterpart of the holotype and only known specimen, of *Arberia allweyensis*; fig. (e): two partially overlapping, incomplete specimens of *Arberia madagascariensis*, the only examples to have been collected in South Africa; fig. (f): holotype of *Vereenia leeukuilensis*; figs (g)-(i): further examples of *V. leeukuilensis*.

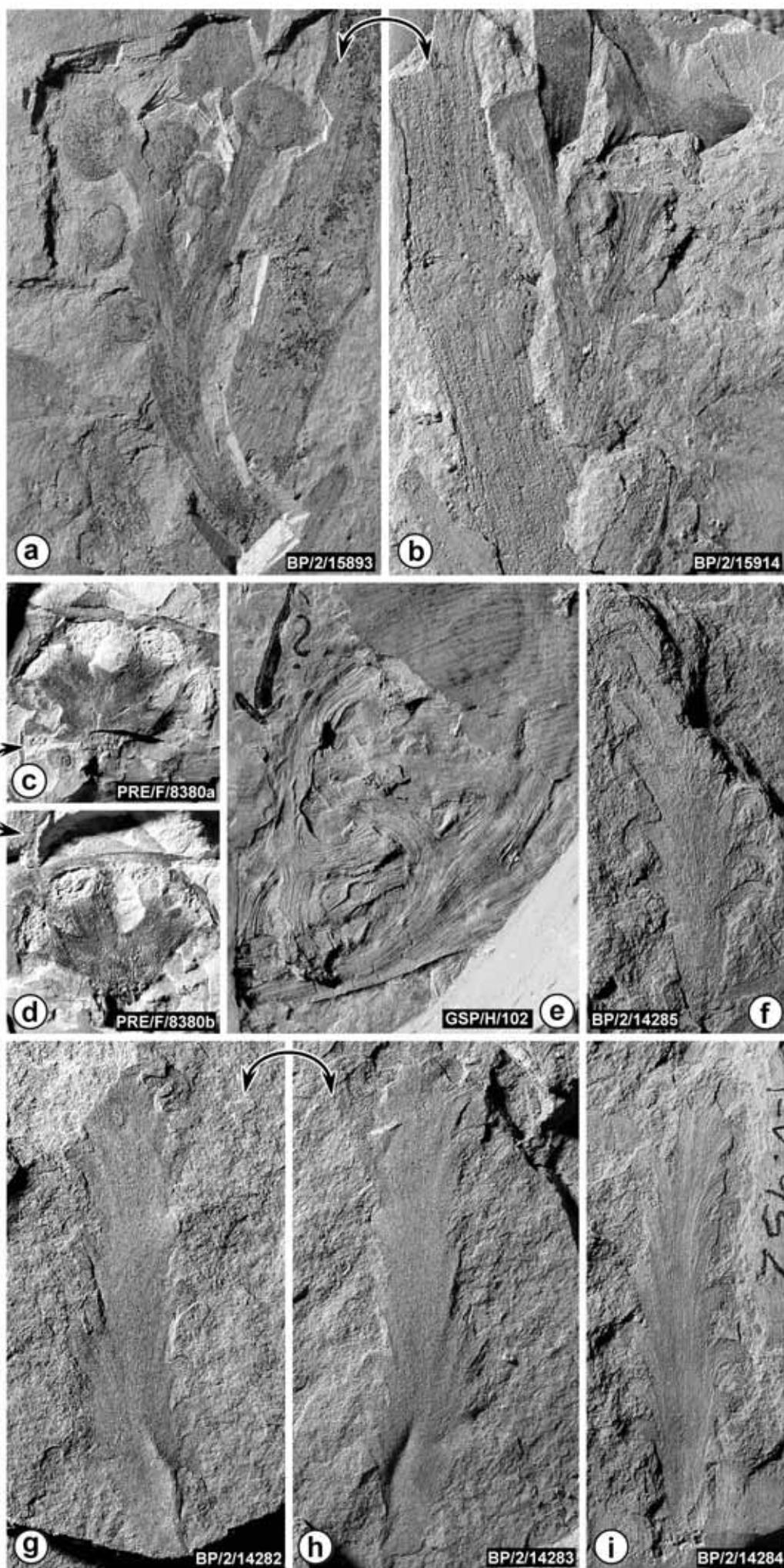
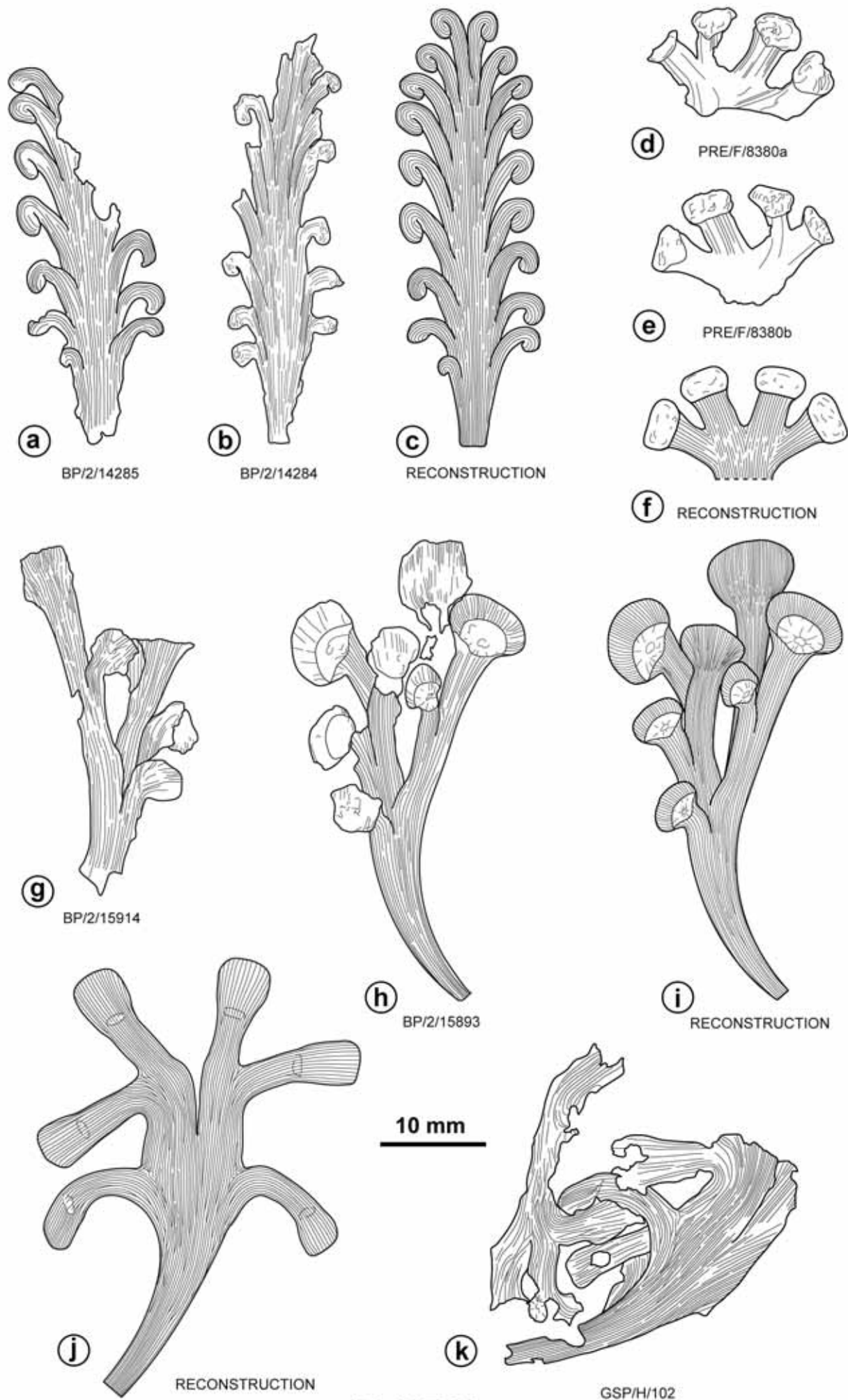


PLATE 10

PLATE 11. Drawings and reconstructions of members of the Arberiaceae and of the taxon previously known as '*Arberia allweyensis*', now regarded as *incertae sedis*. Figs. (a)-(c): *Vereenia leeukuilensis*; figs (d)-(f): drawings of the part and counterpart of the single known specimen of '*Arberia allweyensis*', and a reconstruction; figs (g)-(i): drawings of the part and counterpart of the *Arberia hlobanensis* specimen, and a reconstruction; figs (j) & (k): reconstruction and drawings of *Arberia madagascariensis*.



PLATES 12 - 18: *Bifariala intermittens*

PLATE 12. Fig. (a): holotype of *B. intermittens* fertile surface, with primary wing in apex and along left side of receptacle, and secondary wing exposed to the left of the receptacle; fig (b): fertile surface, secondary wing only visible in basal region (note basal lobes); fig. (c): fertile surface, primary wing visible on left, secondary wing exposed to the right of the receptacle; fig. (d): fertile surface, only the primary wing is visible; fig. (e): fertile surface, only primary wing visible; fig. (f): fertile surface, secondary wing is completely obscured.

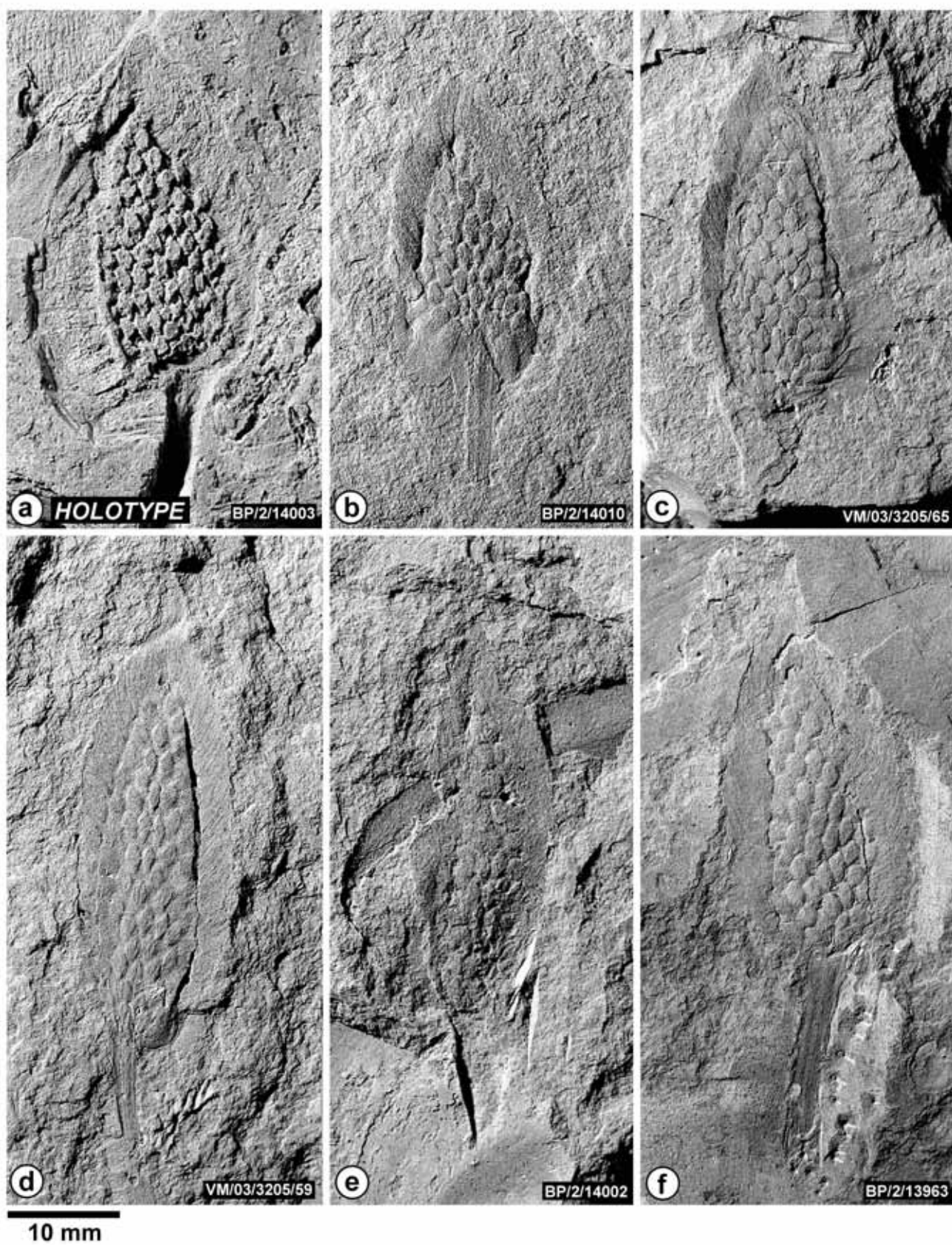


PLATE 12

PLATE 13. Figs. (a), (c), (e), (g) to (j): further examples of fertile surface impressions, with primary wing visible; fig (b): fertile surface primary wing visible on the left and apex, secondary wing visible to the right and in basal area, note basal lobes; fig. (d), (f): impressions of the fertile surface, with primary wing in apex, and secondary wing lobes visible in base; fig. (h): impression of fertile surface with primary wing present laterally and towards the apex, but with a secondary wing lobe visible to the right of the pedicel; fig. (i): fertile surface with secondary wing exposed (note the pronounced peripheral groove and fragment of primary wing in the apex).

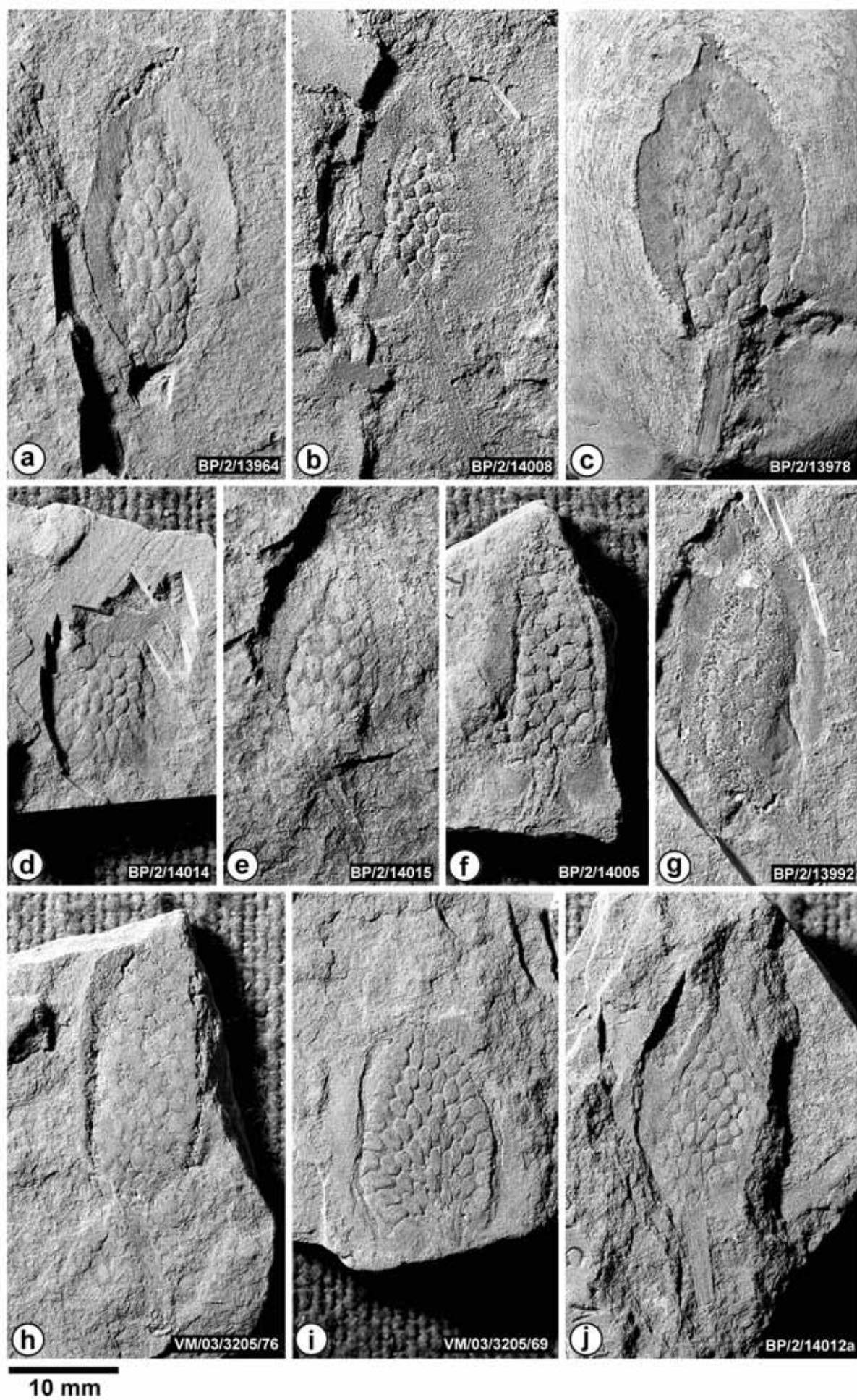
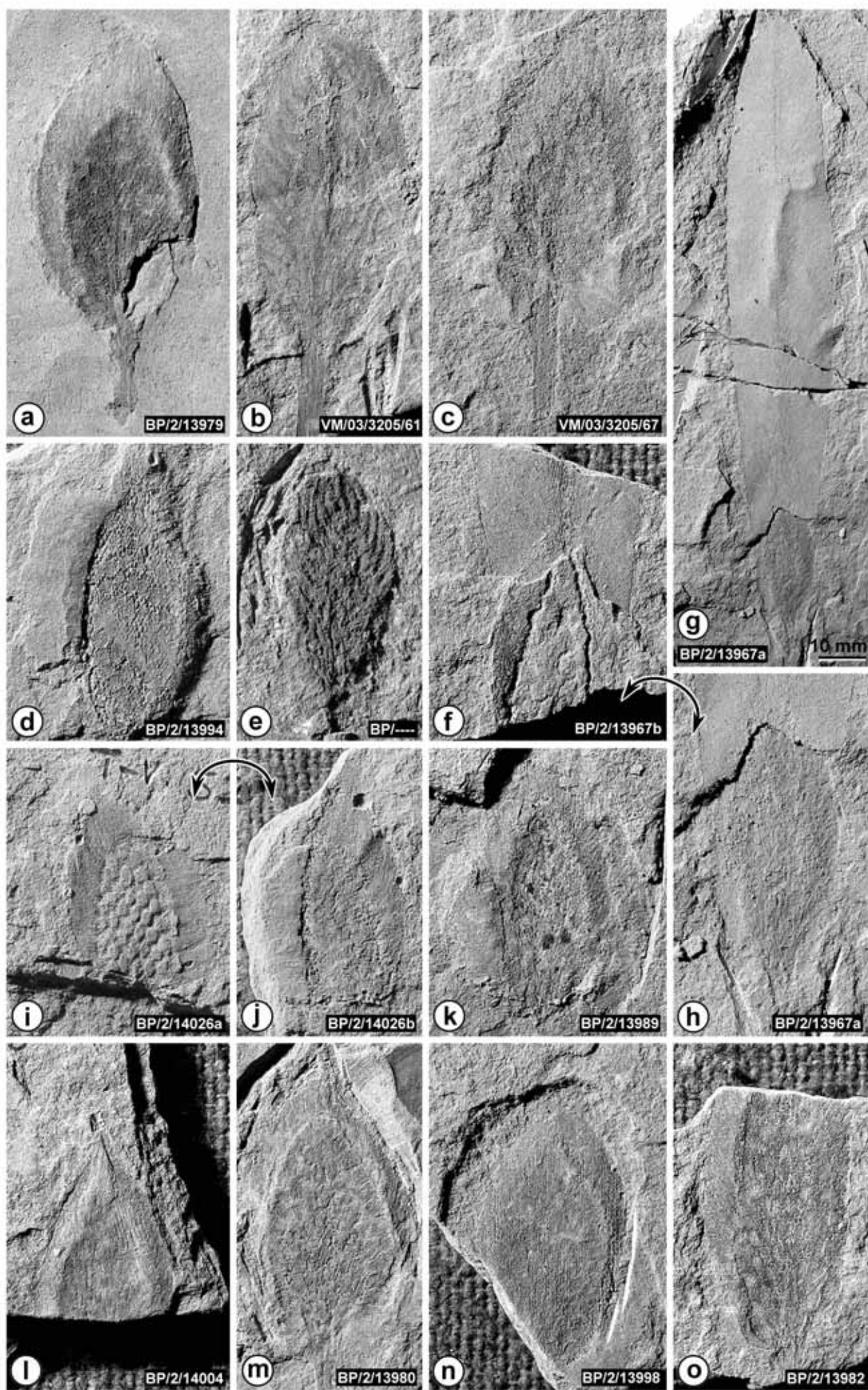


PLATE 13

PLATE 14. Morphology of the sterile surface of *Bifariaia intermittens*. Fig. (a), (b), (h), (l), (n): impressions of the sterile surface with complete exposure of the primary wing, which is continuous with the surface of the receptacle; fig (c): primary wing is exposed in apical portion of fructification, but the basal lobes of the secondary wing are visible in the basal part, at a higher level in the sediment; fig. (d): the primary wing is visible at the apex, but the radially fluted secondary wing is visible along the left side of the receptacle; note the groove along the edge of the receptacle alongside the segment of secondary wing; fig. (e): a key specimen contributing to Plumstead's (1958) insistence on the presence of pollenate organs in this taxon; this impression of a sterile surface has a heavy coating of reddish iron oxide which has exaggerated the venation on the receptacle and the fluting of the primary wing in the apex of the fructification, creating the illusion of individual strands; fig. (f): fertile counterpart of (h), with prominent peripheral groove between receptacle and primary wing; fig. (g): *Glossopteris* leaf with *B. intermittens* attached right near base; enlargement of fructification in fig. (g); figs (i) & (j): part and counterpart illustrating primary and secondary wing morphologies; in fig. (i) the impression of the fertile surface has the primary wing to the left of receptacle and radially striated, fluted secondary wing on the right and in fig. (j) the sterile surface has the primary wing to the right, secondary on the left, with a pronounced groove between receptacle and secondary wing; fig. (k): an impression of the sterile surface of a fructification with remnants of the secondary wing to the left and right of the receptacle; fig. (m): sterile surface with only basal lobes of secondary wing visible; fig. (o): sterile surface with basal lobe of secondary wing visible on left side.



10 mm

PLATE 15. Further examples of *Bifaria* displaying dual wing morphologies. Fig. (a) impression of sterile surface has an overlying secondary wing to the left of the concave receptacle, note clear basal lobes of the secondary wing (enlargement in fig. (c)); fig. (b) counterpart of (a); fertile surface with primary wing in apical region overlying smooth secondary wing which is exposed in lateral and basal areas; fig. (d): enlargement of exposed secondary wing (with fluting and striations) in fig. (b); fig. (e): sterile surface with secondary wing lying at a higher level in the sediment than the receptacle; figs (f), (g), (o): fertile surfaces with primary wing developed laterally and in apex, with secondary wing lobes in base; fig. (h): sterile surface with secondary wing at higher level in sediment than small section of primary wing at apex; figs (i), (j): apex of sterile surface of fructification with small section of fluted, striated secondary wing on left side of receptacle; note how secondary wing is discontinuous with receptacle edge, and overlies the primary wing; figs (k), (l): fertile surface of small fructification with primary wing in apex and on right side of fructification, and radially fluted, striated secondary wing to left side of receptacle; note the ridge of primary wing remaining on the secondary wing, adjacent to the receptacle on the left side; figs (m), (n): part and counterpart of a fructification with the primary wing exposed at the apex, secondary wing in the base; fig. (p): sterile surface with primary wing.

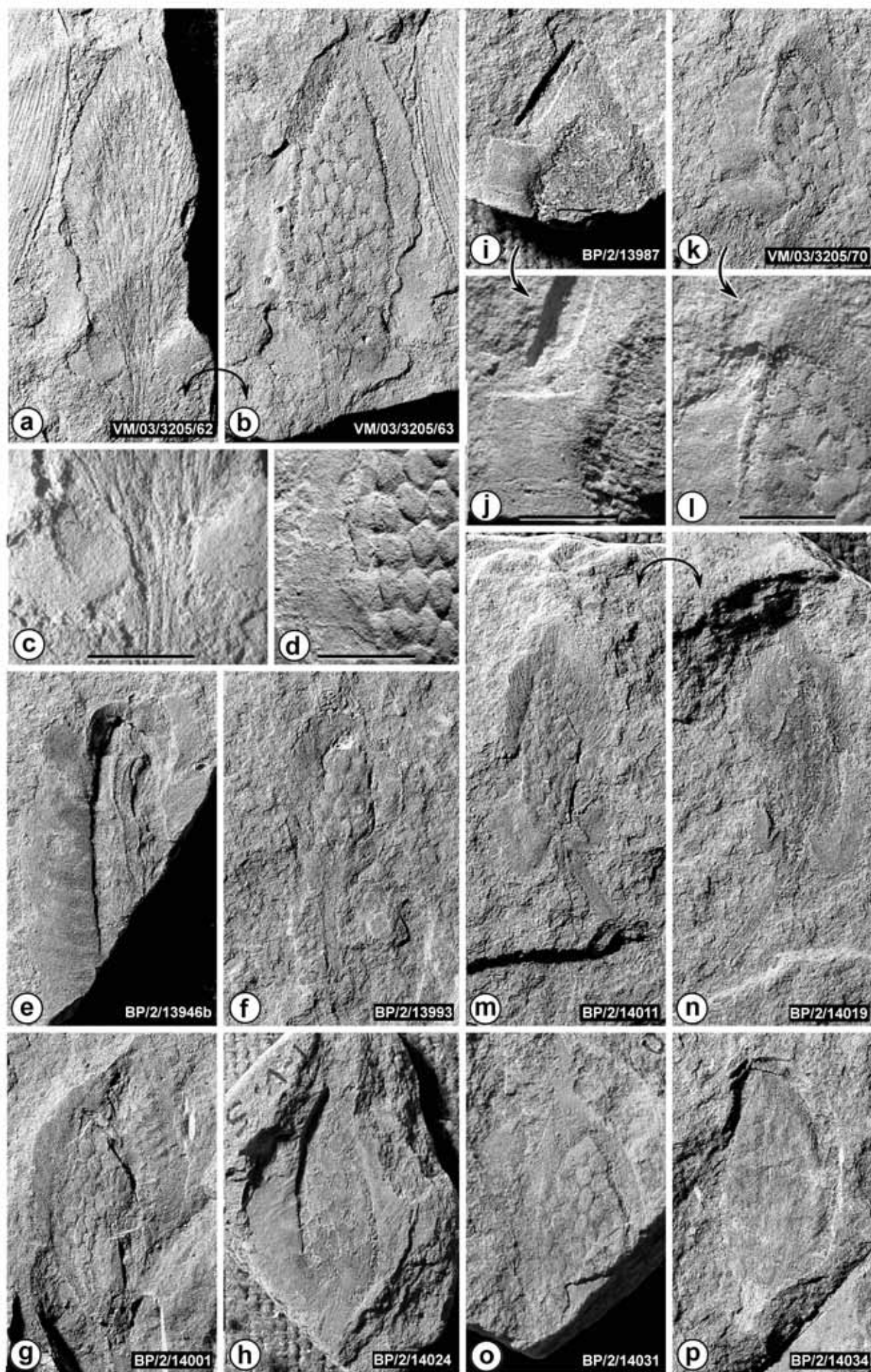
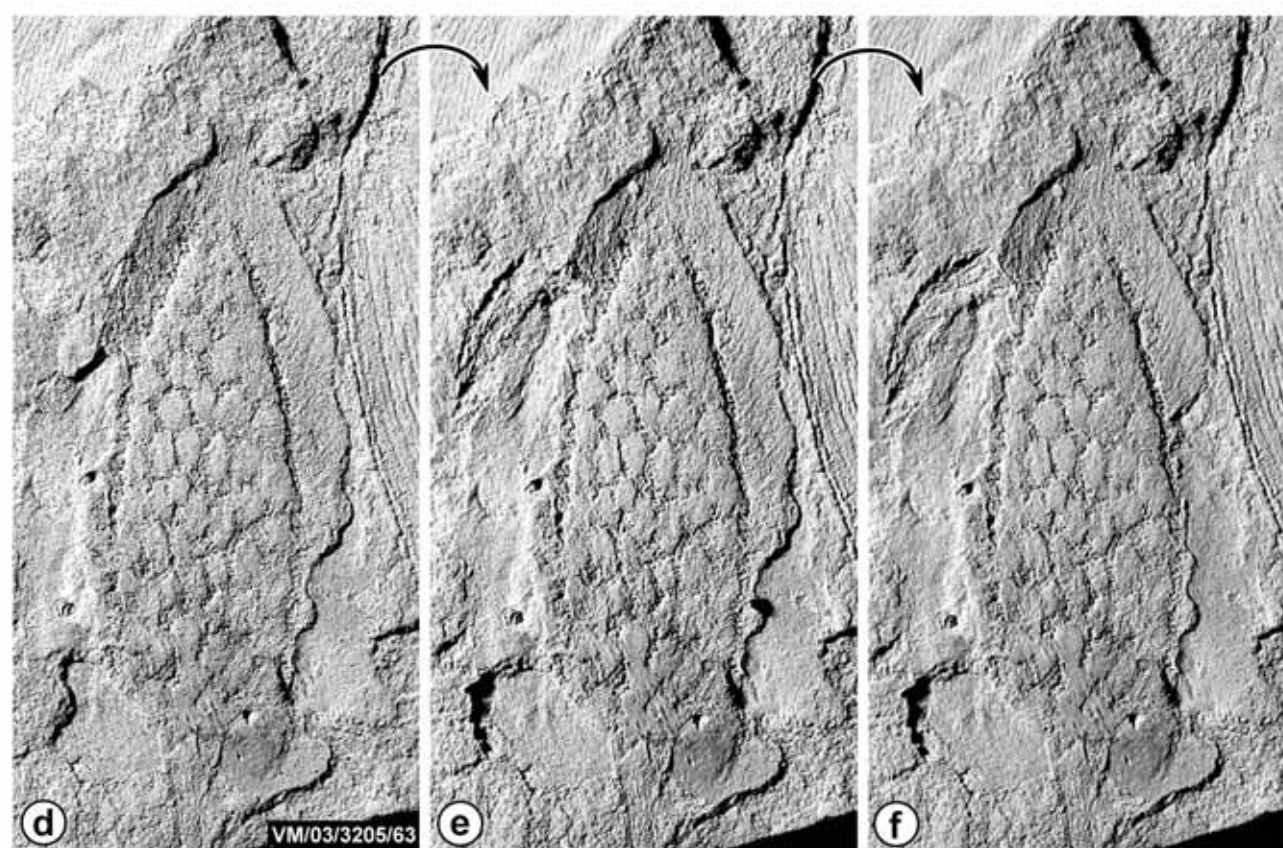
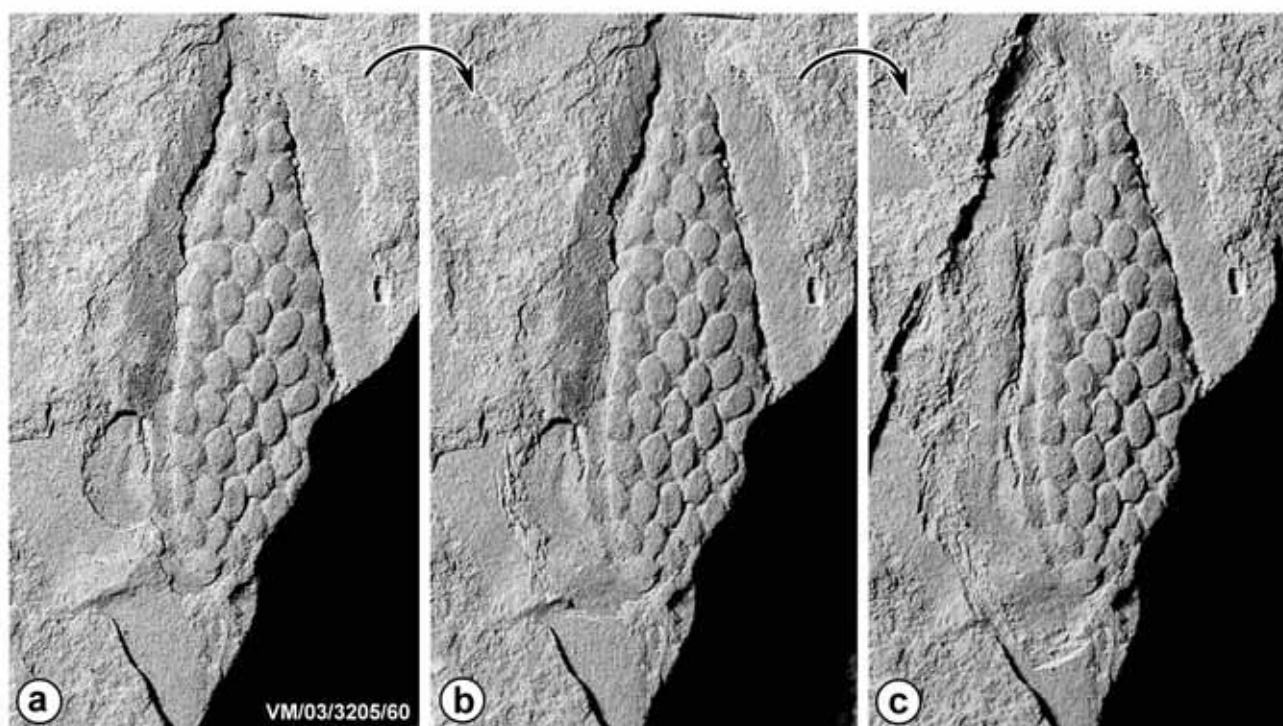


PLATE 15

PLATE 16. Serial photographs of dissections: two impressions of the fertile surface of *Bifariaia intermittens*, revealing the presence of a radially fluted and striated secondary wing beneath the impression of the primary wing. Figs (a)-(c): the primary wing along the left side of the receptacle is removed to reveal the secondary wing beneath; note how the faint fluting corresponds to the junctions between the marginal seed scars of the receptacle; figs (d)-(f): some of the primary wing is removed in the apical region on the left side of the fructification in (e), and in the middle of the fructification on the right side, in fig. (f).



10 mm

PLATE 17. Details of the fructification dissected in pl. 16, figs (a)-(c). Fig. (a): and enlargement of the fructification; figs (b), (c): close-ups of the left side of the fructification illustrating the striations and faint fluting orientated perpendicular to the receptacle edge; note how the fluting corresponds to the positions of the marginal seed scars in fig. (c); the secondary wing has been damaged immediately adjacent to the receptacle on the left side.

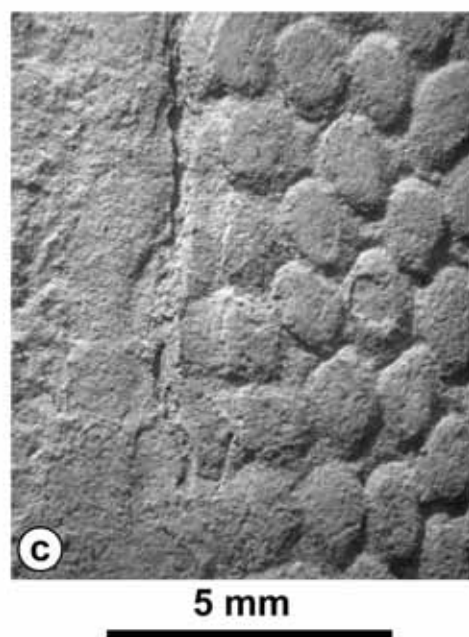
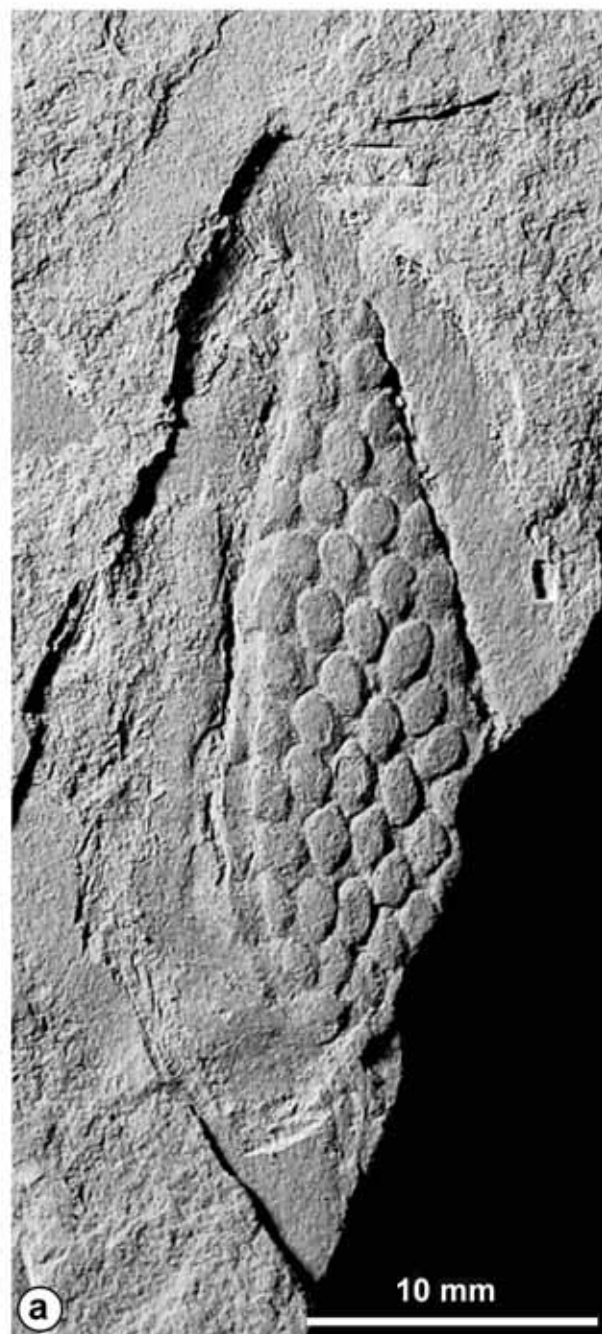
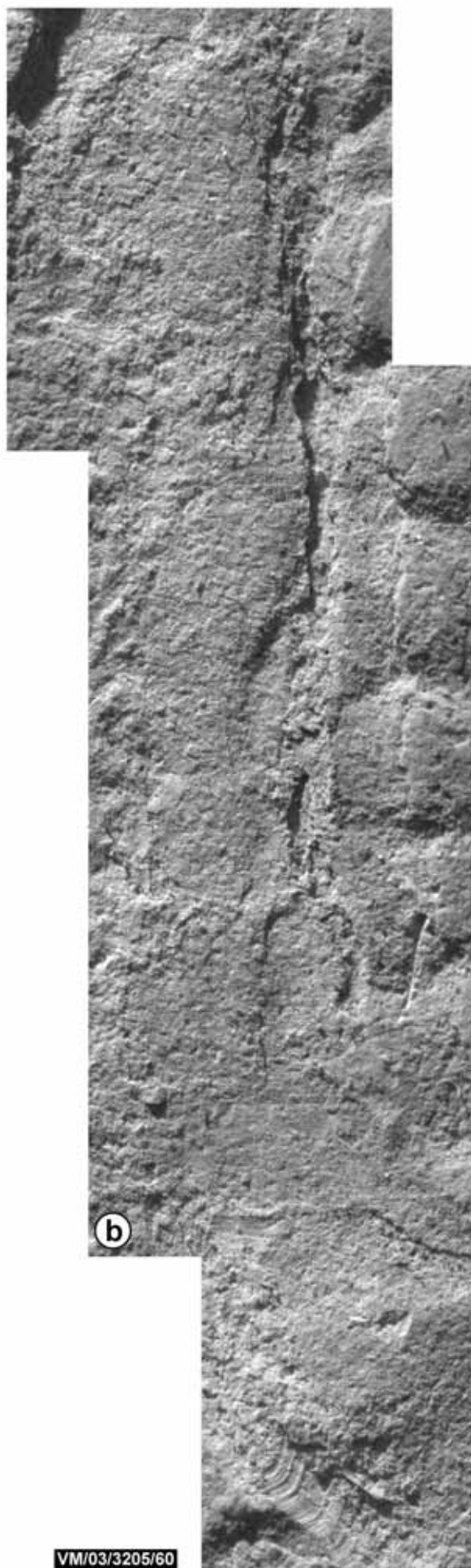
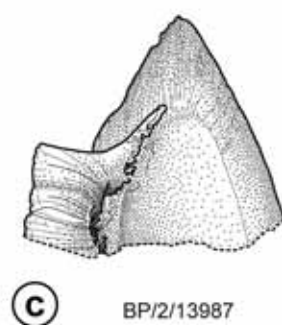
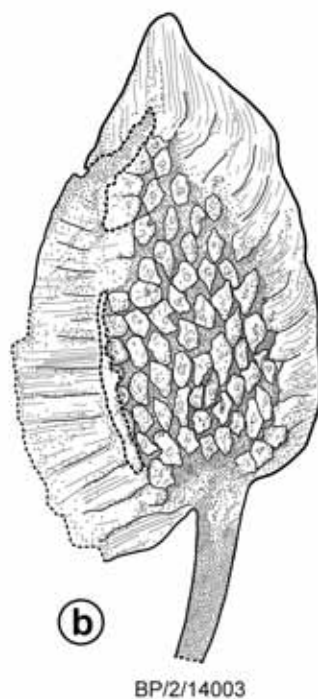
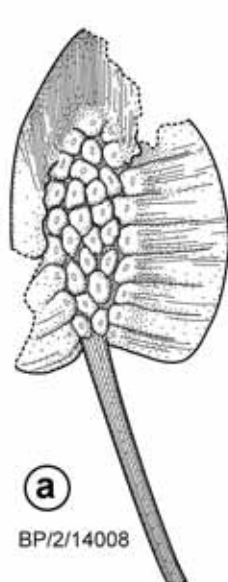
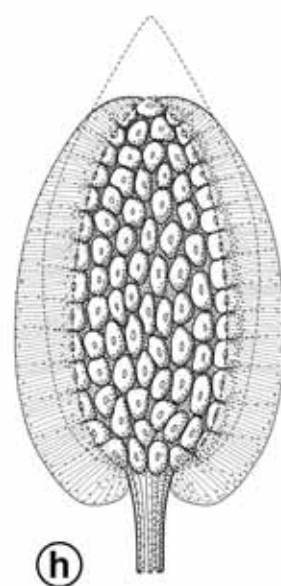
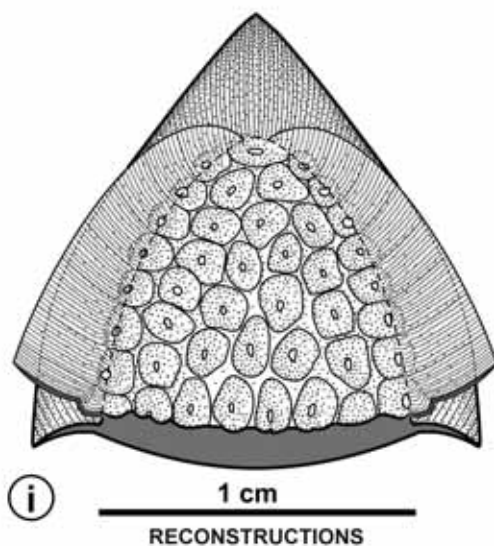
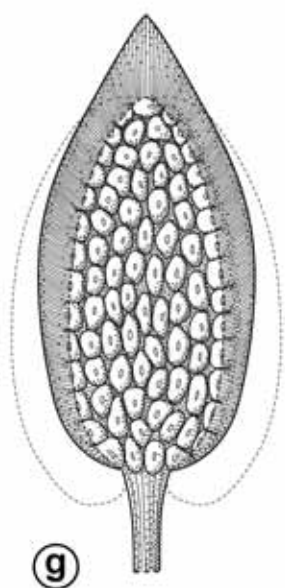
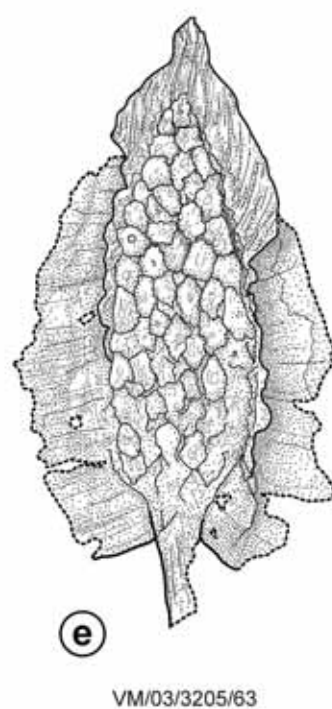
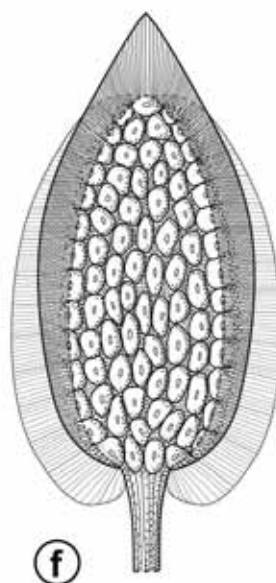
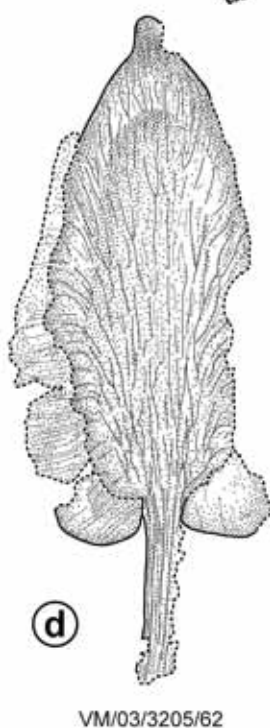


PLATE 18. Drawings and reconstructions of *Bifariaia intermittens*. Fig. (a): drawing of the specimen in pl. 13, fig. (b); fertile surface with a primary wing remnant in upper left part of fructification, and a well-preserved secondary wing in the base and along the right side of the fructification; this specimen has a particularly long pedicel; fig. (b) HOLOTYPE of *B. intermittens*, with primary wing in apex and on right side, and secondary wing to the left; fig. (c): apex of the sterile surface of a fructification, with a section of secondary wing preserved on the left; figs (d), (e): drawings of the part and counterpart of a fructification with elements of both the primary and secondary wings; figs (f)-(h): fossil reconstructions of *B. intermittens* based on the drawings of VM/03/3205/62 and VM/03/3205/63 in figs (d) and (e); figs (g) and (h) represent fructifications with exposure of the entire primary and secondary wing respectively; fig. (i) is a reconstruction of the apex of the original fructification illustrating the relative positions of the wings.



10 mm



RECONSTRUCTIONS

PLATE 18

PLATES 19 - 22: *Estcourtia*

PLATE 19. *Estcourtia conspicua*: part and counterpart of the holotype, NM/1276b.

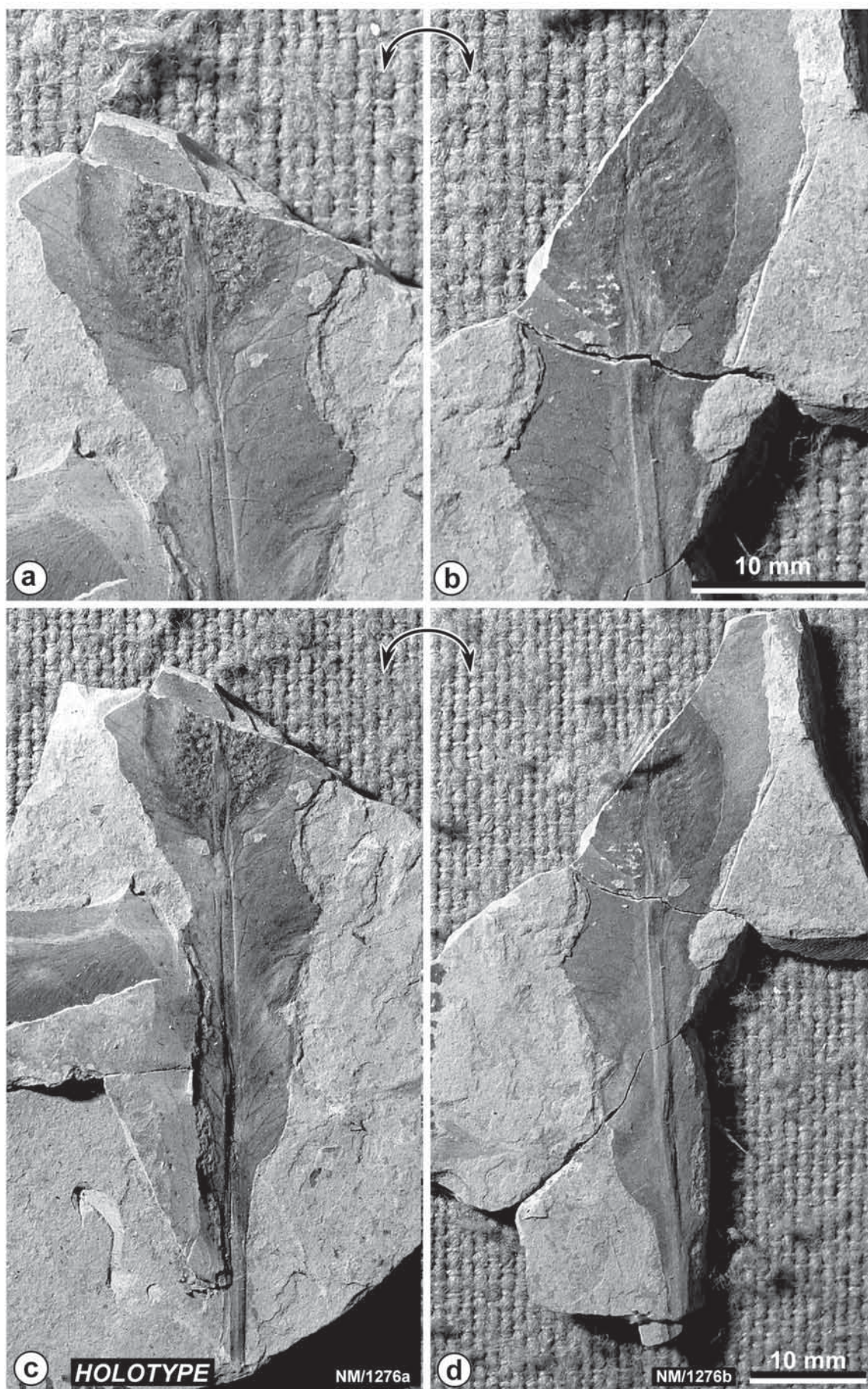


PLATE 19

PLATE 20. *Estcourtia conspicua*: part and counterpart of specimen BP/2/8172.

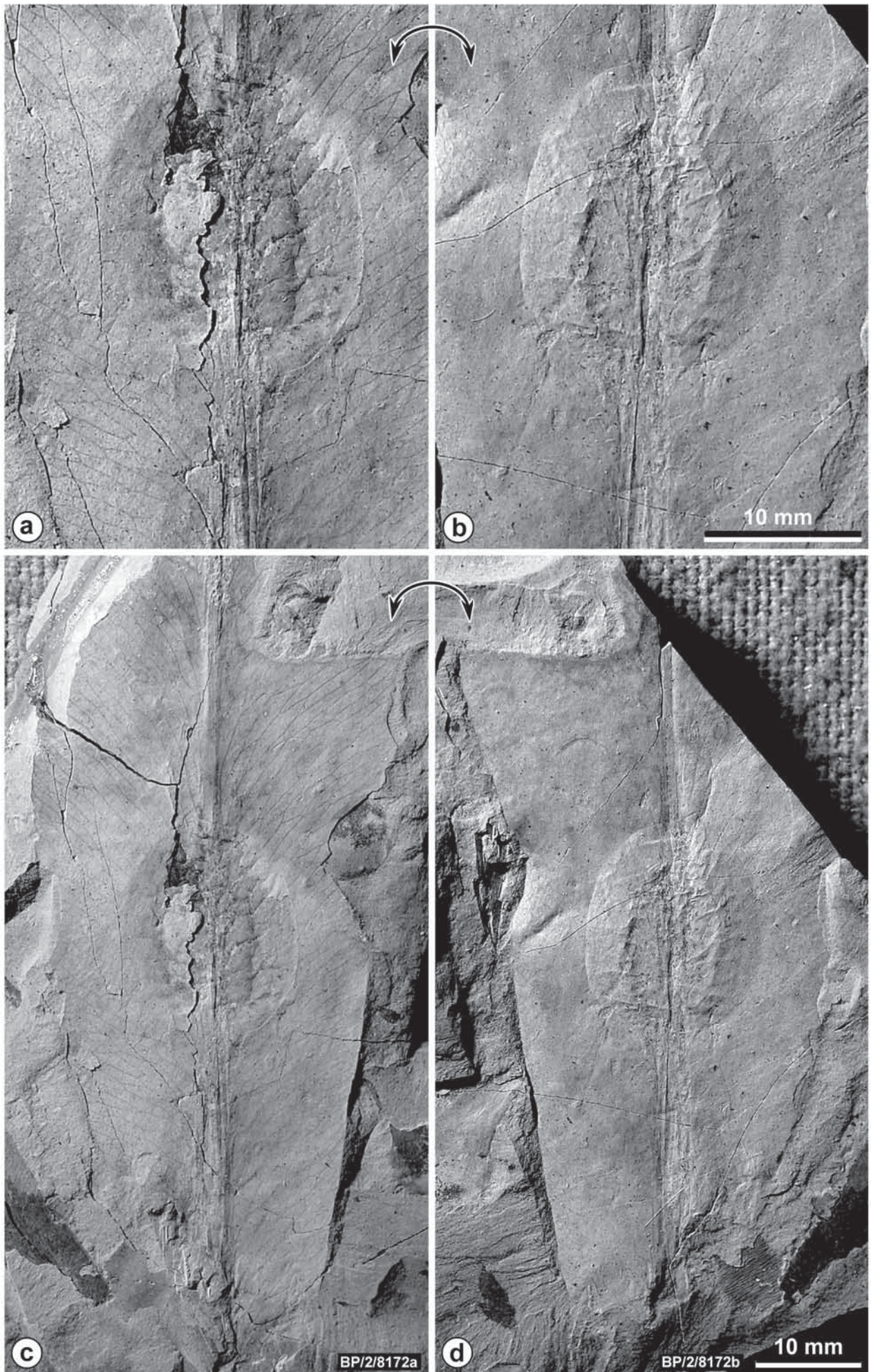


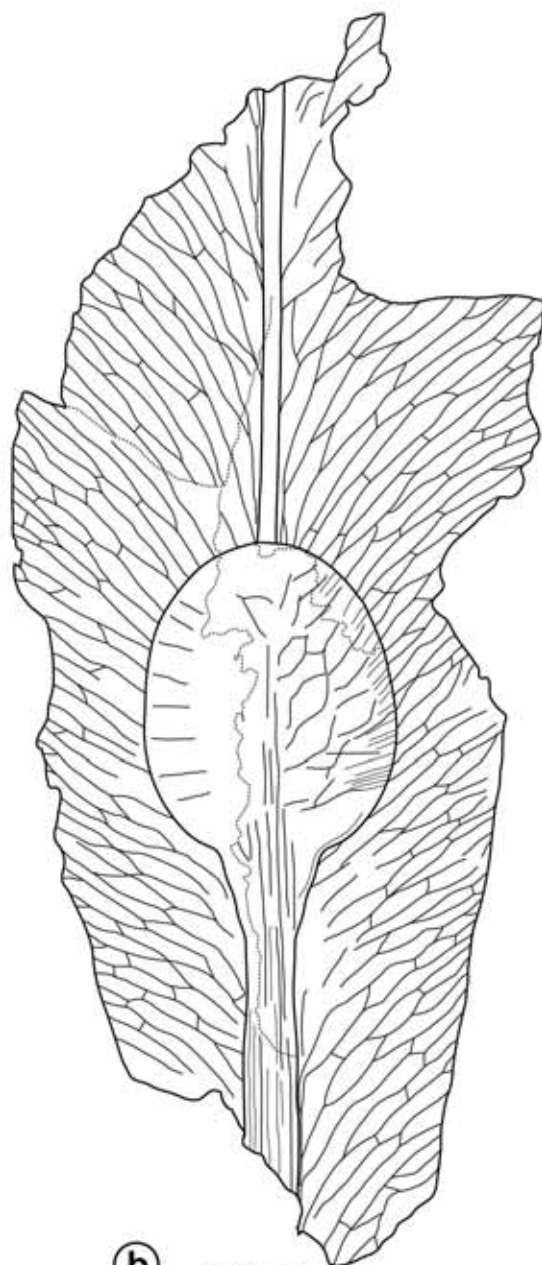
PLATE 20

PLATE 21. An incomplete specimen of *Estcourtia conspicua*, with the apical portion of the subtending *Glossopteris* leaf preserved.



PLATE 21

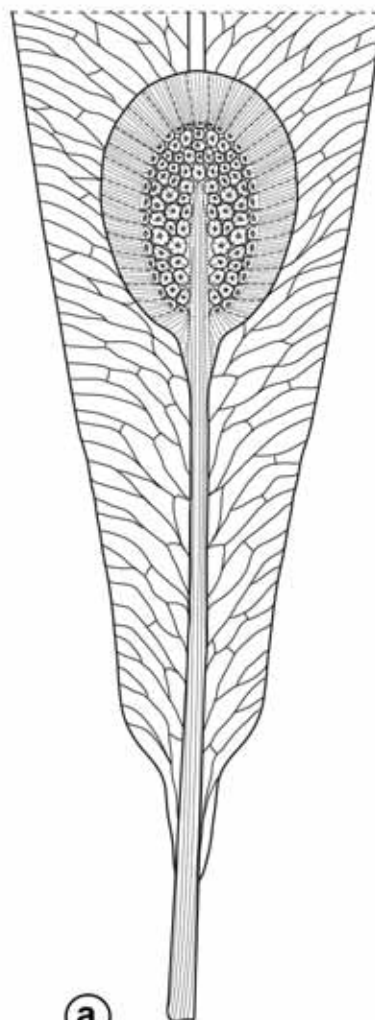
PLATE 22. Line drawings of BP/2/8172a, fig. (b) and the holotype (NM/1276a), fig. (c), with a reconstruction of *Estcourtia conspicua* in fig. (a).



(b)

BP/2/8172a

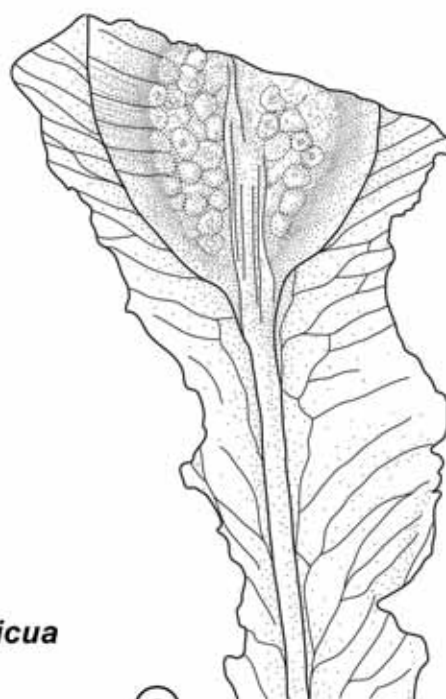
10 mm



(a)

RECONSTRUCTION

10 mm



(c)

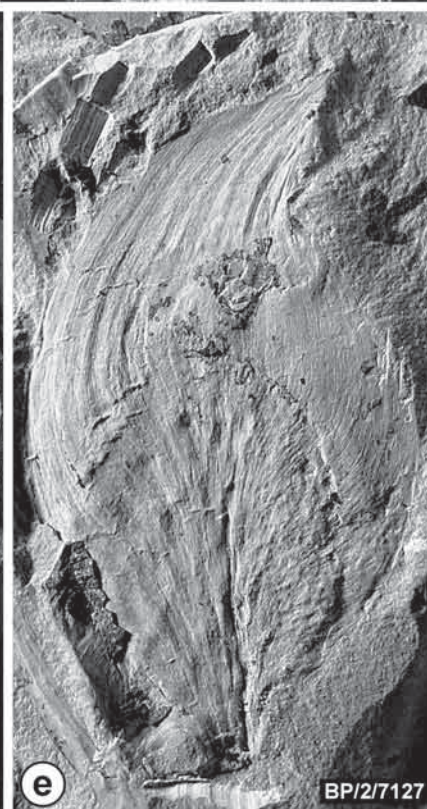
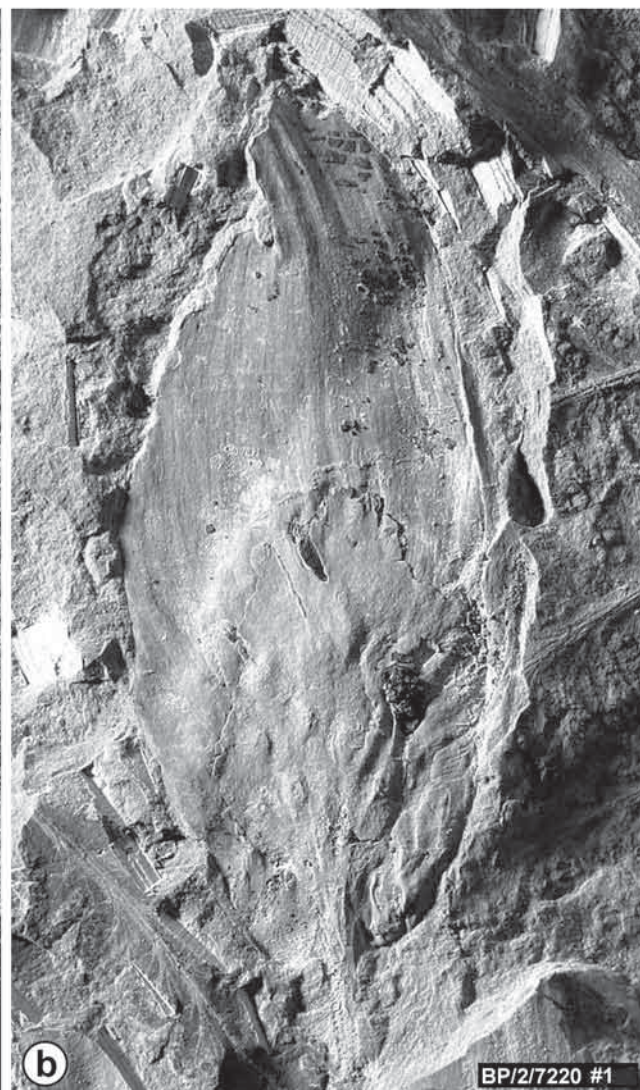
NM/1276a

10 mm

Estcourtia conspicua

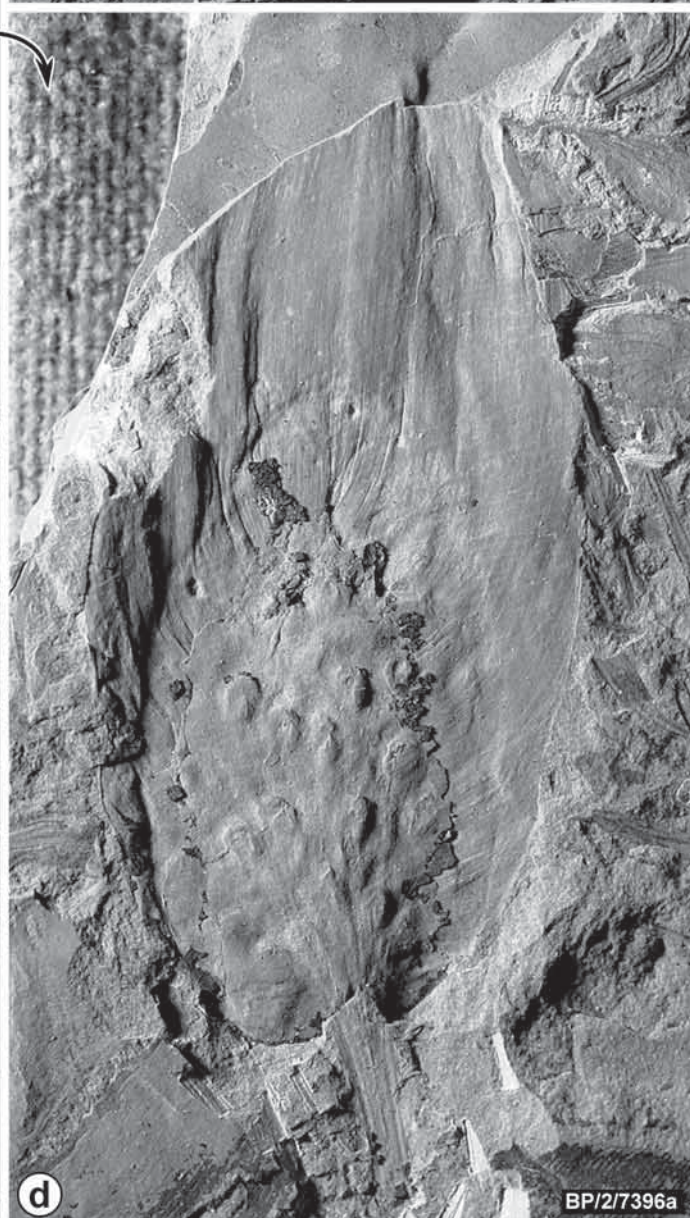
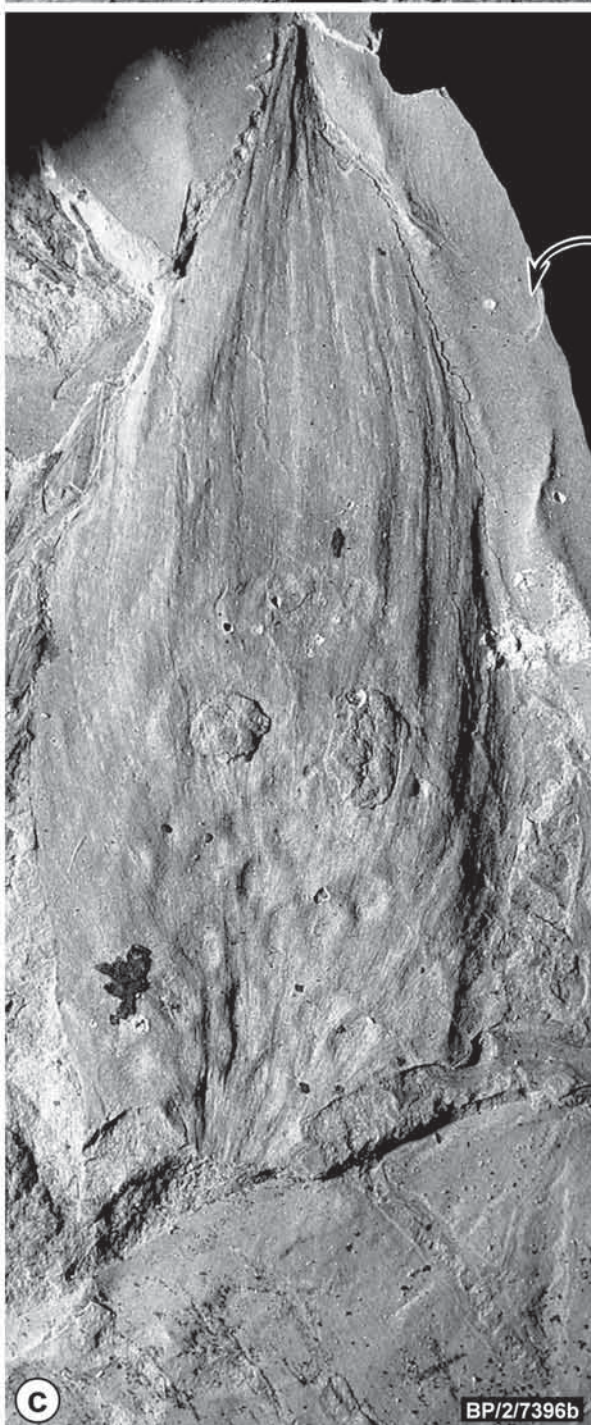
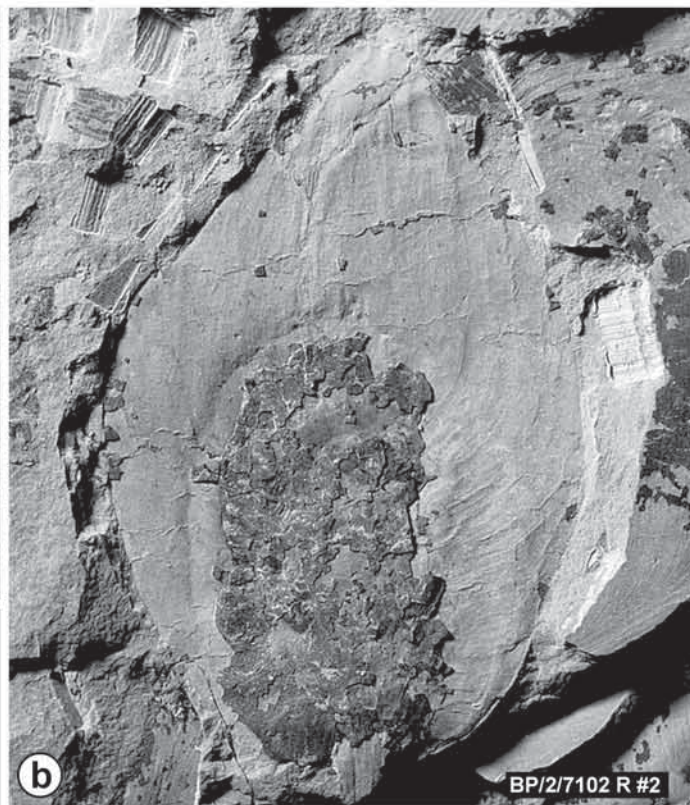
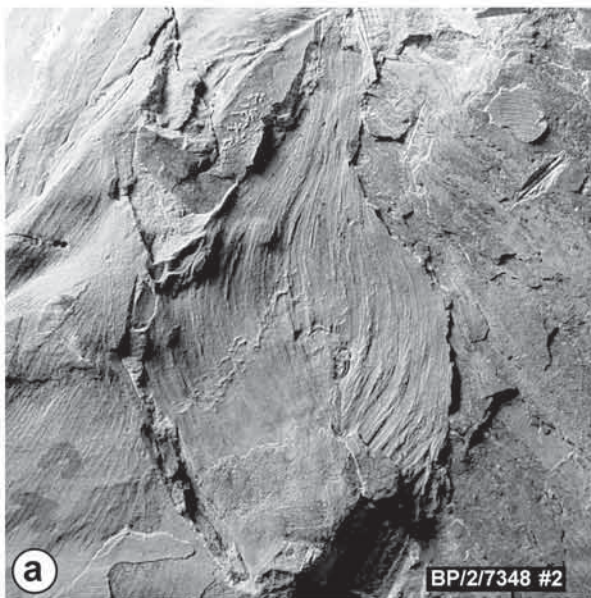
PLATES 23 - 42: *Elatra leslii*

PLATE 23. Fig. (a): Holotype of *E. leslii* from Vereeniging; impression of the sterile surface of the fructification; counterpart of type specimen first described by Thomas (1921), which is housed in the Natural History Museum, London (NHMV20742); fig. (b): fertile surface of specimen with long, acuminate primary wing, and well-developed secondary wing lobes in base (see pl.33 for dissection of this specimen); figs (c), (e): impressions of sterile surface; note continuous passage of veins from receptacle into primary wing; fig. (d): impression of fertile surface, with wedge of sediment bearing impressions of well-defined seed-scars lying above the impression of the primary wing.



10 mm

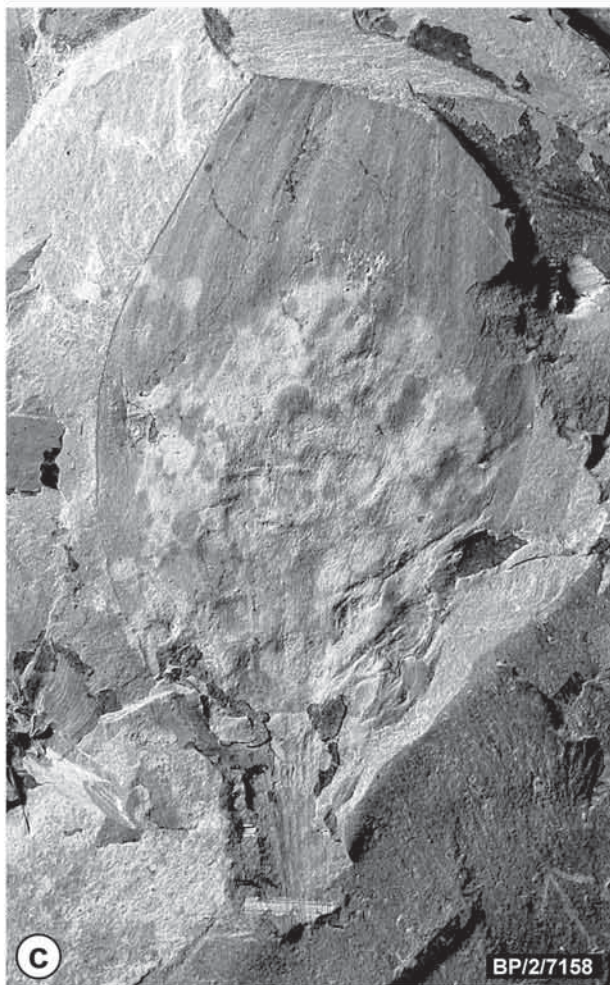
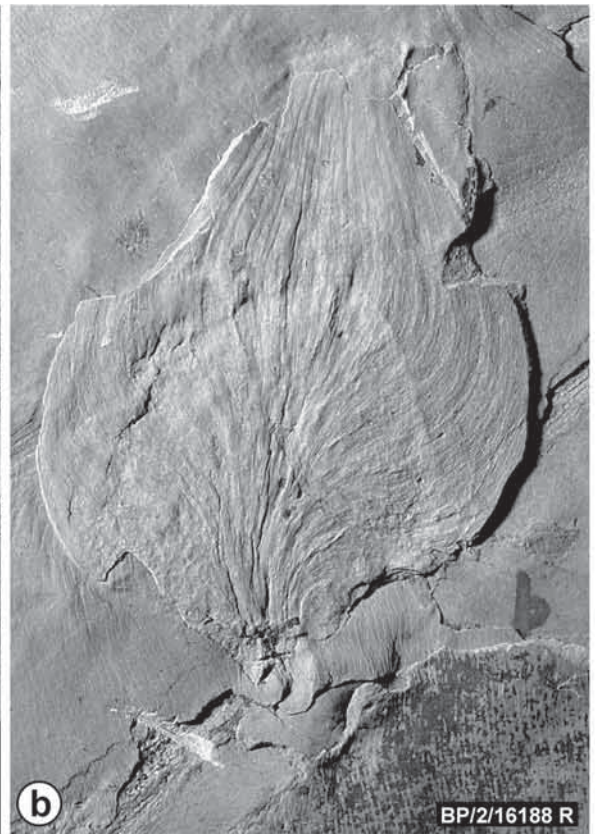
PLATE 24. Fig. (a): impression of fertile surface of fructification, where cleavage plane has passed close to the covering hood, with sediment bearing seed scar impressions only present in the base and on the left side of the fructification; the secondary wing lobe is visible in the base, on the left; fig. (b): fertile surface with narrow rim of hood visible (depressed region proximal to primary wing); figs (c), (d): part and counterpart of fructification with very elongated primary wing; the hood is visible in (d) as the depressed region proximal to but continuous with the primary wing, around and beneath the wedge of sediment bearing the impression of the fertile surface of the receptacle.



10 mm

PLATE 24

PLATE 25. Figs (a)-(c): impressions of the sterile surface; note the depression around the receptacle, at the base of the primary wing, which may represent the line of fusion with the hood; fig. (d): impression of a fertile surface, with very poor seed scar definition.



10 mm

PLATE 26. Further examples of impressions of the sterile surface of *Elatra leslii* fructifications.



10 mm

PLATE 27. Figs. (a)-(d): impressions of the sterile surface of *Elatra leslii*; fig. (e): impression of the fertile surface; the wedge of sediment with impressions of seed scars also bears secondary imprints of seeds which lay between the receptacle surface and the hood at the time of preservation; the secondary wing is visible in the base, on the right side of the fructification.

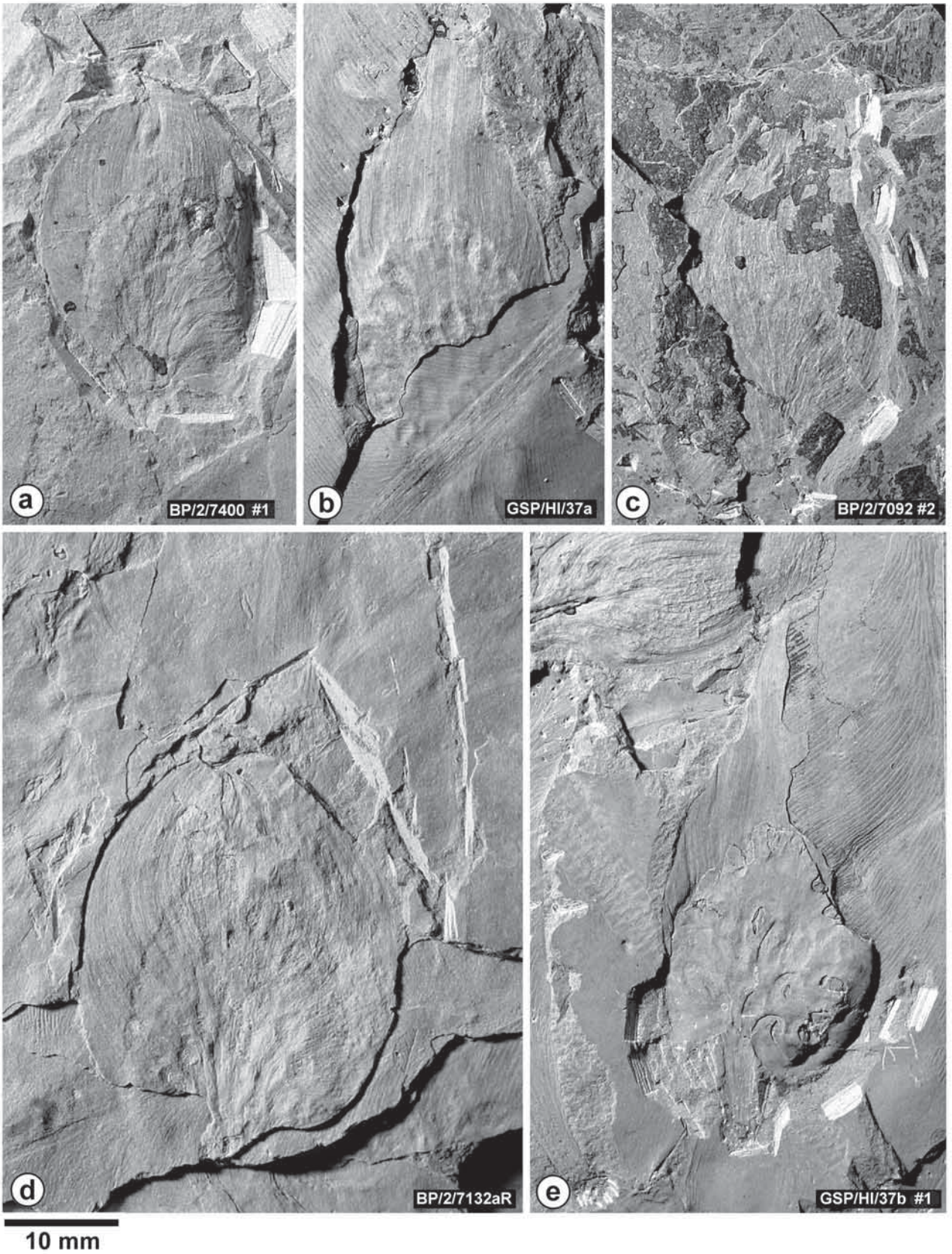
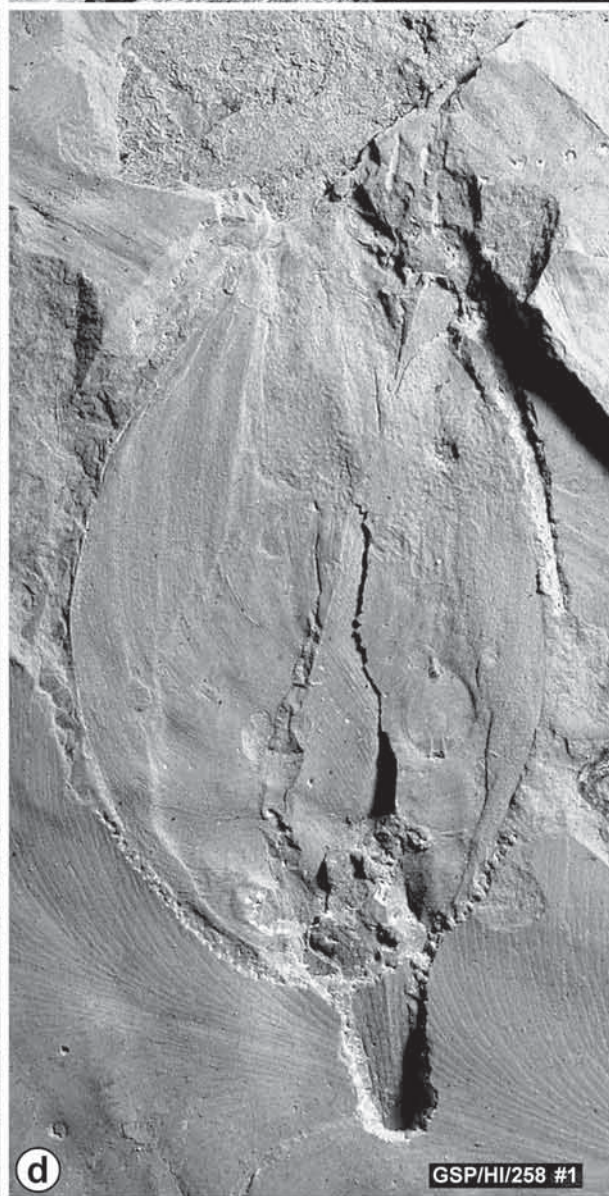
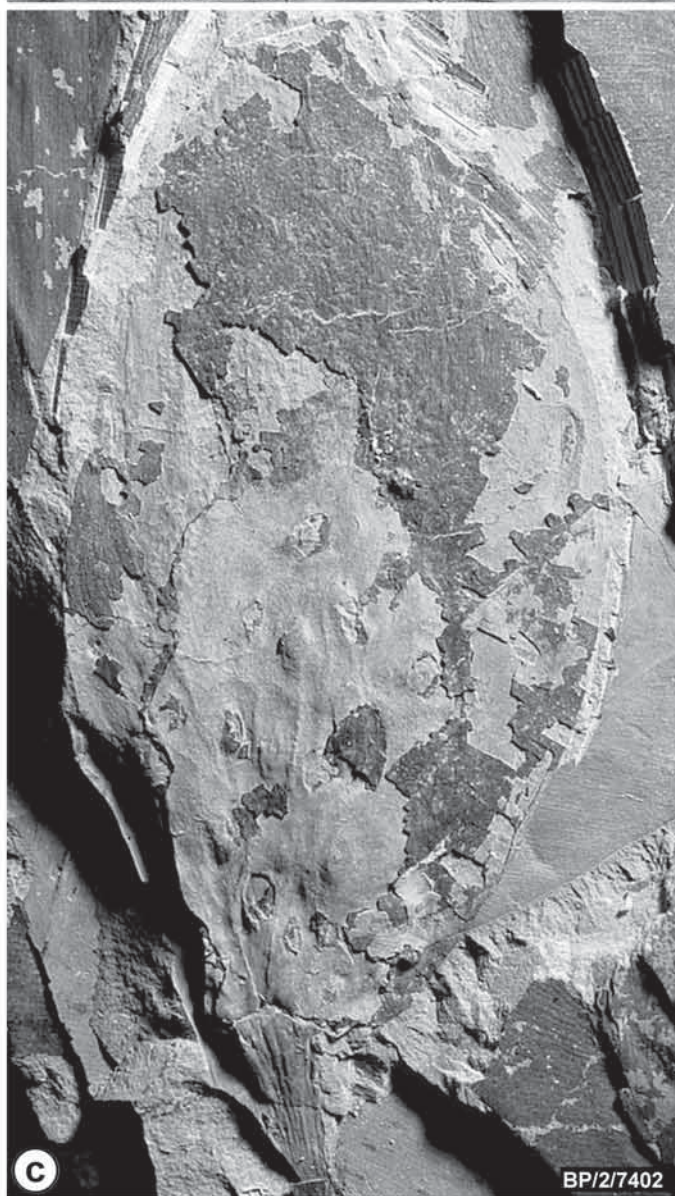
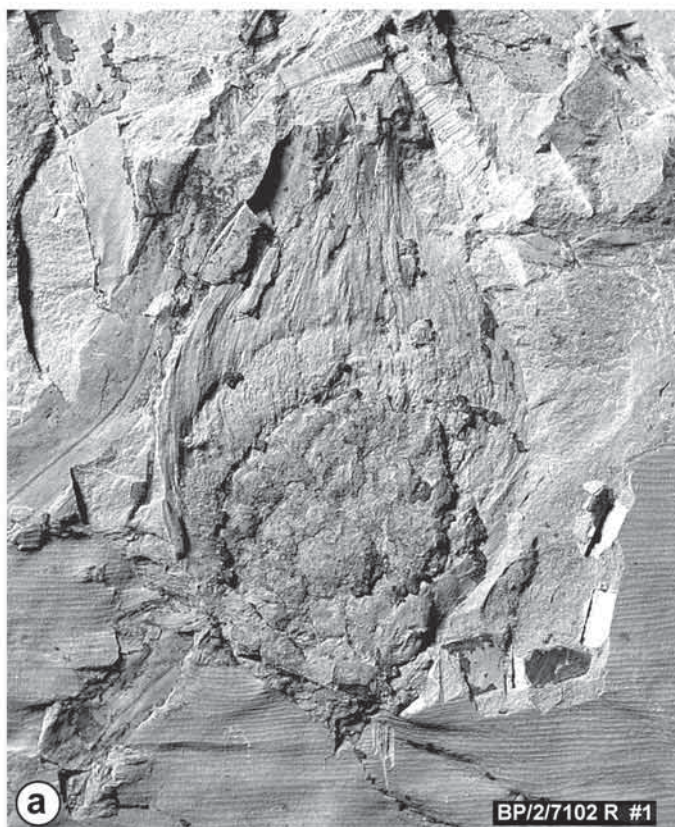


PLATE 28. Figs (a)-(c): impressions of the fertile surface of *Elatra leslii* fructifications; note the prominent basal lobes of the secondary wing in the slightly distorted specimen in fig. (b); fig. (d): this specimen, although damaged and , appears to represent a view of the primary wing and hood; the edge of the aperture of the hood is visible on the left side, but the wing appears to have been torn prior to preservation, with a glossopterid leaf visible protruding through the tear on the right; there is an impression of a seed on the right side of the fructification.

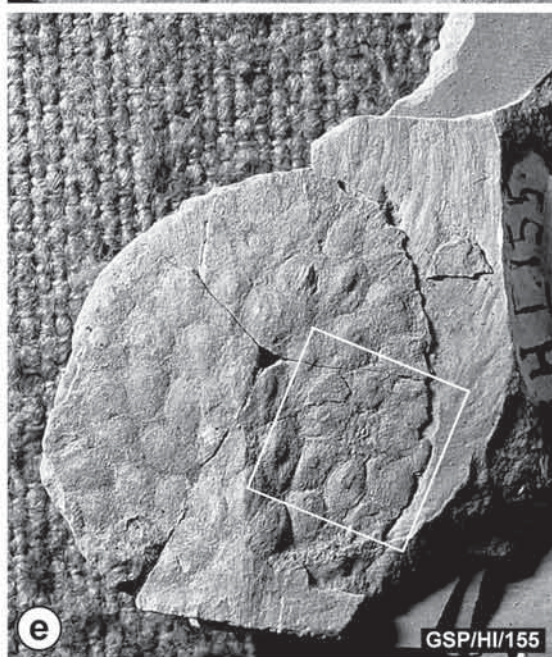
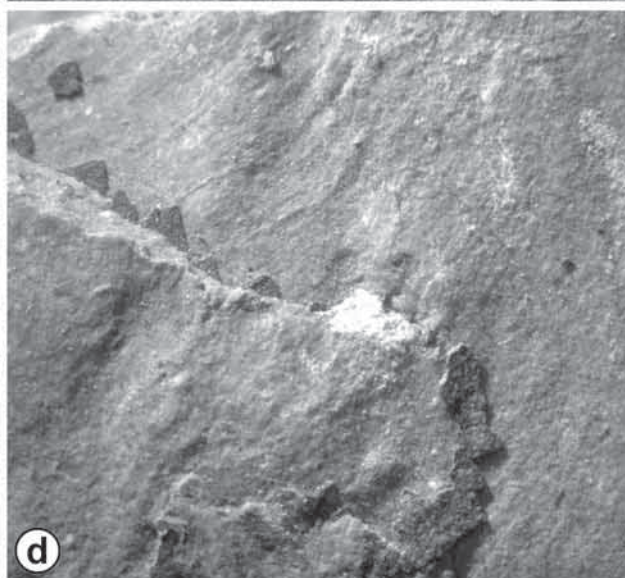
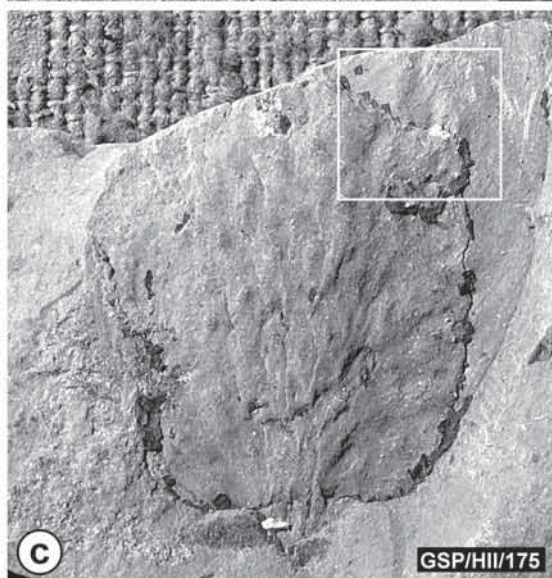
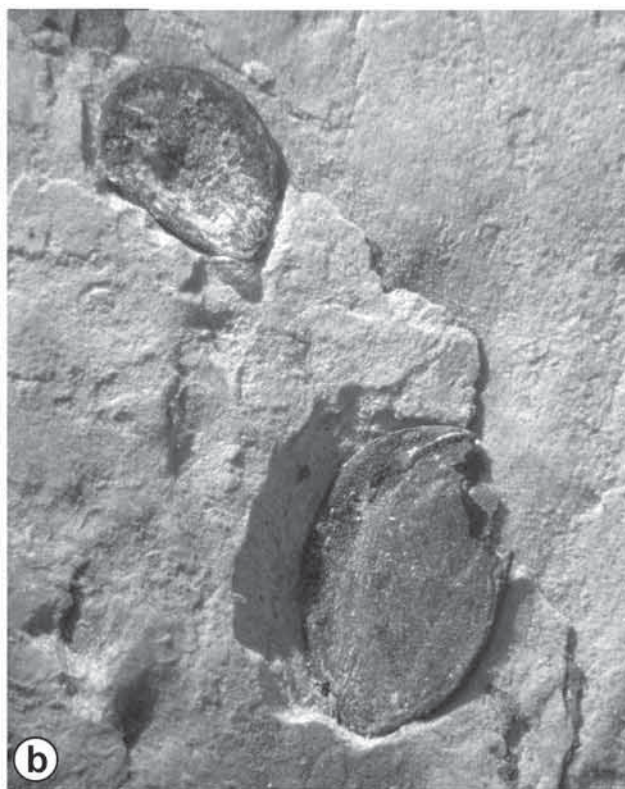


10 mm

PLATE 29. Figs (a)-(c): impressions of the fertile surface of *Elatra leslii* fructifications with impressions of seeds visible in the wedge of sediment obscuring the hood.



PLATE 30. Figs (a), (b): impression of the fertile surface of a specimen of *E. leslii* with a particularly elongated primary wing; compressions of seeds are visible in the wedge of sediment bearing the impression of the fertile surface of the receptacle (enlargement of seeds in (b)); secondary wing is visible in the base of the fructification; figs (c), (d): impression of fertile surface illustrating the discontinuity of the receptacle and primary wing impressions; note the carbonaceous layer beneath the wedge of sediment bearing the impression of the receptacle (enlargement in fig. (d)); this is the compression fossil of the hood; figs (e), (f): a further example of an impression of the fertile surface of an *E. leslii* fructification, with particularly well-preserved seed scars (enlargement in fig. (f)).



10 mm

PLATE 31. Figs (a)-(c): fertile surface of *Elatra leslii* with partial exposure of the hood along the periphery of the impression of the receptacle; note the characteristic, radial creasing of the hood; (d): sterile surface of an *E. leslii* fructification preserved in attachment to its subtending leaf; note the robust aggregation of veins in the base of the fructification, and the campylodromous pattern of vein divergence.

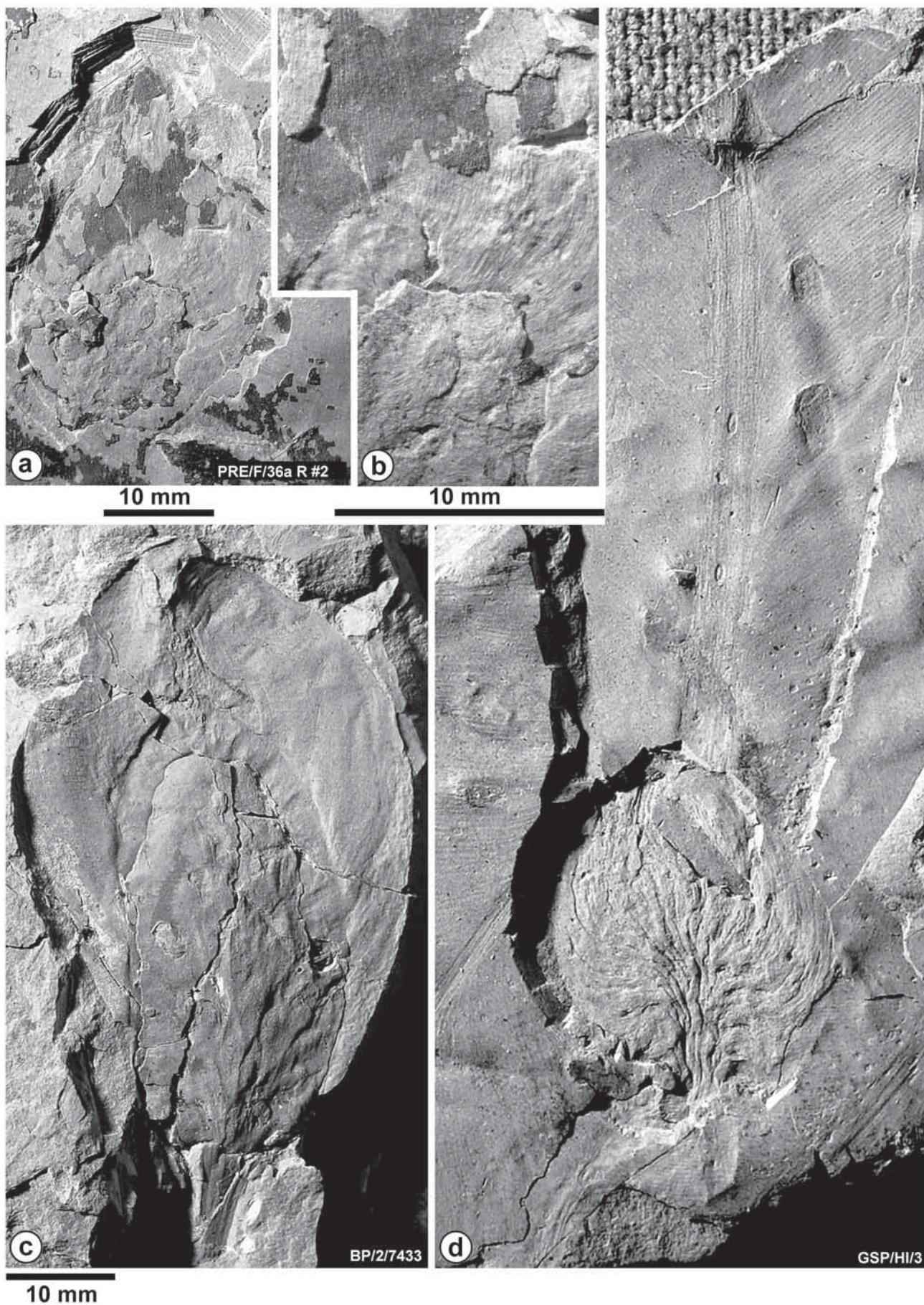


PLATE 32. Specimen BP/2/7401: the fructification is still attached to its subtending leaf, but only remnants of the leaf material remain in the fossil. In fig. (a) the darkly shaded area represents the impression of the subtending leaf, with typical *Glossopteris* venation and a broad, well-developed midrib; the medium grey shading highlights an impression of the hood; the light grey is the primary wing and sterile surface of the fructification. Note the carbonaceous phytolite or compressions between the layers of sediment bearing impressions of the various structures (black shaded areas in fig. (a)). Fig. (b) is a close-up of a portion of the specimen illustrating the different layers. Note the glossopterid venation in the impression of the leaf to the lower left of the image. Between the leaf impression and the next layer of sediment, is a layer of black carbon representing the compression fossil of the hood. The layer of matrix below this carbonaceous layer bears an impression of the hood. Below this layer of matrix is another carbonaceous deposit, this time representing the receptacle and primary wing of the fructification. The lowermost layer of sediment bears an impression of the primary wing and sterile surface of the receptacle. Fig. (c) is a view of the whole fructification, and fig. (d) is another close-up of the fructification illustrating the layering of matrix and carbonaceous material.

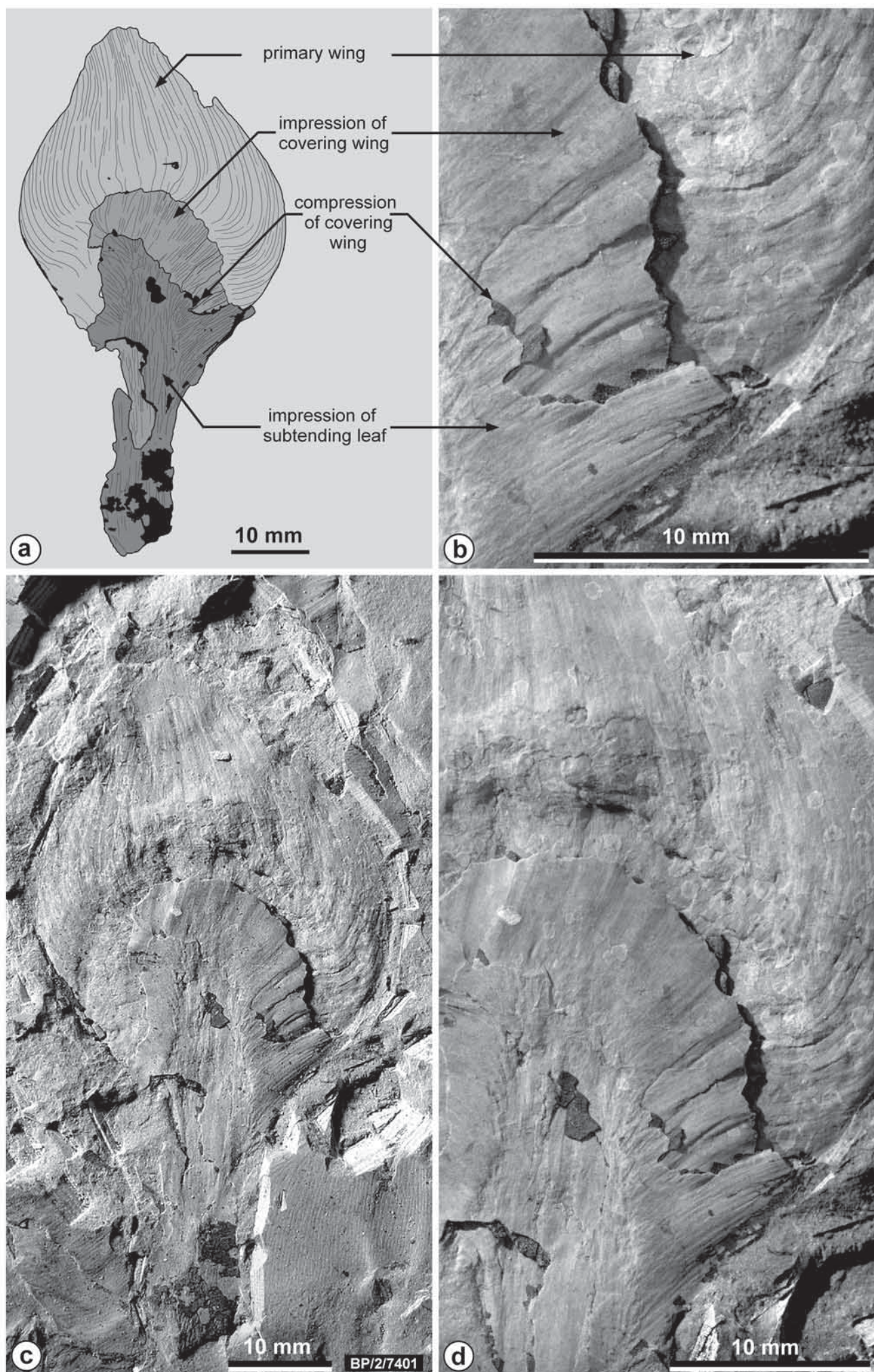


PLATE 32

PLATE 33. A closer look at BP/2/7220, and the results of a dissection to reveal the hood beneath the wedge of sediment bearing an impression of the fertile surface of the receptacle. The striations and fluting on the hood are continuous with those of the primary wing. The line of divergence of the hood from the primary wing is gently scalloped, as seen in fig. (c). The hood dips down into the sediment, and is creased due to compression during preservation; it ends in a triangular, tent-shaped opening which spans the lower two thirds of the fructification. In figs (b) and (c), dissection of the basal lobe of the secondary wing on the left reveals an extension of the hood.

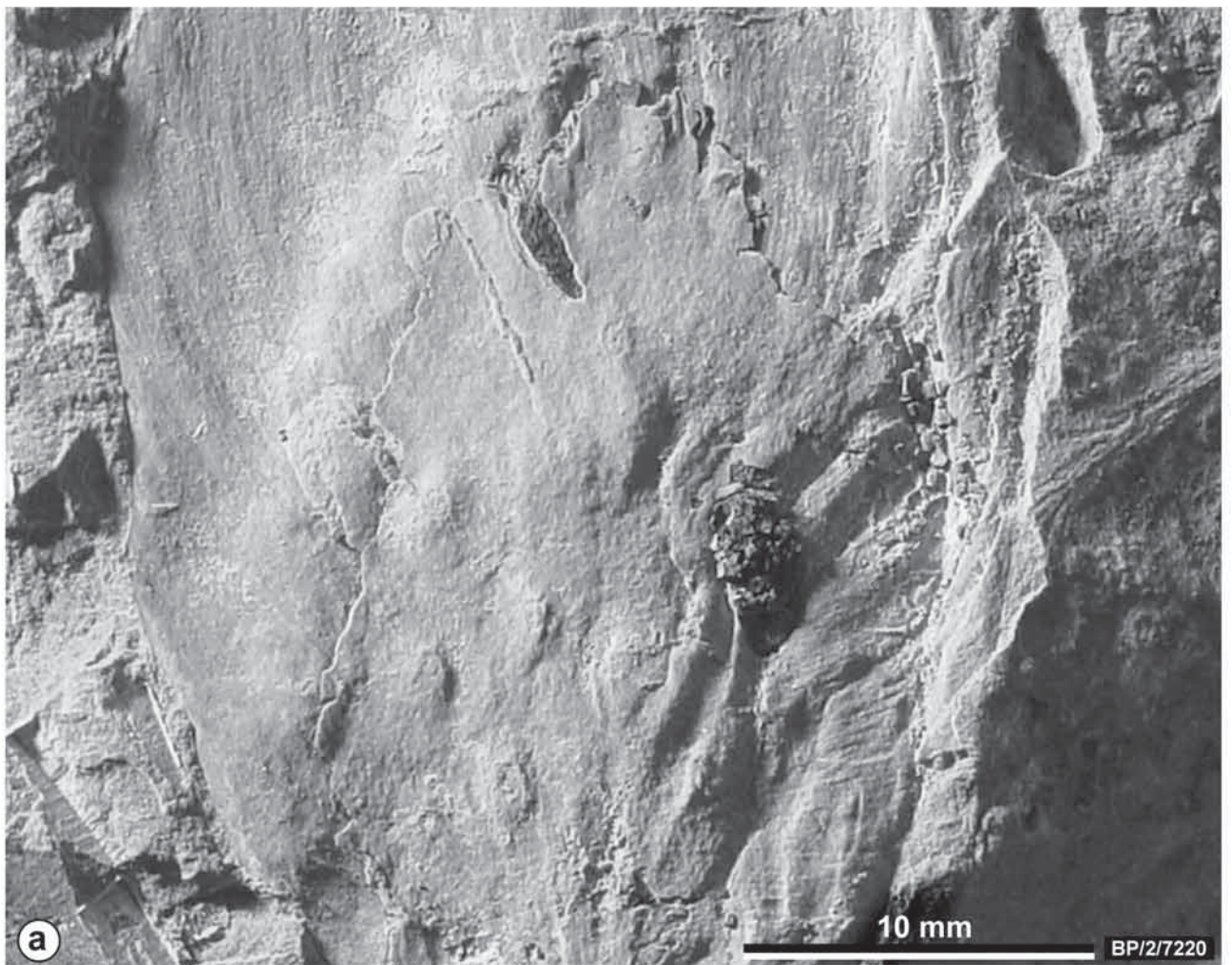


PLATE 34. Details of the dissection of BP/2/7318 to expose the hood; fig. (a): the impression fossil before dissection; fig. (d): the impression fossil following removal of the wedge of sediment bearing beautifully preserved impressions of seed scars; figs (b)-(g): close views of the edge of the impression of the receptacle, illustrating the presence of a carbonaceous compression between the sediment bearing an impression of the receptacle, and the underlying hood; in figs (b), (e) and (g), the reverse side of the dislodged sediment is shown to bear the impressions of fine striations from the hood beneath; the carbonaceous remnants of the hood lie beneath the impression of the receptacle; the exposed distal edge of the hood (along the aperture) is visible in fig. (f).

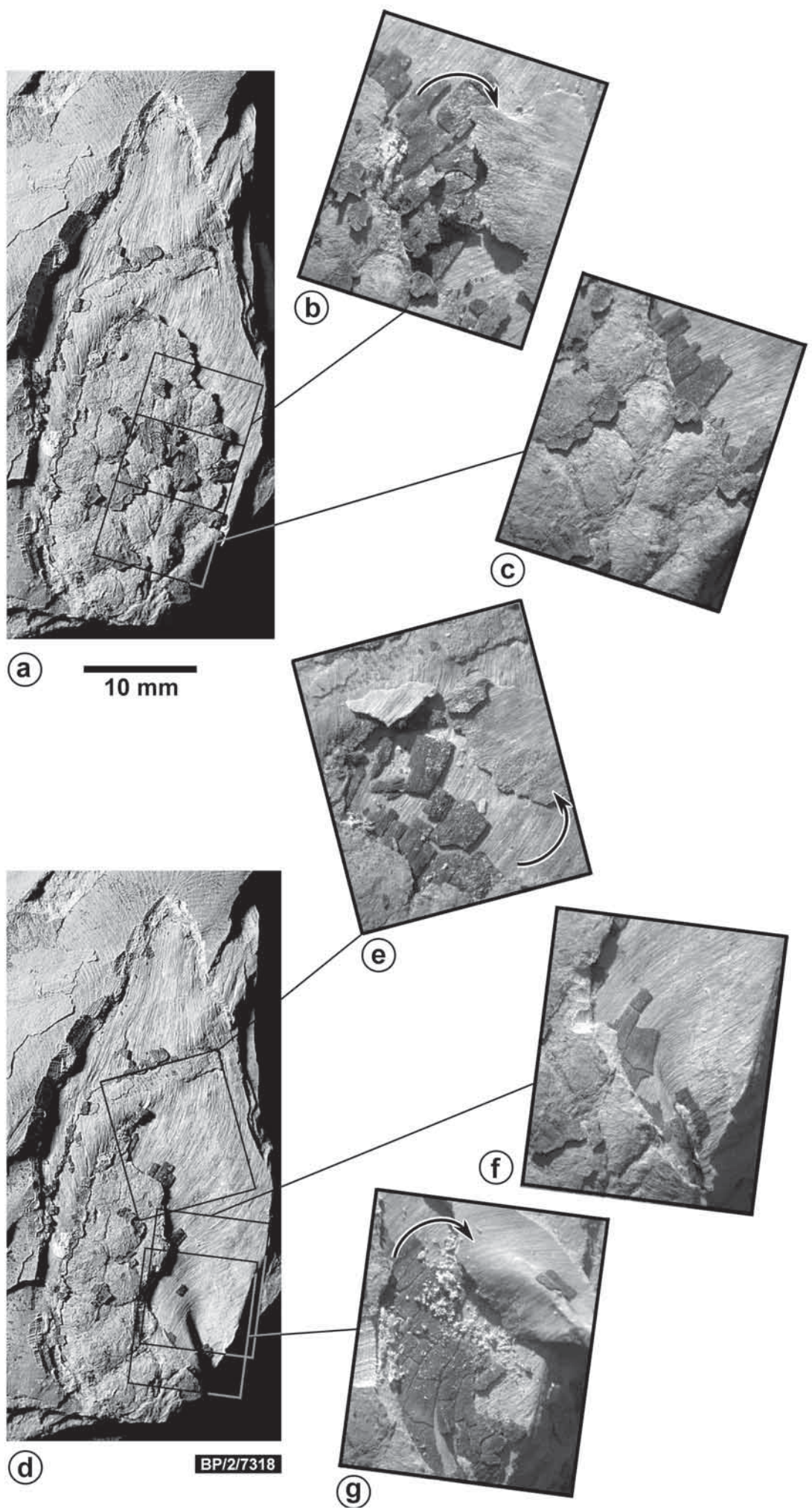


PLATE 35. Details of the dissection of BP/2/7220, illustrating how removal of the impression of the fertile surface of the receptacle reveals the hood beneath; the reverse surface of some of the fragments of sediment that were removed, have been enlarged to illustrate the presence of fine striations which represent an impression of the inner surface of the hood.

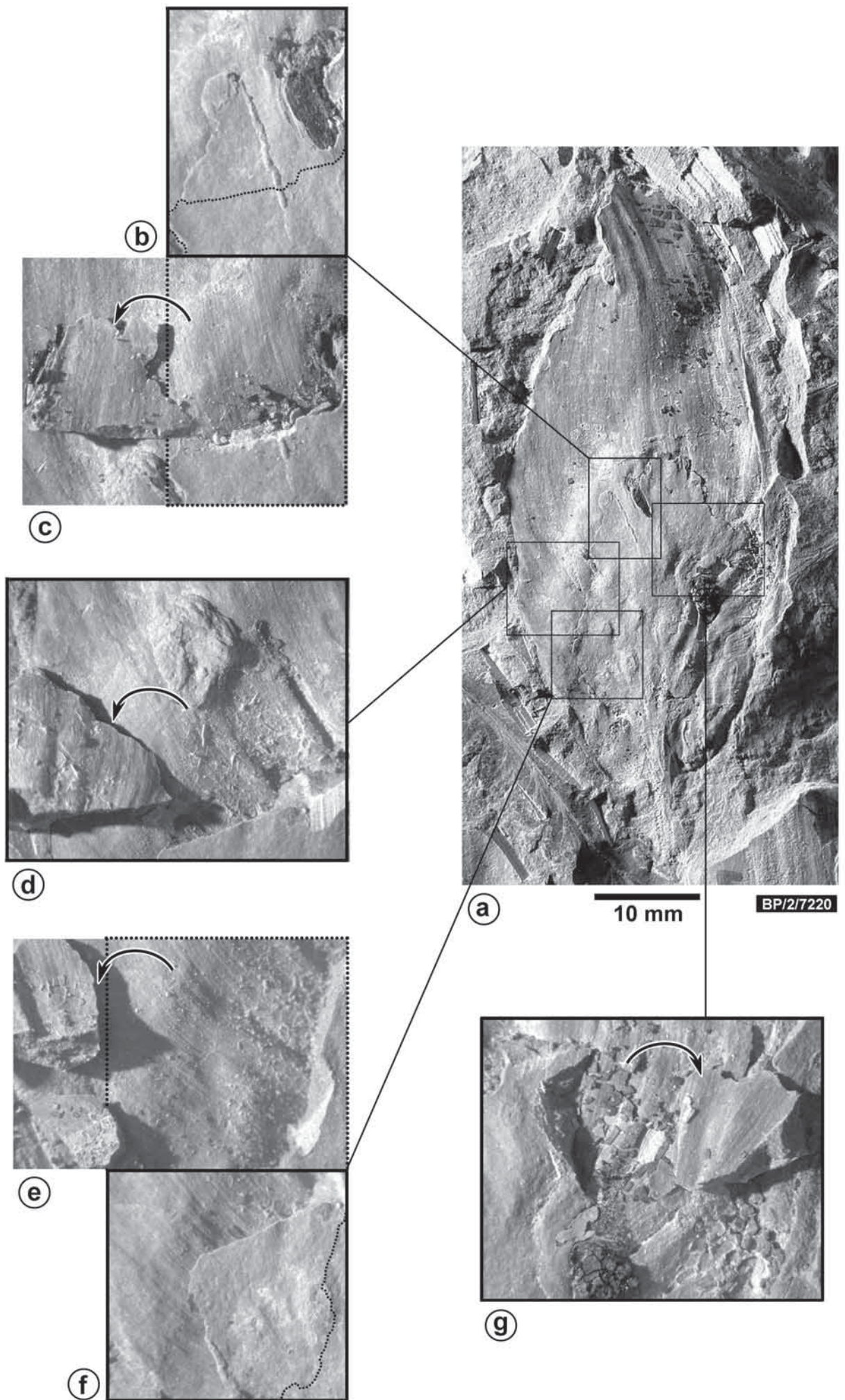
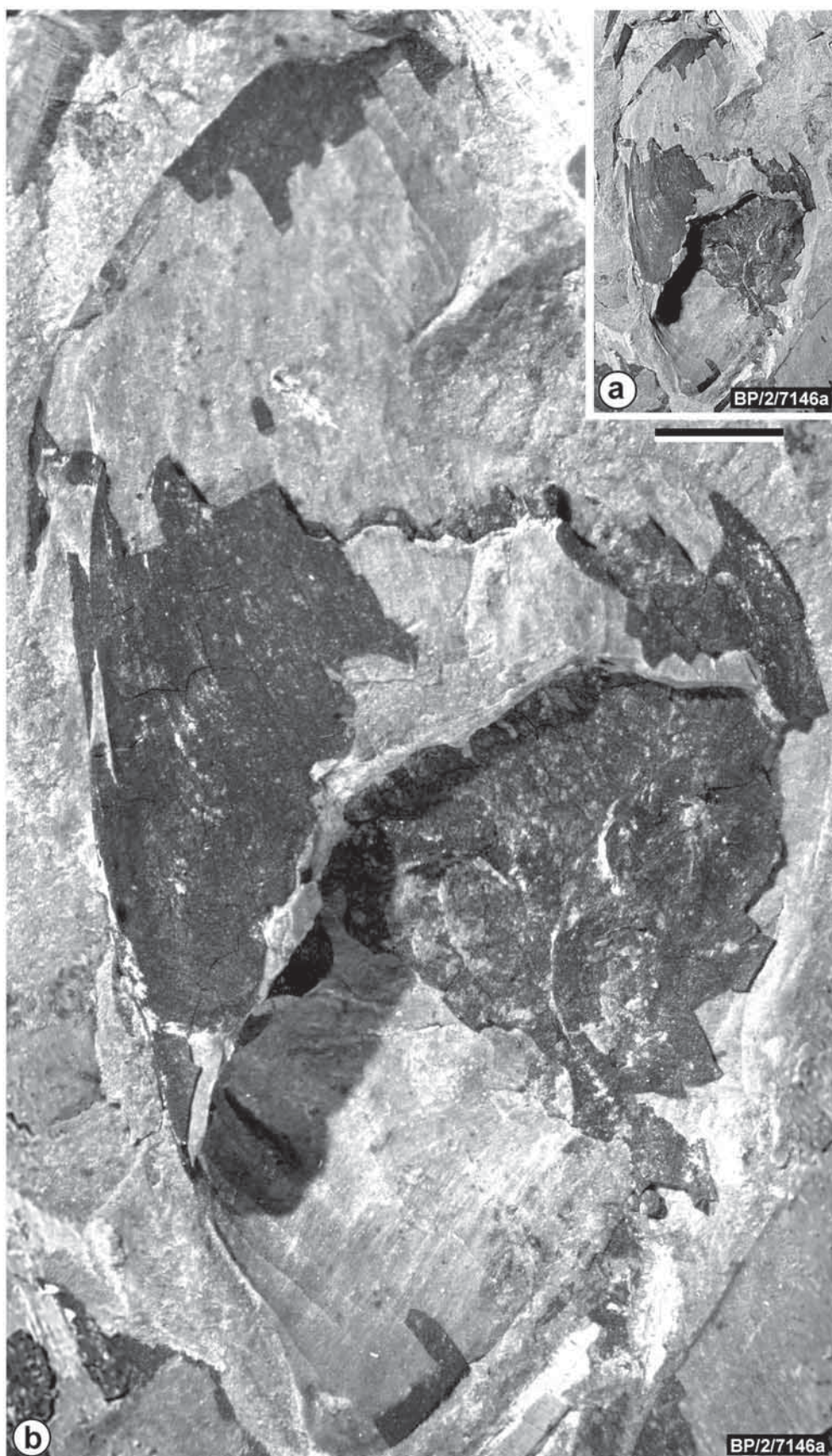


PLATE 35

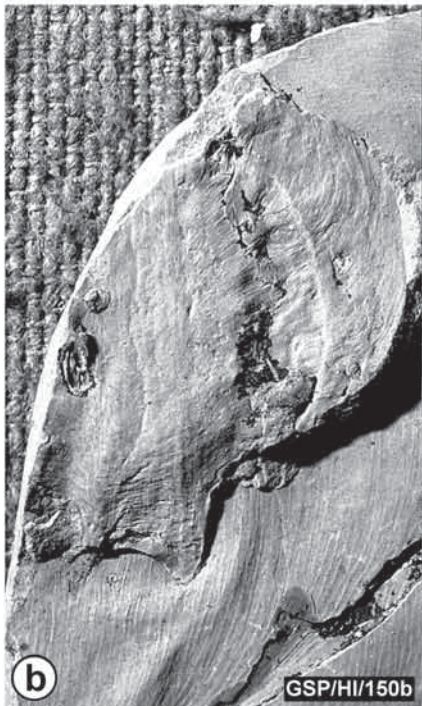
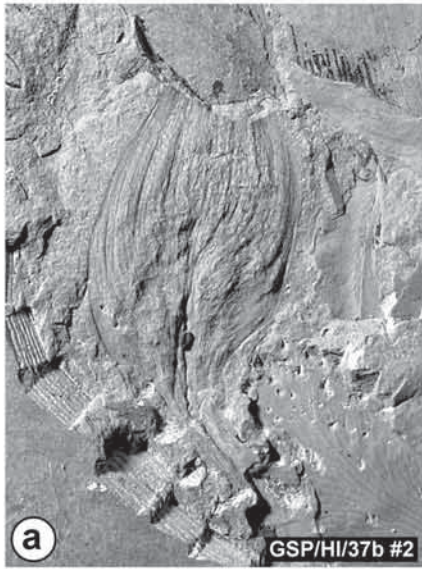
PLATE 36. Specimen BP/2/7146a: an unusual specimen of *Elatra leslii* with three-dimensional preservation; one can follow the phytoleim as it arches away from the receptacle on the left side of the fructification, illustrating the continuity between the covering and primary wings; the two layers of phytoleim merge in the apex of the fructification, where only the primary wing is present; although the orientation of the fructification is unclear, the specimen suggests that the outer margin of the secondary wing may be continuous with the hood.



10 mm

PLATE 36

PLATE 37. Fig. (a): a possible view of a fully exposed hood; the wedge-shaped feature may represent the aperture of the hood, or may be a crease in the sterile surface of the fructification; fig. (b) impression of a leaf base with the edge of the sterile surface of an attached fructification visible to the right; fig. (c): a view of a primary wing and fully exposed hood; note the prominent tent-shaped aperture in the hood, and the characteristic creasing of the hood-like wing due to compression during preservation; the slight indentation in the wing running approximately parallel to the aperture represents the line of divergence of the hood from the primary wing; fig. (d): a *Glossopteris* leaf of the same morphological type as those found with attached specimens of *Elatra leslii*; the leaf base has a characteristically expanded, bulbous base.

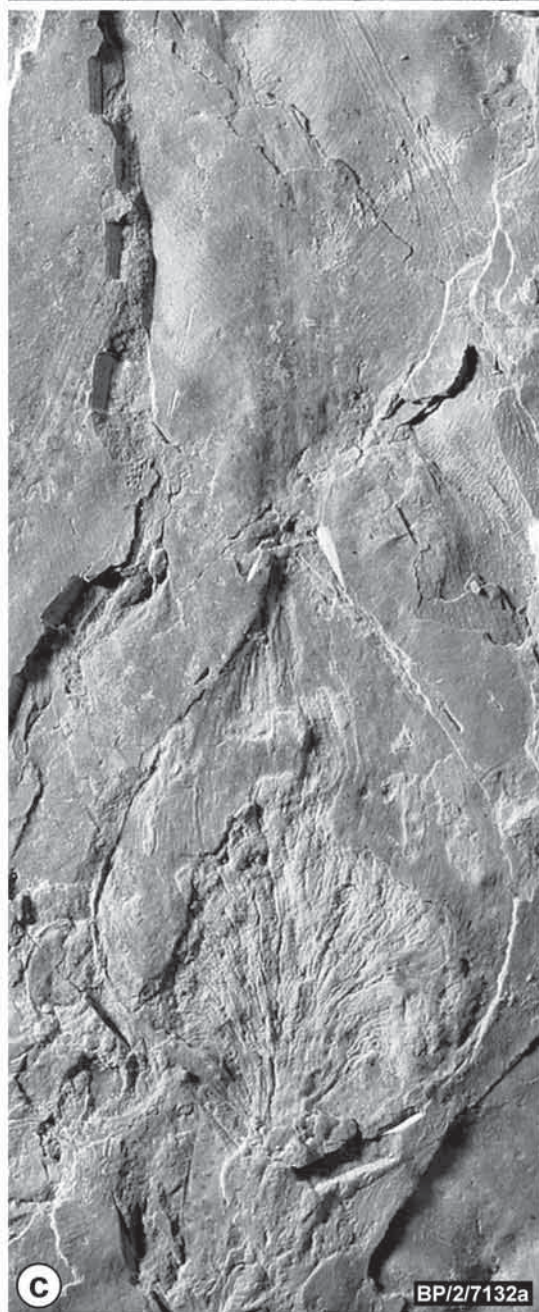
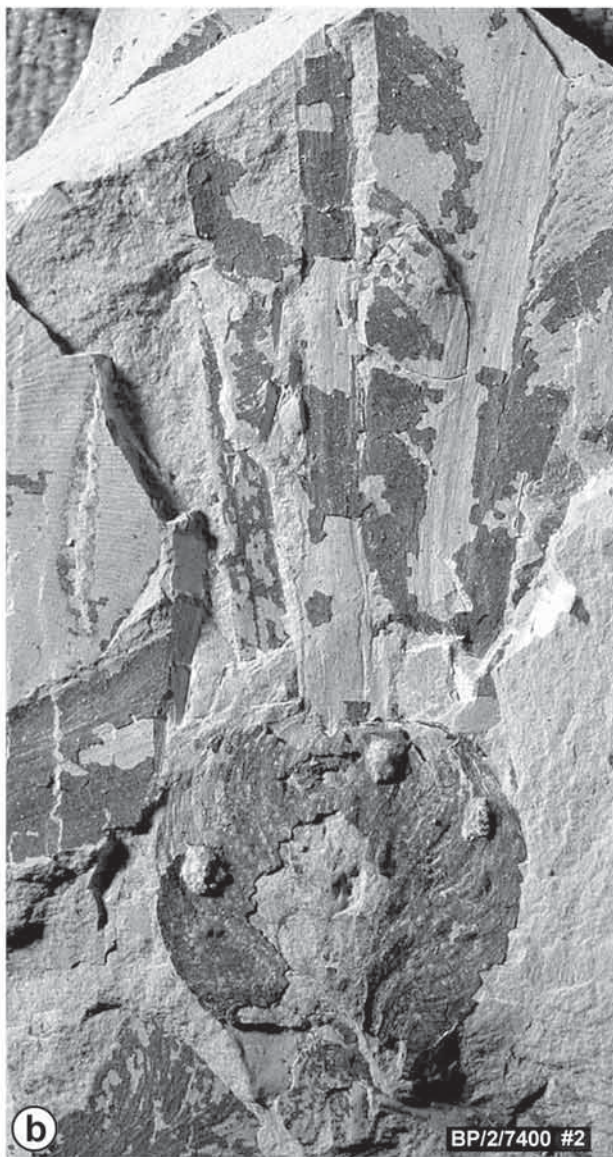
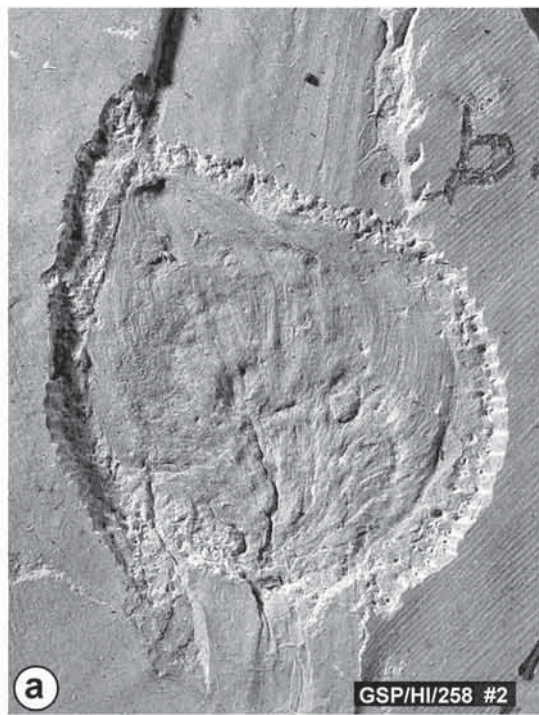


10 mm



PLATE 37

PLATE 38. Examples of *Elatra leslii* fructifications preserved in attachment to a subtending *Glossopteris* leaf.



10 mm

PLATE 39. Examples of *Elatra leslii* fructifications preserved in attachment to a subtending *Glossopteris* leaf.

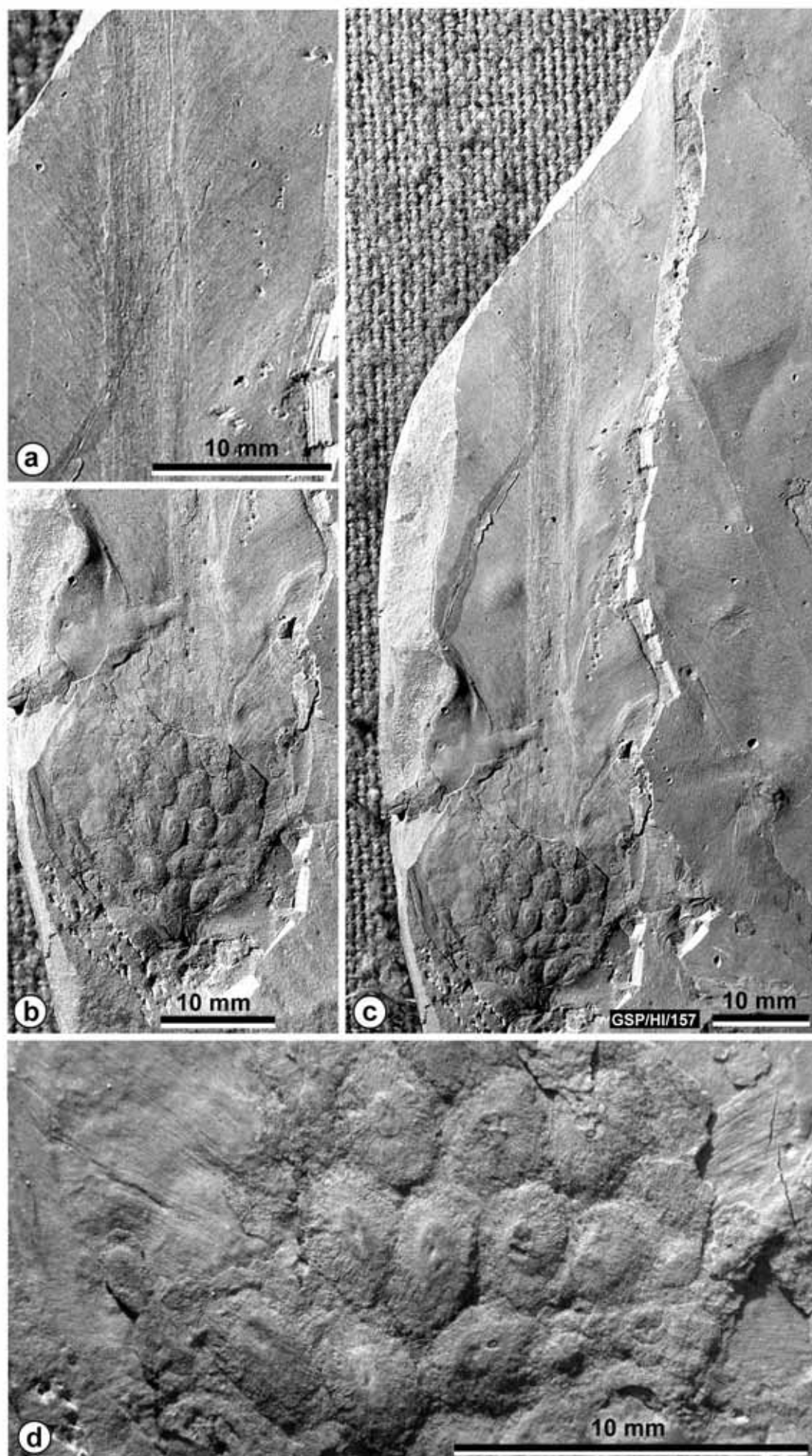


PLATE 39

PLATE 40. Examples of *Elatra leslii* fructifications preserved in attachment to a subtending *Glossopteris* leaf.

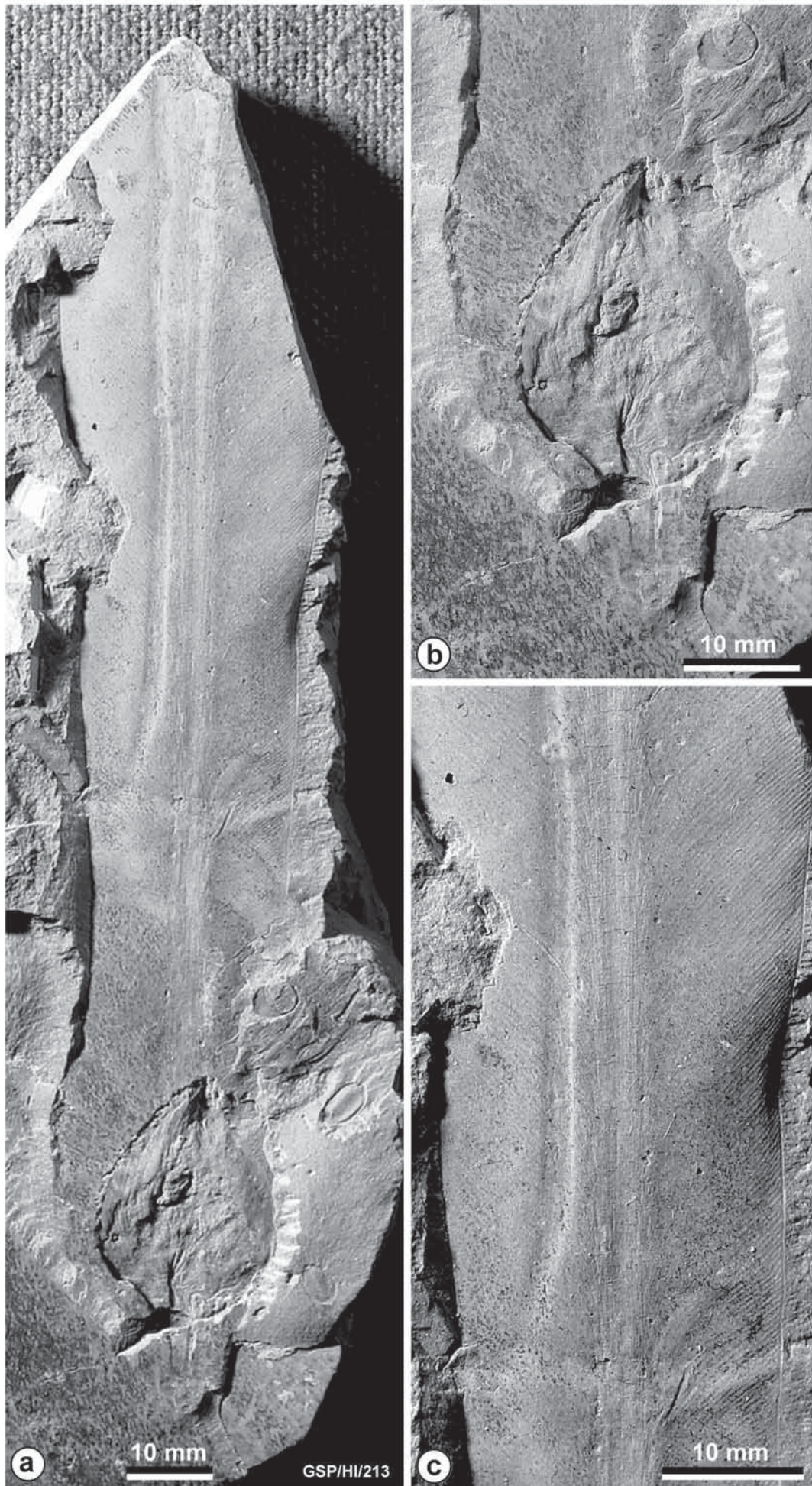


PLATE 40

PLATE 41. Drawings of *Elatra leslii*. Fig. (a): drawing of specimen in pl. 24, fig. (a); with an almost fully exposed hood, only some of the matrix bearing an impression of the fertile surface of the receptacle remaining in the lower left of the fructification; figs (b), (c): part and counterpart of the fructification in pl. 24, figs (c) and (d); note continuous surface of the impression of the sterile side of the fructification (c) and the separate wedge of sediment overlying the primary wing on the impression of the fertile side; fig. (d): drawing of the specimen in pl. 25, fig. (a), an impression of the sterile surface with venation passing uninterrupted from the receptacle into the primary wing; note the unusual lobes in the base of the fructification; fig. (e) counterpart of specimen figured in (d), with well-preserved seed-scar detail on wedge of sediment overlying the hood; fig. (f): drawing of specimen with impressions of subtending *Glossopteris* leaf, hood and sterile surface (figured and described in detail in pl. 32).

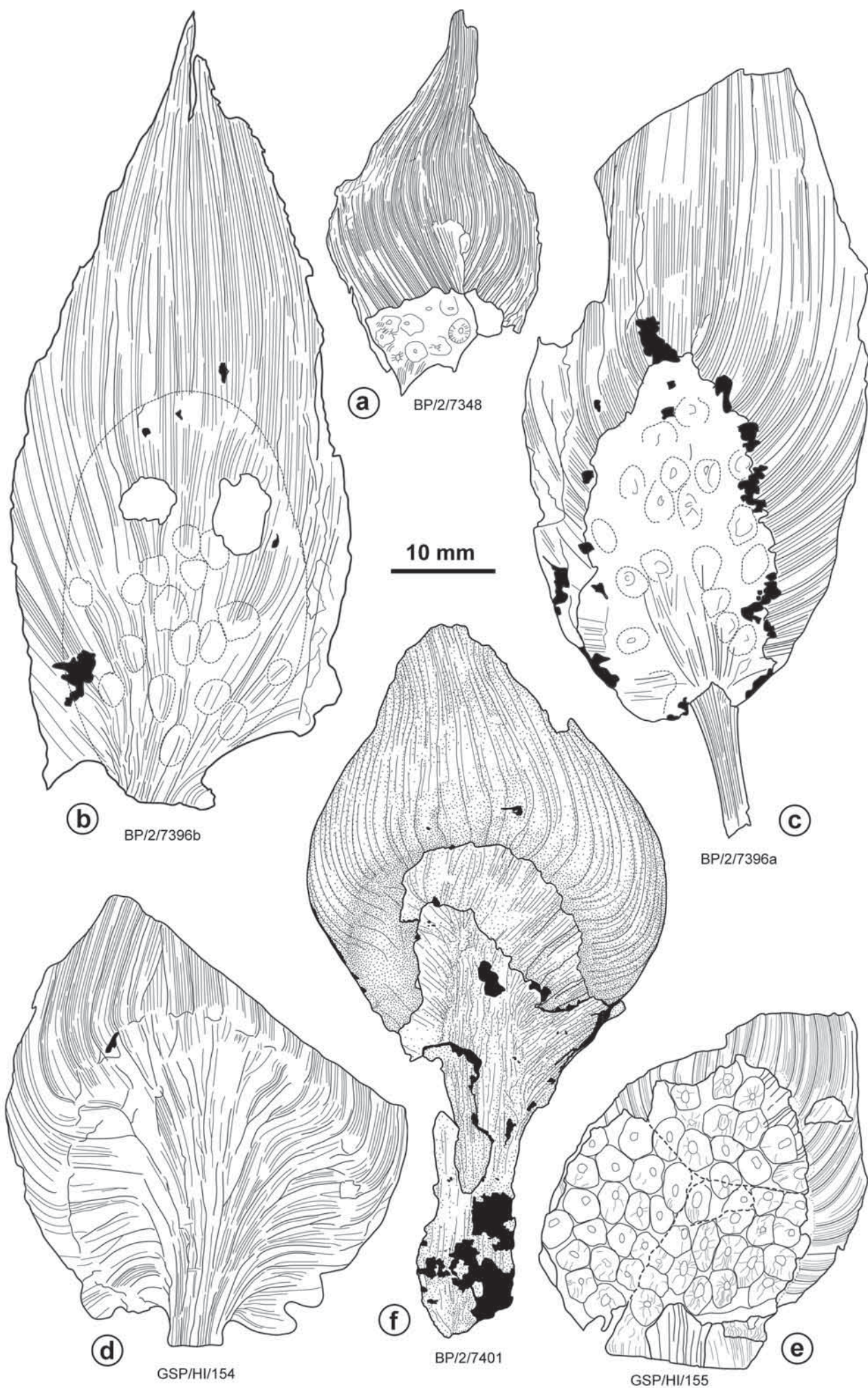
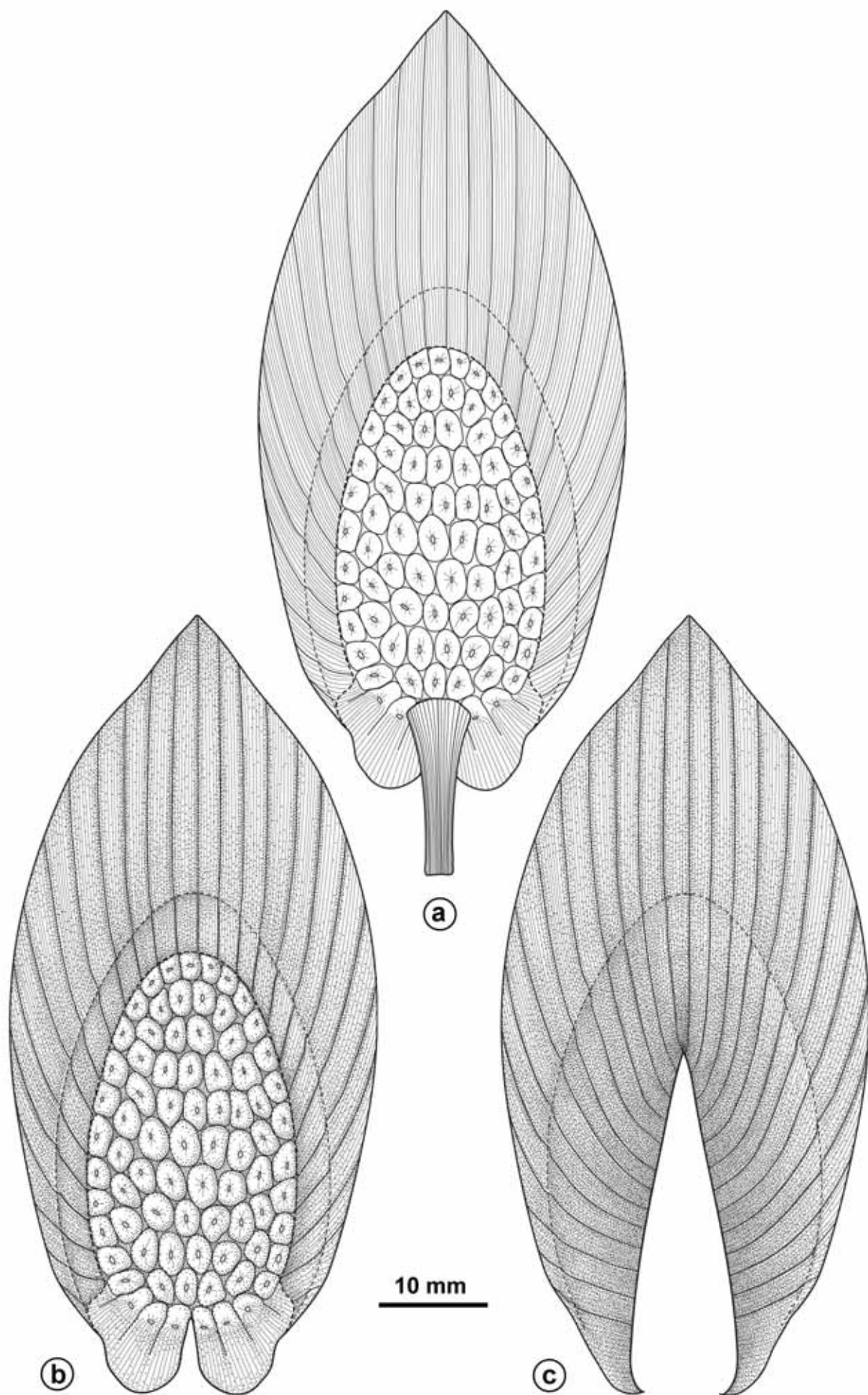


PLATE 42. Reconstructions of *Elatra leslii*. Fig. (a): a full fossil reconstruction of the fructification, with pedicel; fig. (b): a fossil reconstruction without pedicel, illustrating the position and structure of the secondary wing, with radial fluting and striations associated with the marginal seed scars at the base of the receptacle; the dotted line at the base of the primary wing represents the line of divergence of the hood, beneath the wedge of sediment bearing the impression of the seed scars; note how the elongated primary wing bears fluting and striations that are apically inclined; the fluting in the primary wing also corresponds to the positions of the marginal seed scars; fig. (c): a reconstruction of a fully exposed hood with its tent-like basal aperture; this is the view that results from complete removal of the impression of the fertile surface and secondary wing.



RECONSTRUCTIONS

PLATES 43 - 48: *Ottokaria* spp.

PLATE 43. Figs (a)-(f): specimens of *Ottokaria transvaalensis* from Vereeniging. Figs (a), (b): part and counterpart of the holotype, illustrating the long, narrow pedicel of even width, and the deeply incised wing lobes distinctive of the species.

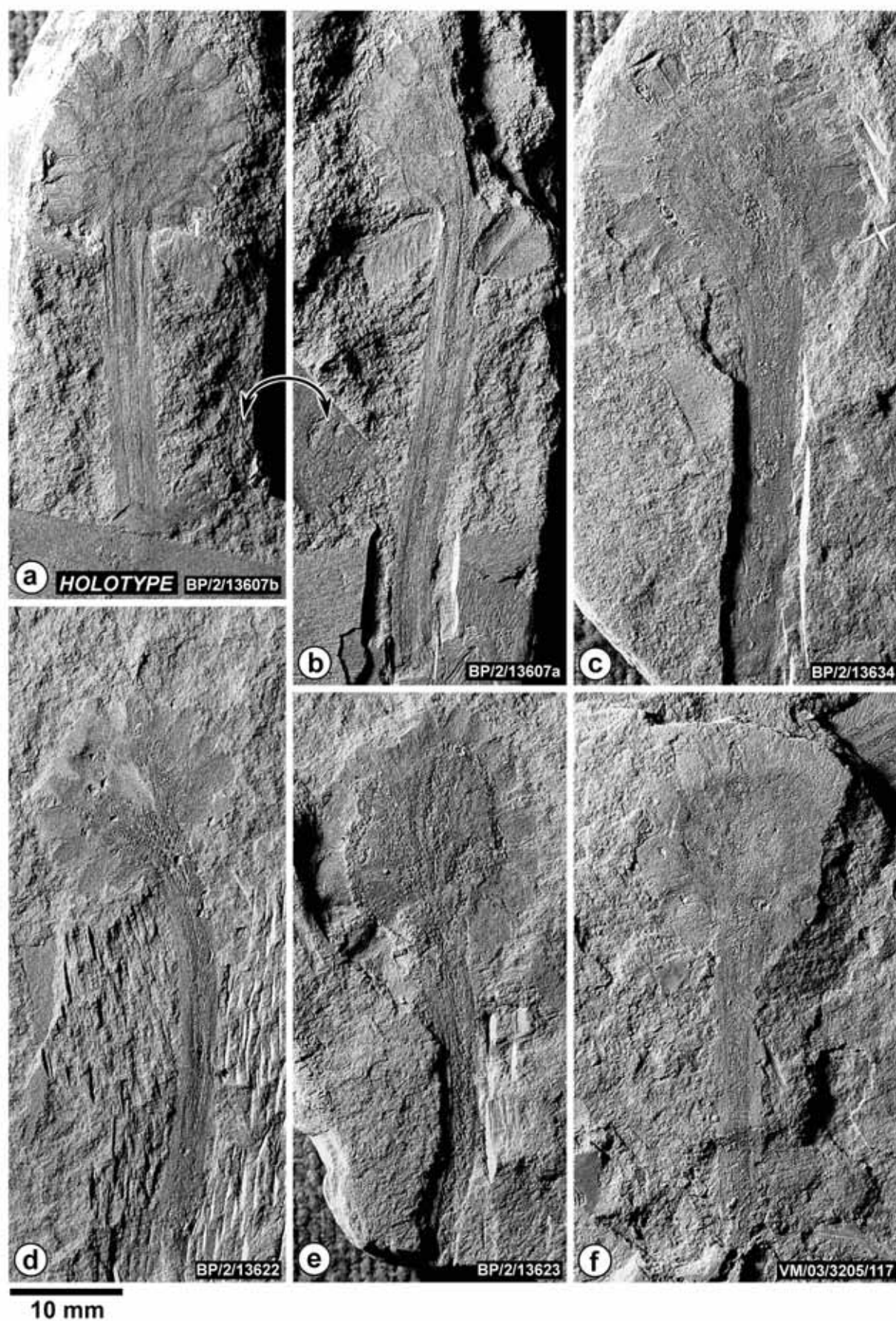
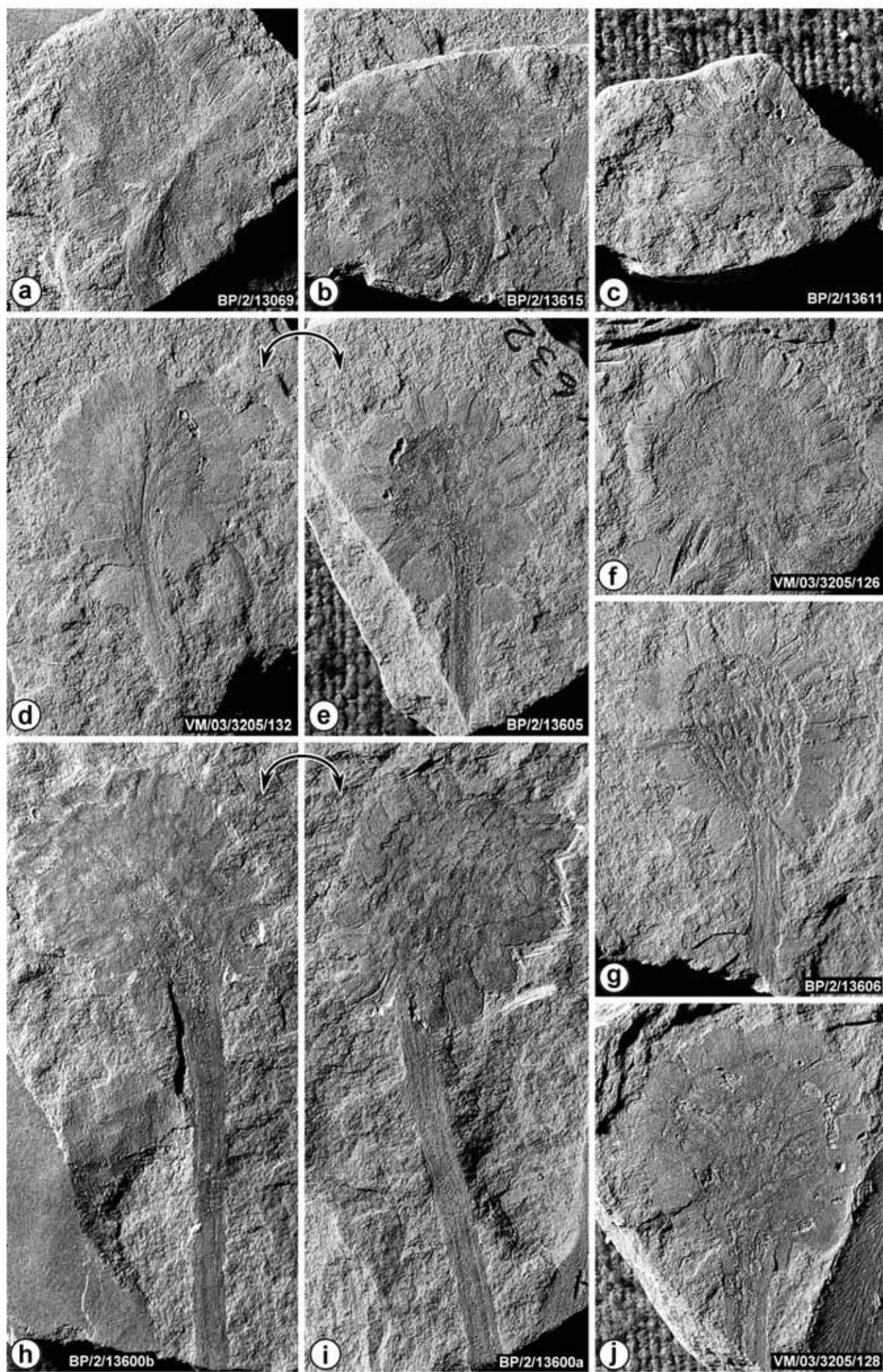
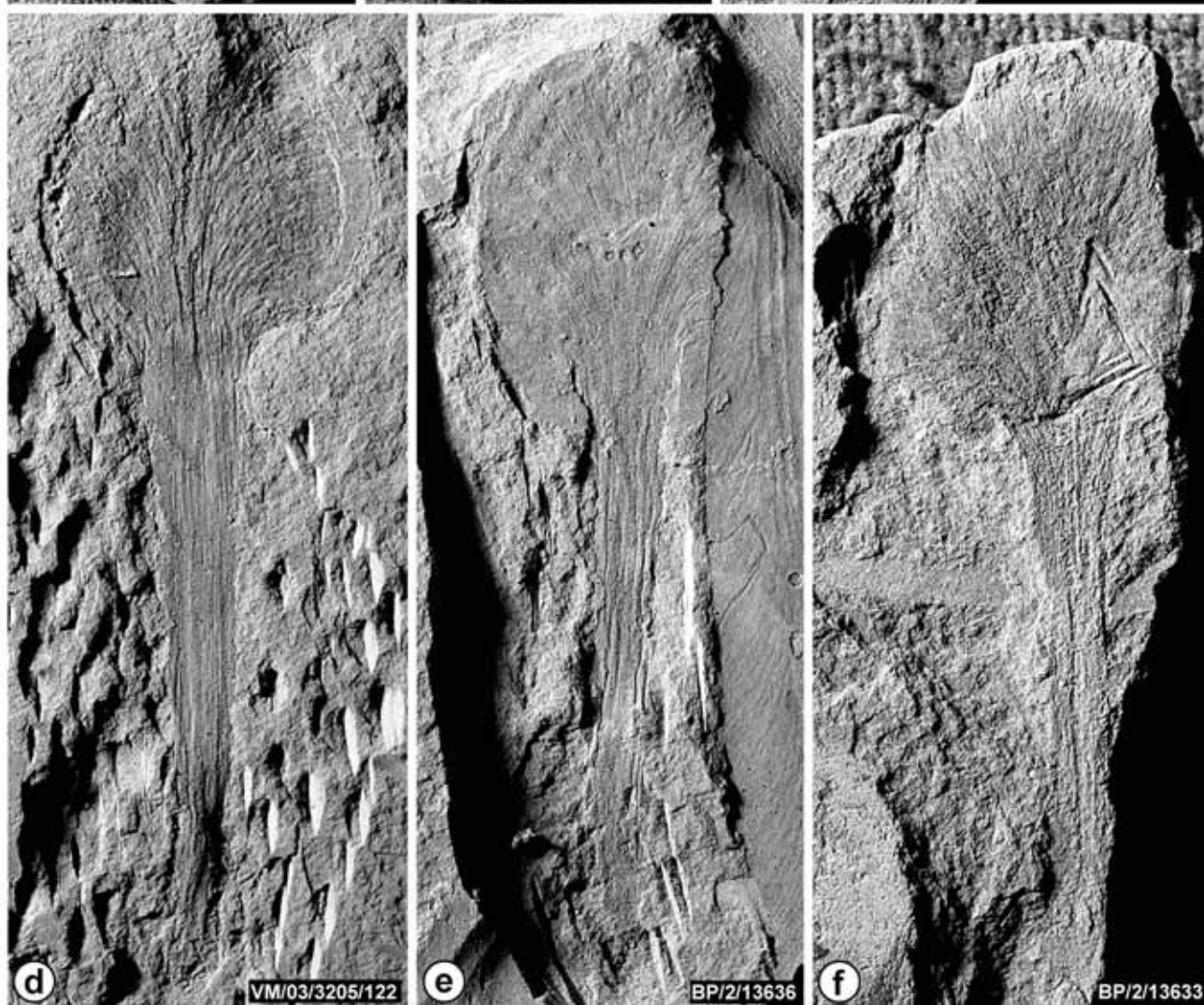
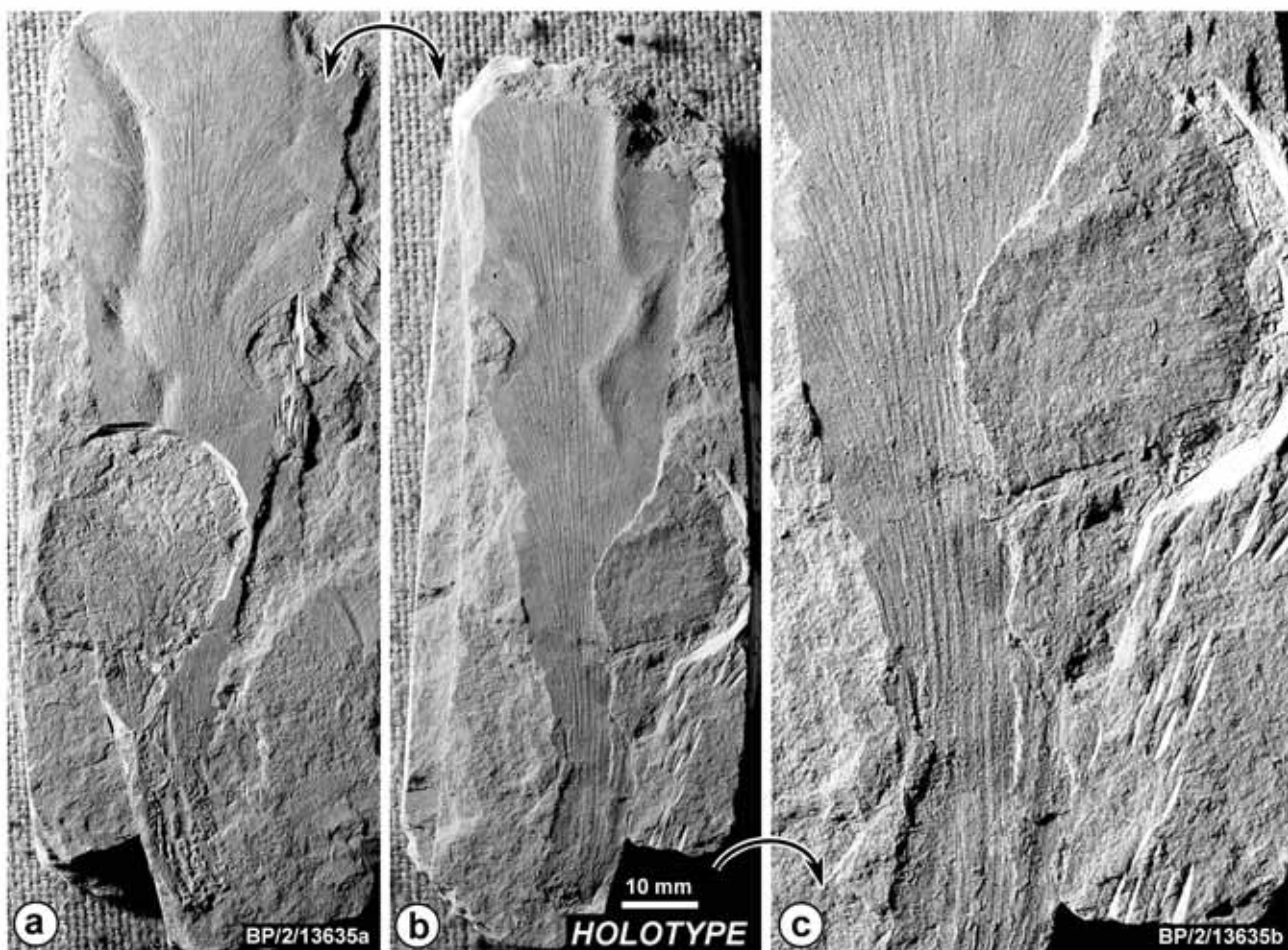


PLATE 44. Additional examples of *O. transvaalensis* from Vereeniging, illustrating the variation in receptacle shape, wing width and degree of lobe incision. The part and counterpart in figs (h), (i) very clearly show the division of the wing into blunt, rounded lobes.



10 mm

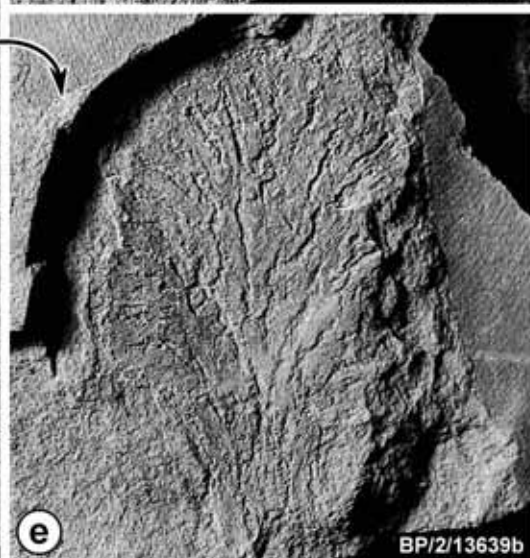
PLATE 45. *Ottokaria buriadica* from Vereeniging. Figs (a)-(c): the holotype of *O. buriadica* in attachment to the base of a gangamopterid *Glossopteris* leaf; figs (d)-(f): additional examples from Vereeniging, showing the round receptacle, narrow wing and pedicel which is broadly expanded at insertion into the receptacle.



10 mm

PLATE 45

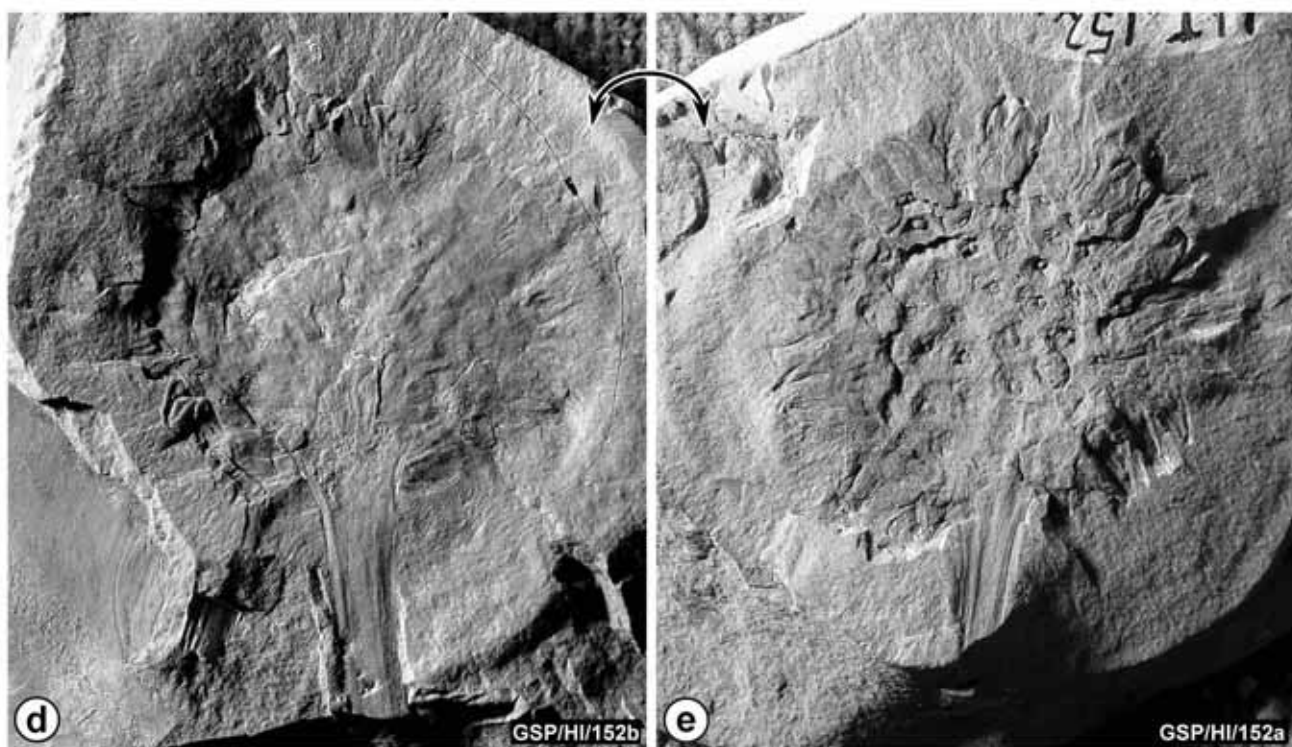
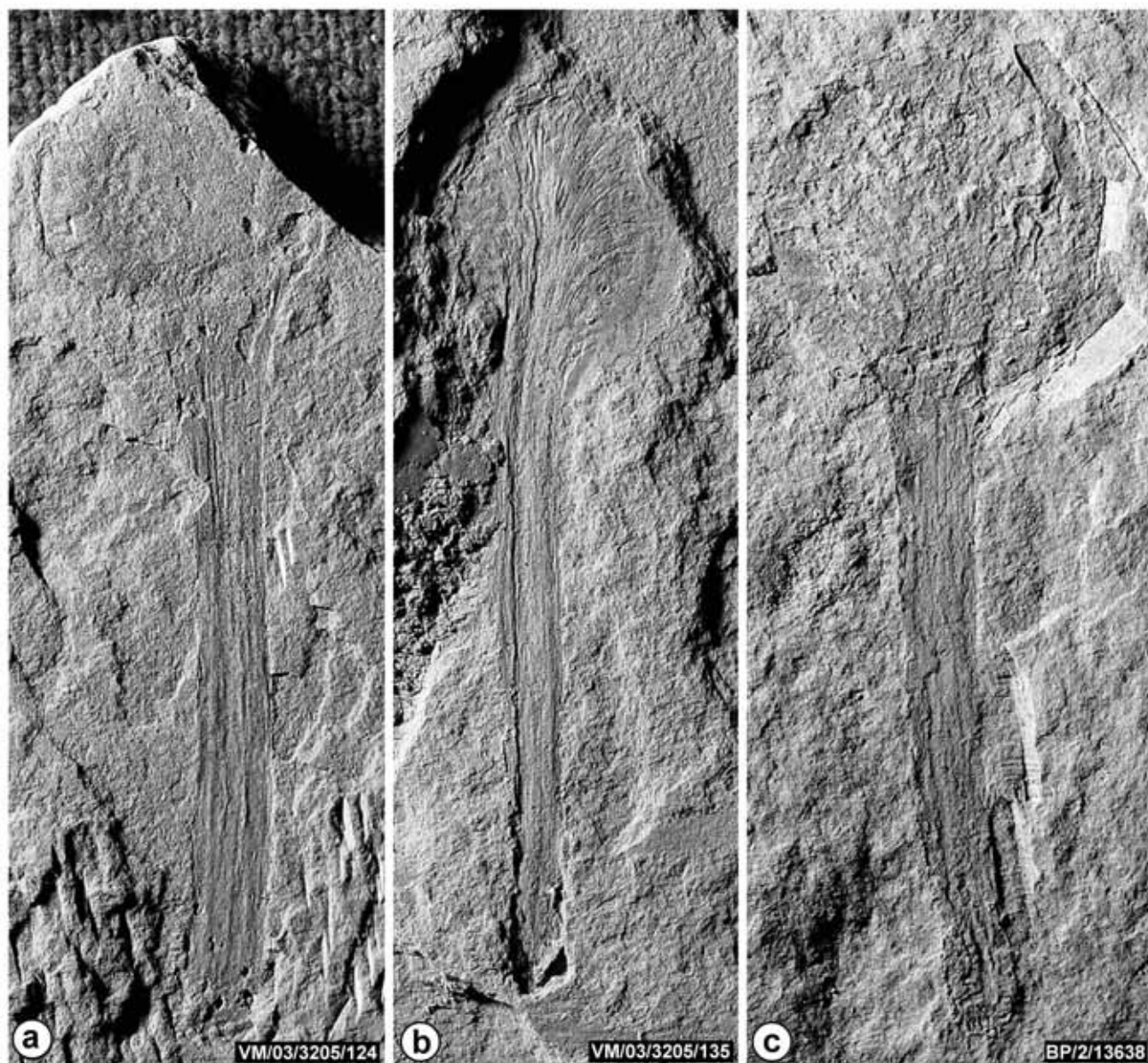
PLATE 46. Further examples of *O. buriadica* from Vereeniging.



10 mm

PLATE 46

PLATE 47. Figs (a)-(c): *O. buriadica* from Vereeniging; figs (d) & (e): part and counterpart of the best-preserved specimen of *O. hammanskraalensis* from Hammanskraal.



10 mm

PLATE 48. Figs (a)-(c): reconstructions of *O. transvaalensis*, *O. hammanskraalensis* and *O. buriadica* respectively.

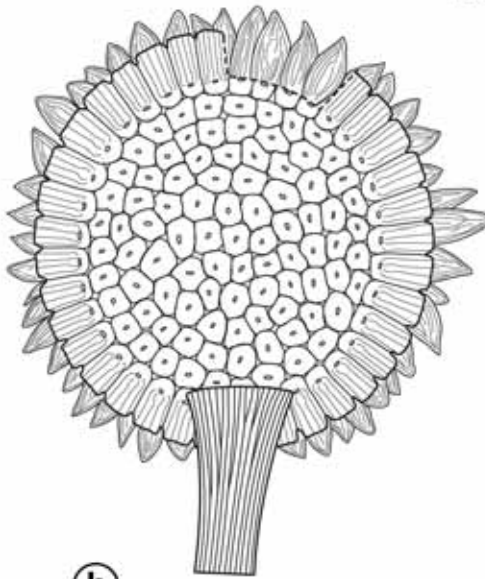


(a)

Ottokaria transvaalensis

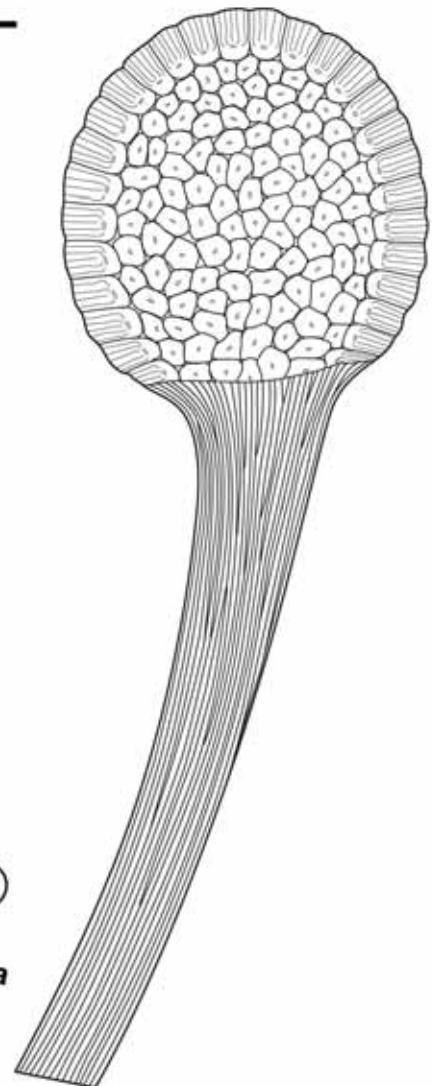
RECONSTRUCTIONS

10 mm



(b)

Ottokaria hammanskraalensis



(c)

Ottokaria buriadica

PLATES 49 - 58: *Scutum leslii*

PLATE 49. *Scutum leslii* specimens from Vereeniging. One of Plumstead's (1952) syntypes for '*S. rubidgeum*' is figured in (a) & (b), and the two syntypes she assigned to *S. leslii* are figured in (c), (e) & (f).

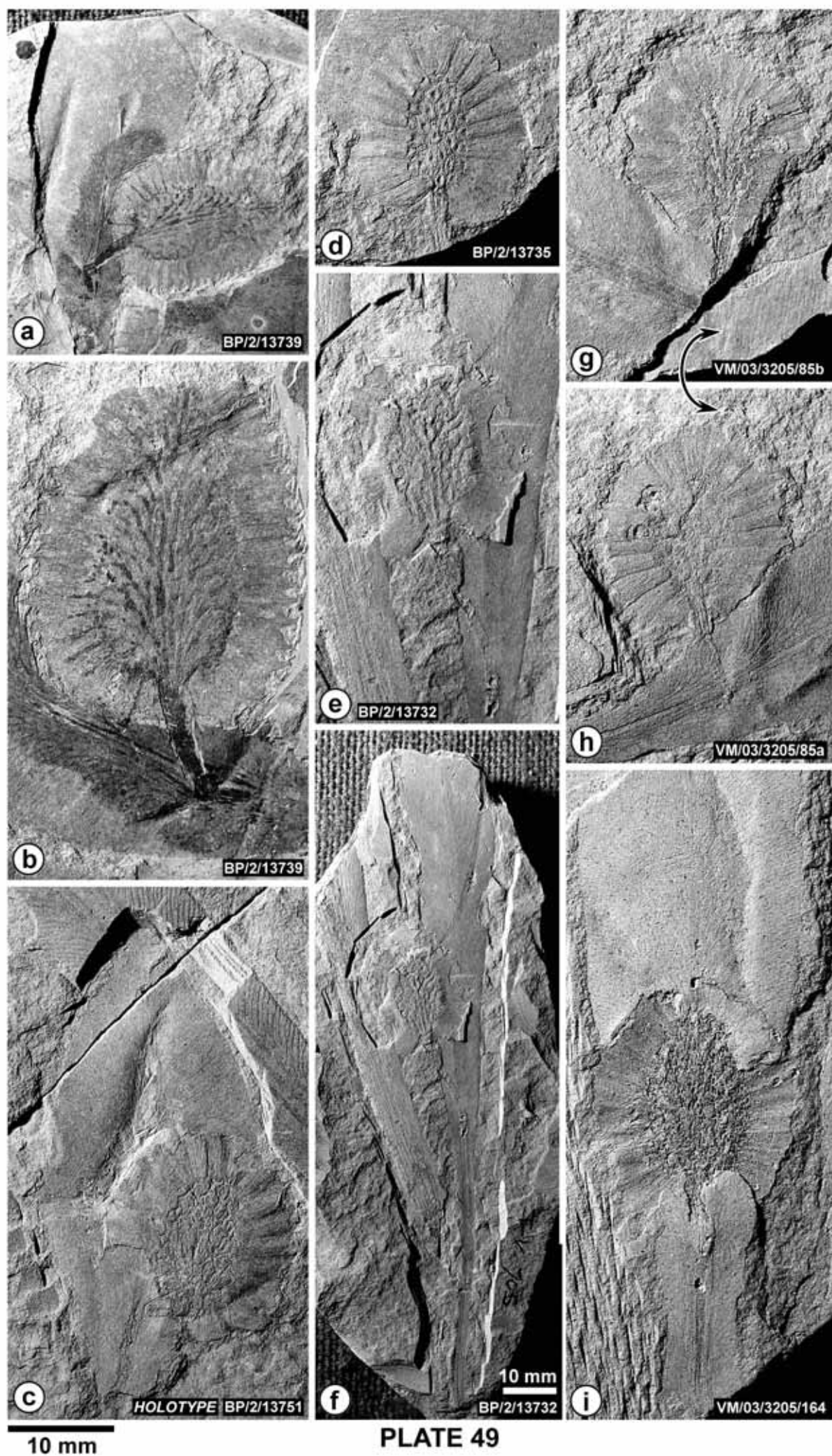
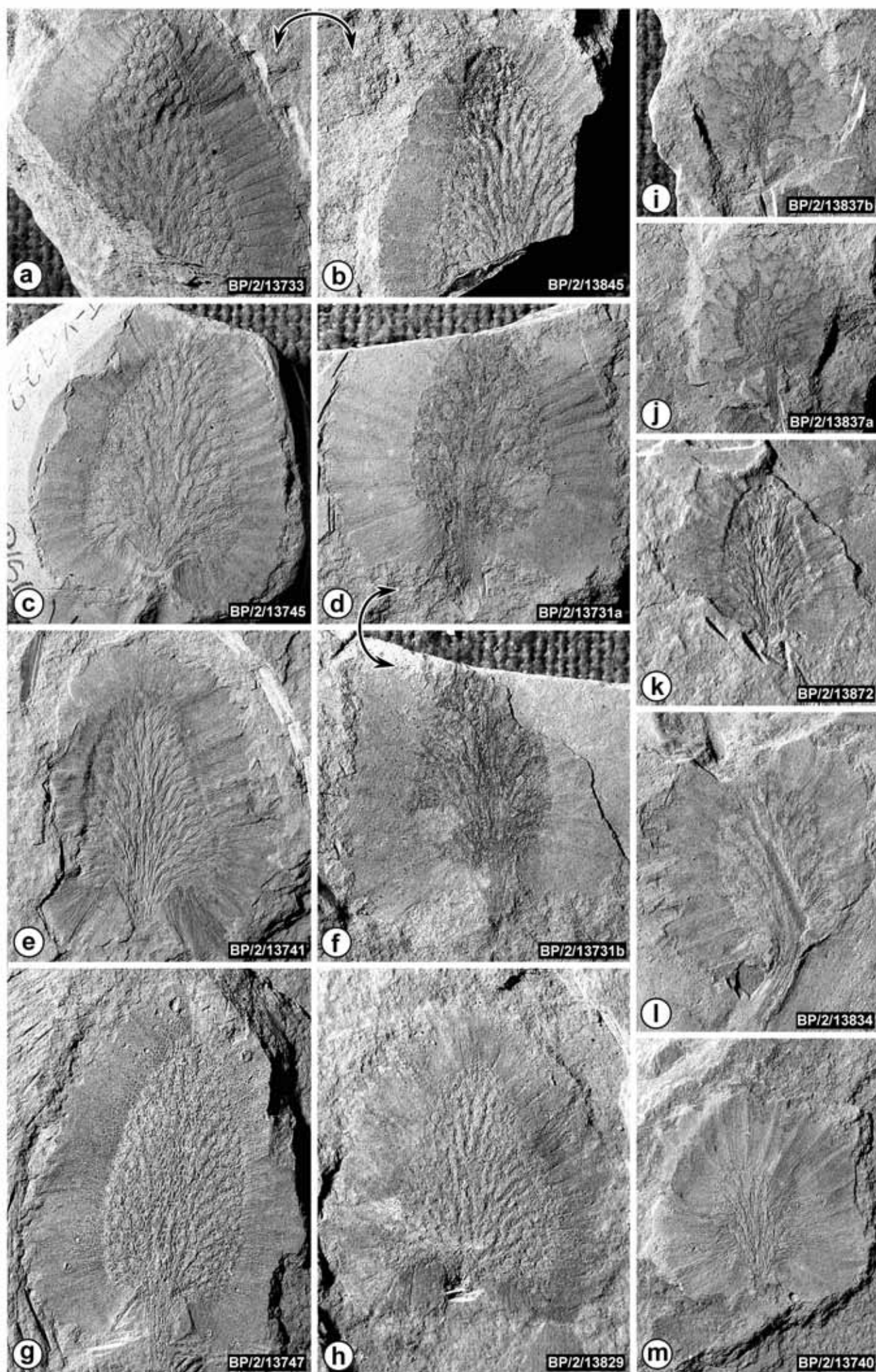


PLATE 49

PLATE 50. Additional examples of *S. leslii*, illustrating the huge variety in size and shape of specimens from Vereeniging. The specimen in fig. (a) was assigned by Anderson & Anderson (1985) to '*S. draperium*', perhaps on the basis of its large size.



10 mm

PLATE 50

PLATE 51. *S. leslii* from Vereeniging; note the very high wing width to receptacle ratio of the specimens in figs (j), (l) & (m), and the slightly cordate bases of those in figs (a), (c), (d) & (h).

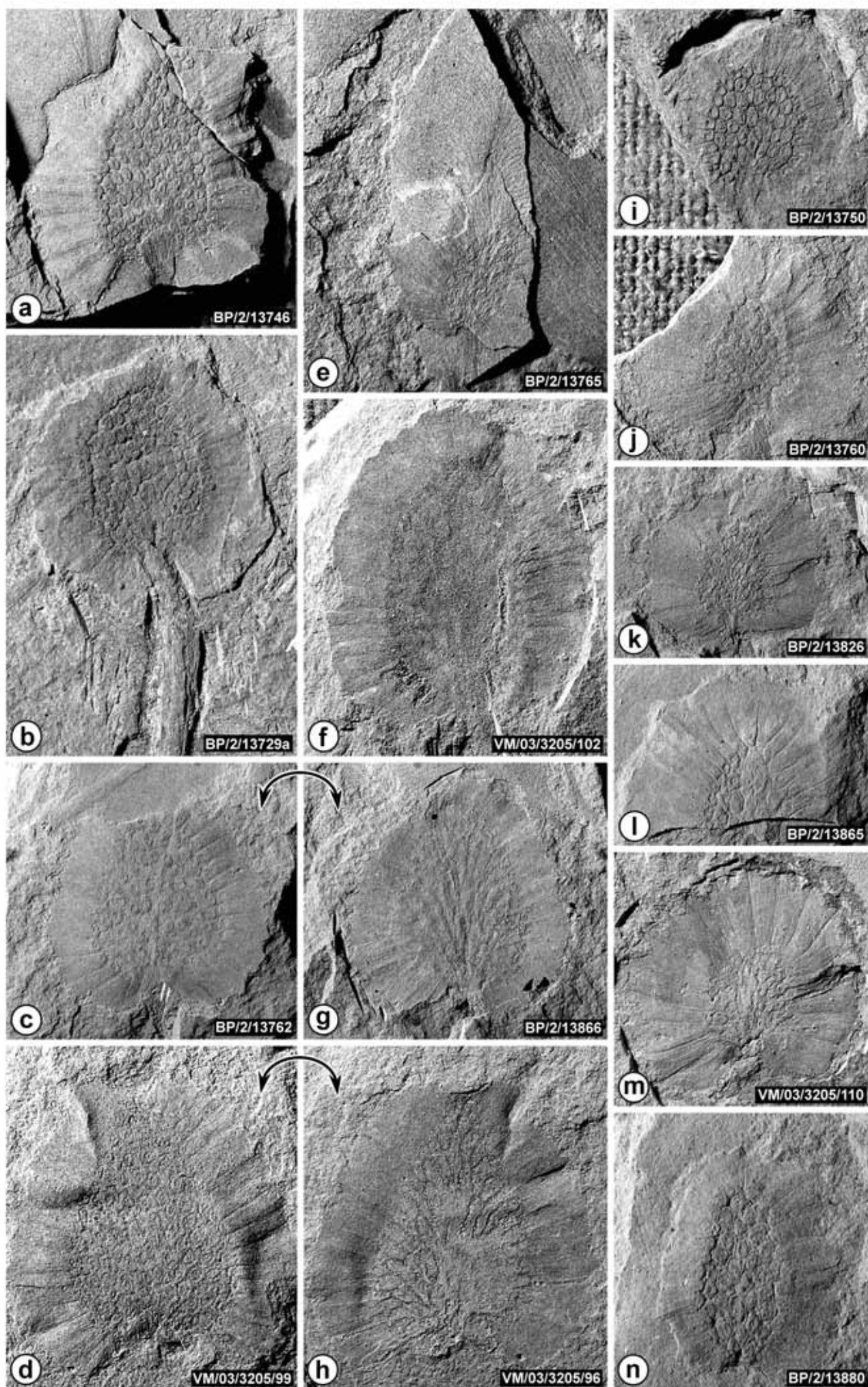


PLATE 51

PLATES 52-53. *S. leslii* fertiligers from Vereeniging, illustrating the variation in form of the subtending leaves. Figs (d)-(f) illustrate Plumstead's (1952) syntype for the seed-bearing surface of '*S. rubidgeum*'. The specimen figured in pl. 53, figs (g), (h) is an example of '*S. draperium*' as per Plumstead (1952, 1956a) and Anderson & Anderson (1985).

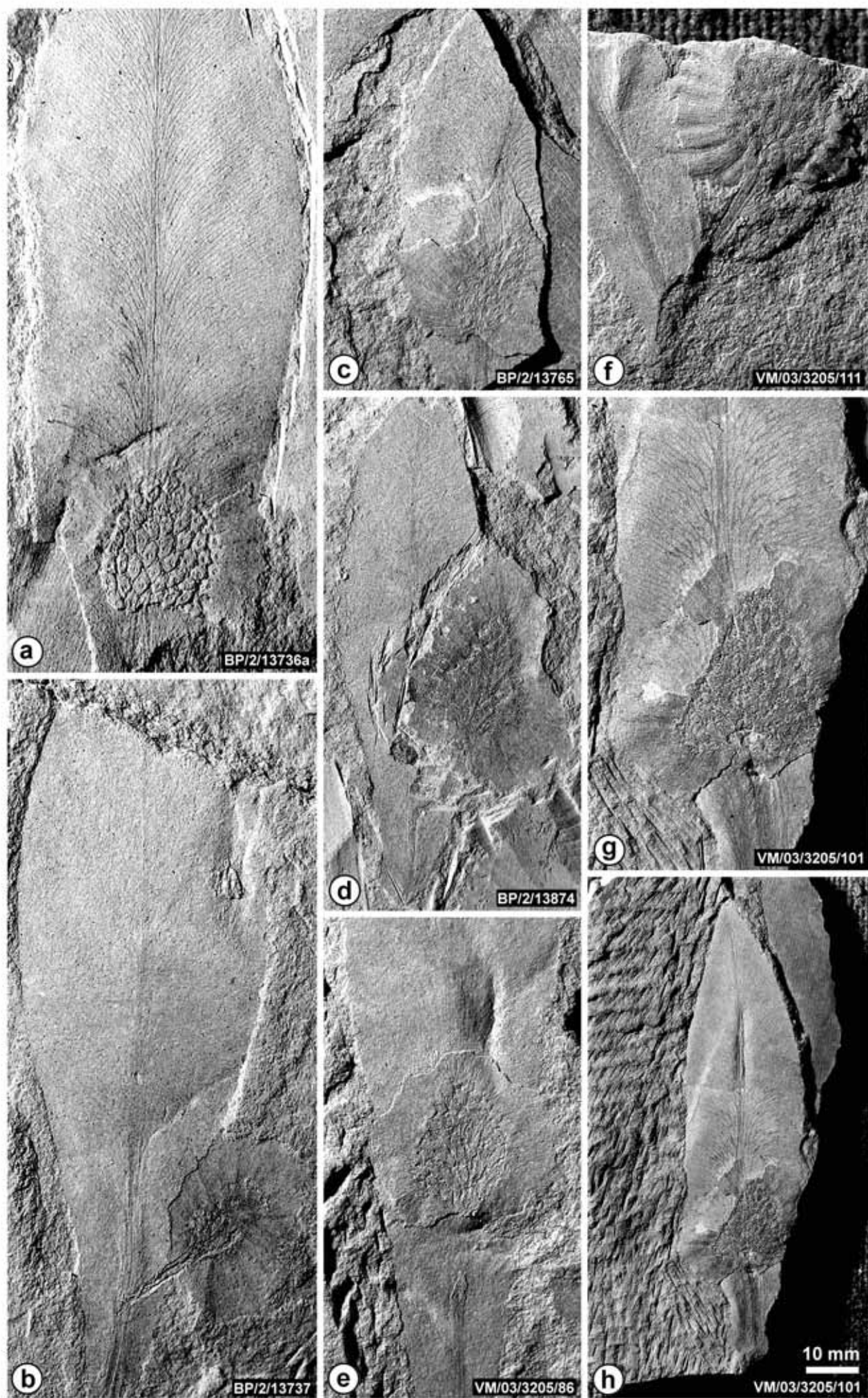
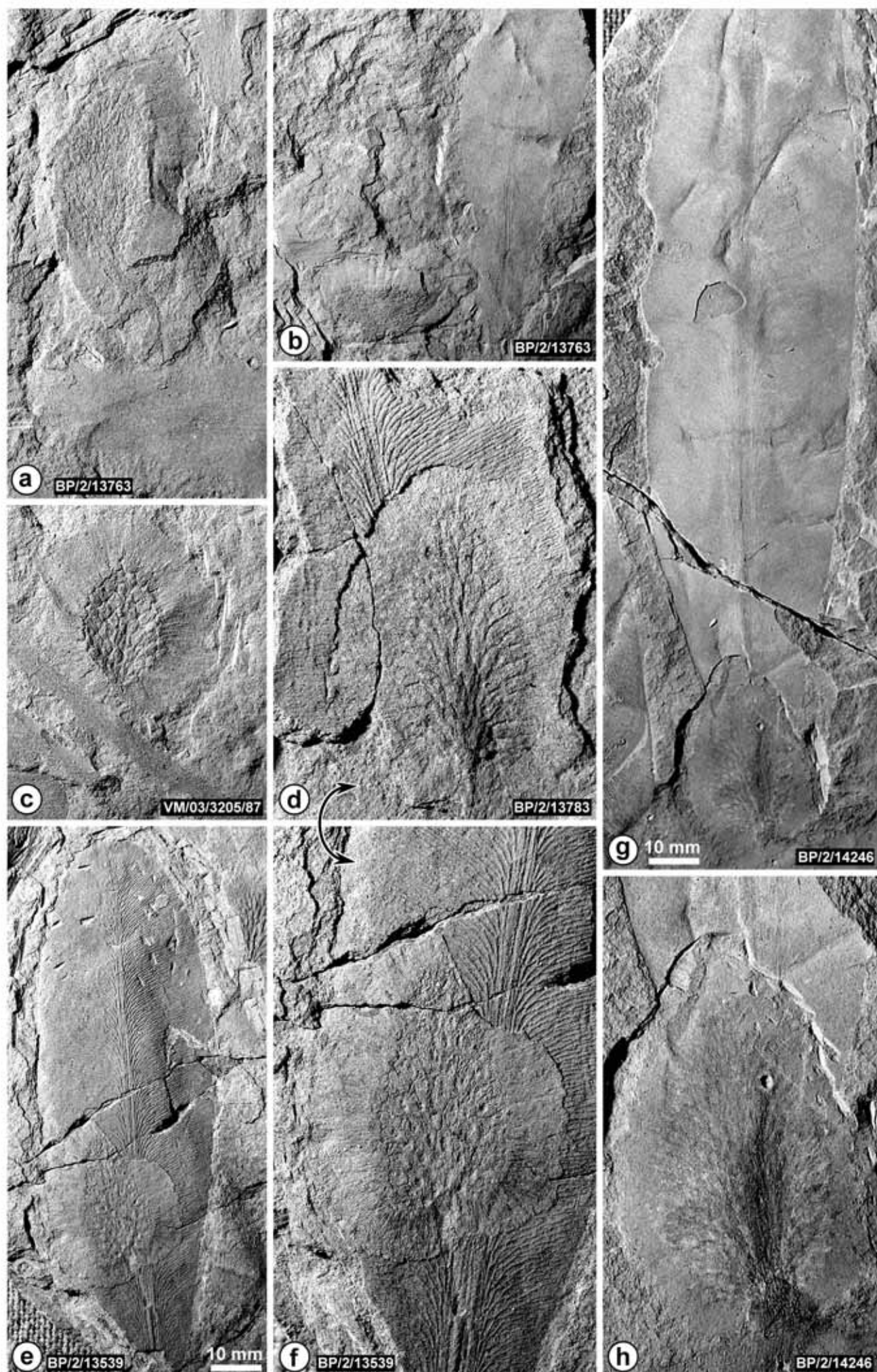


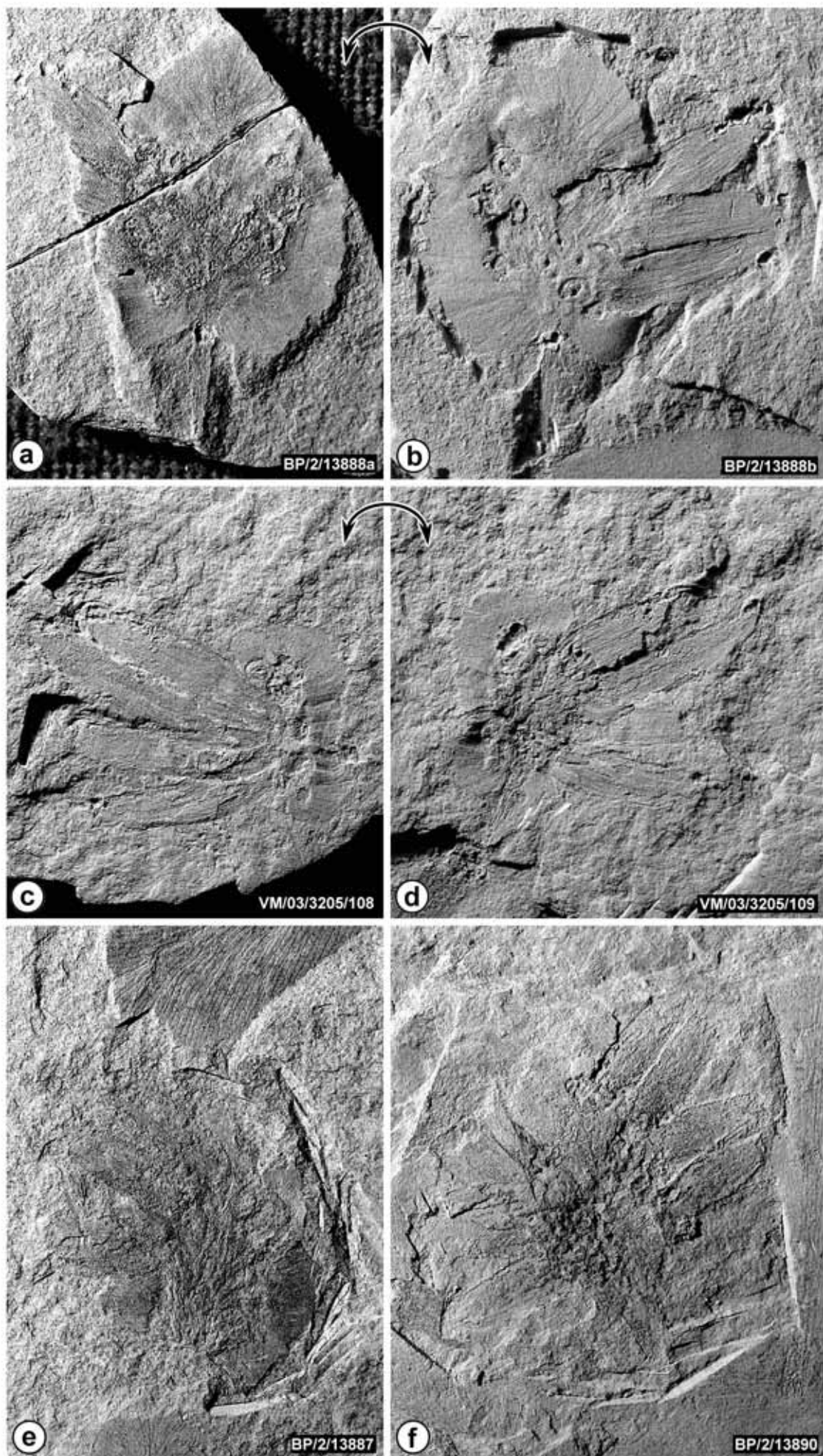
PLATE 52



10 mm

PLATE 53

PLATE 54-55. The controversial, bract-bearing *S. leslii* specimens from Vereeniging. The 'bracts', interpreted by Plumstead (1956a, 1958a) as pollenate structures, are here considered to be the elongate wings of attached seeds.



10 mm

PLATE 54

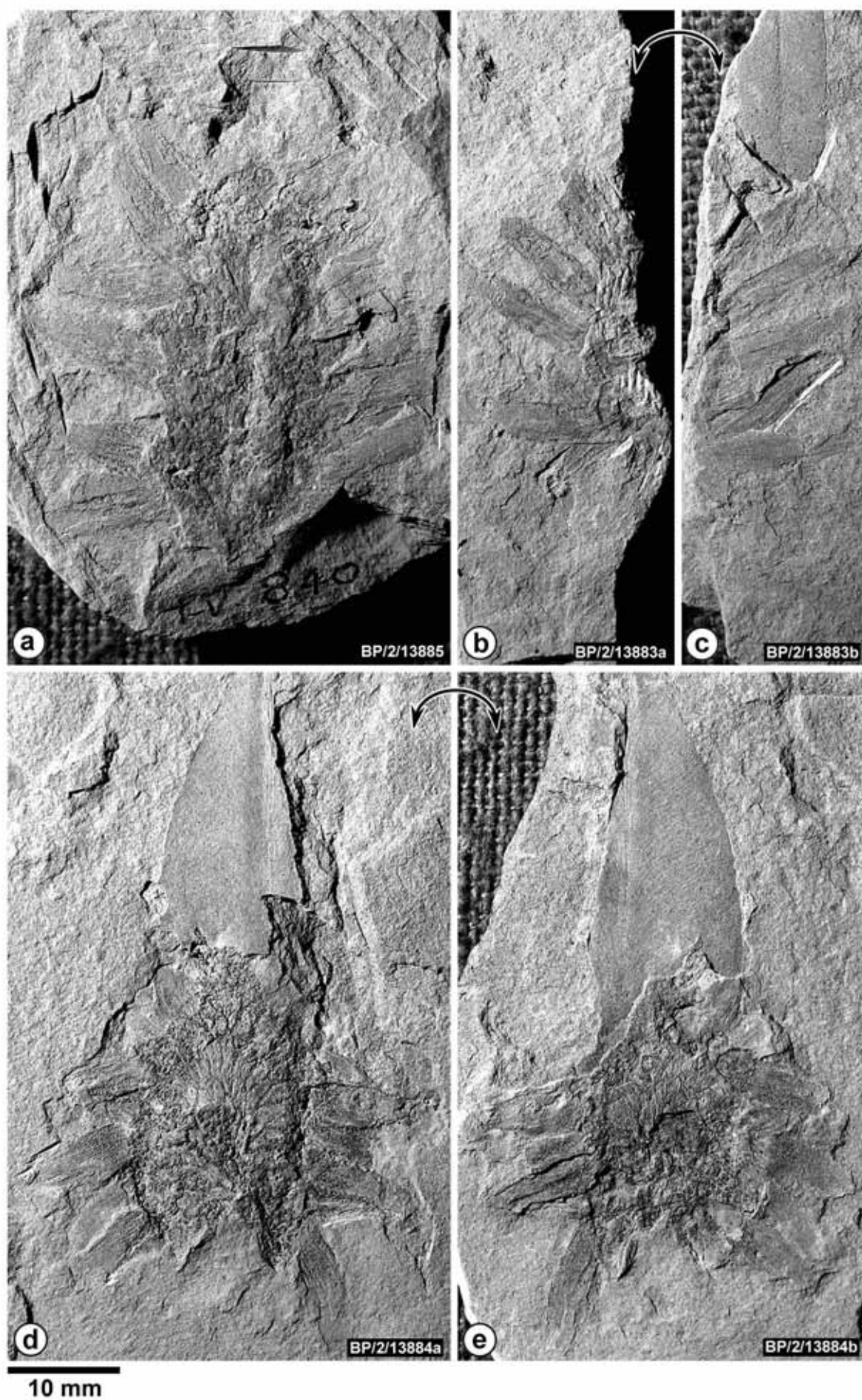
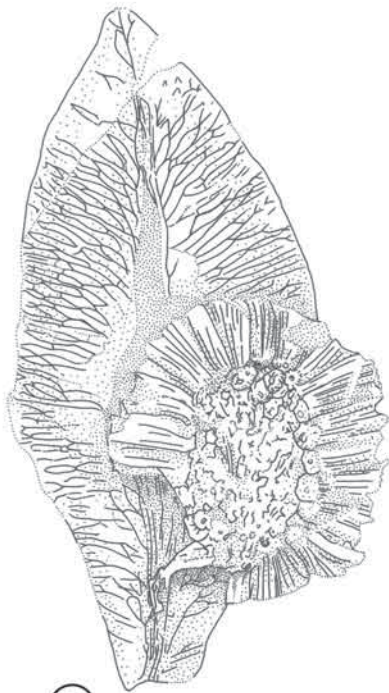


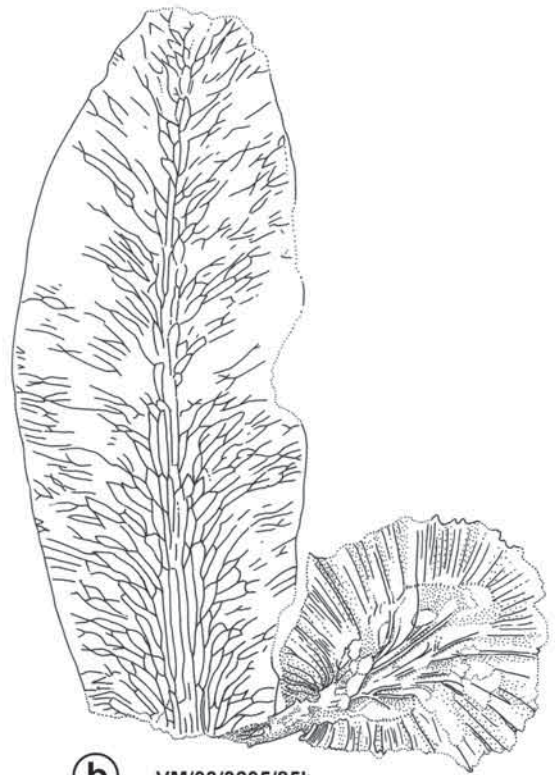
PLATE 55

PLATE 56. Line drawings of *S. leslii* fertiligers from Vereeniging. Note the scar on the midrib in fig. (c), at the site of pedicel divergence, and how the midrib is more robust below this point. Specimens such as these lend support to the theory that the pedicel is an axillary structure which is adnate to the leaf.



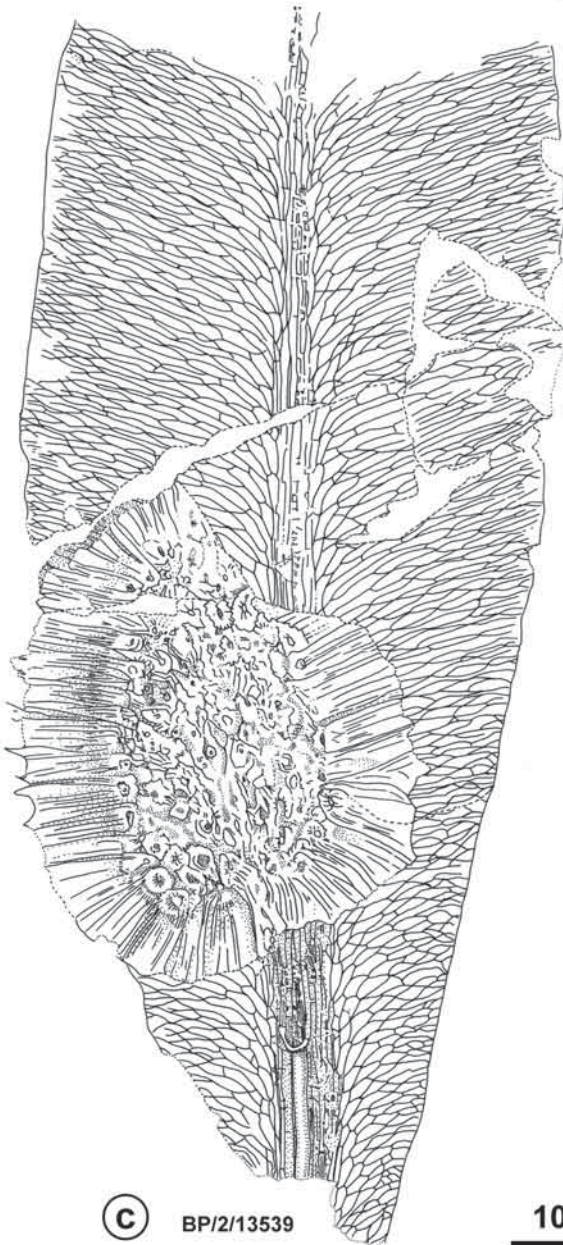
(a)

BP/2/13751



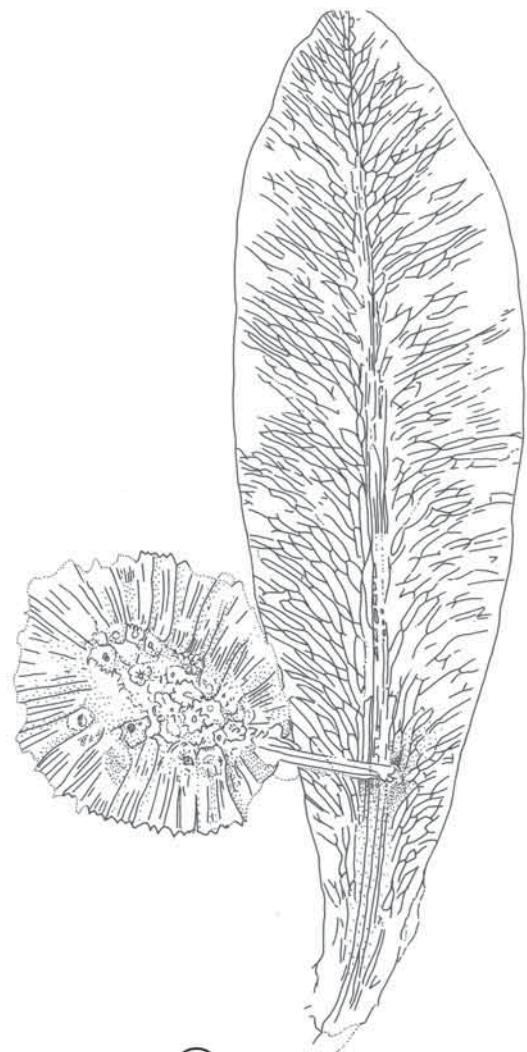
(b)

VM/03/3205/85b



(c)

BP/2/13539



(d)

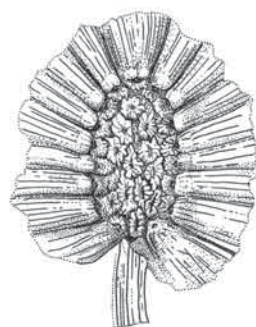
VM/03/3205/85a

10 mm

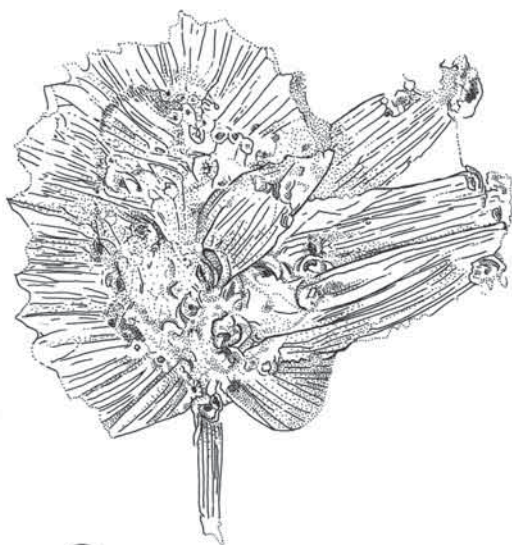
PLATE 57. Figs (a), (b): line drawings of two *S. leslii* specimens with attached seeds; fig. (c): drawing of a particularly beautifully preserved impression of the fertile surface of an *S. leslii* fructification; figs (d)-(f): drawings of venation patterns observed on the sterile surfaces of several *S. leslii* fructifications.



(a) VM/03/3205/109



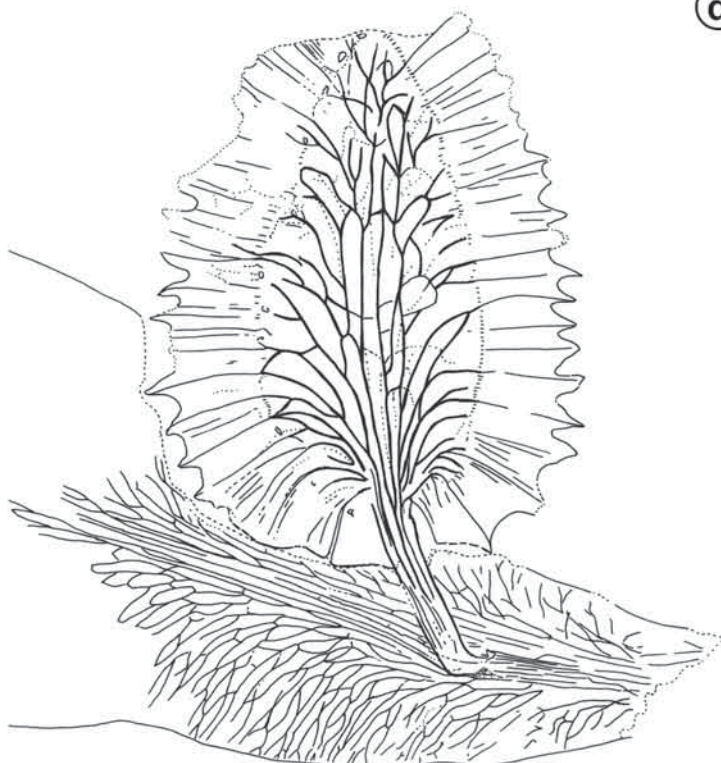
(c) BP/2/13735



(b) BP/2/13888b



(d) BP/2/13845



(e) BP/2/13739



(f) BP/2/13745

10 mm

PLATE 58. Silhouette drawings of *Scutum* specimens from Vereeniging, illustrating the wide range of intergrading wing and receptacle morphologies. Members of both *S. rubidgeum* and *S. draperium*, as categorised by Anderson & Anderson (1985), have been included (all drawings at approximately life-size).

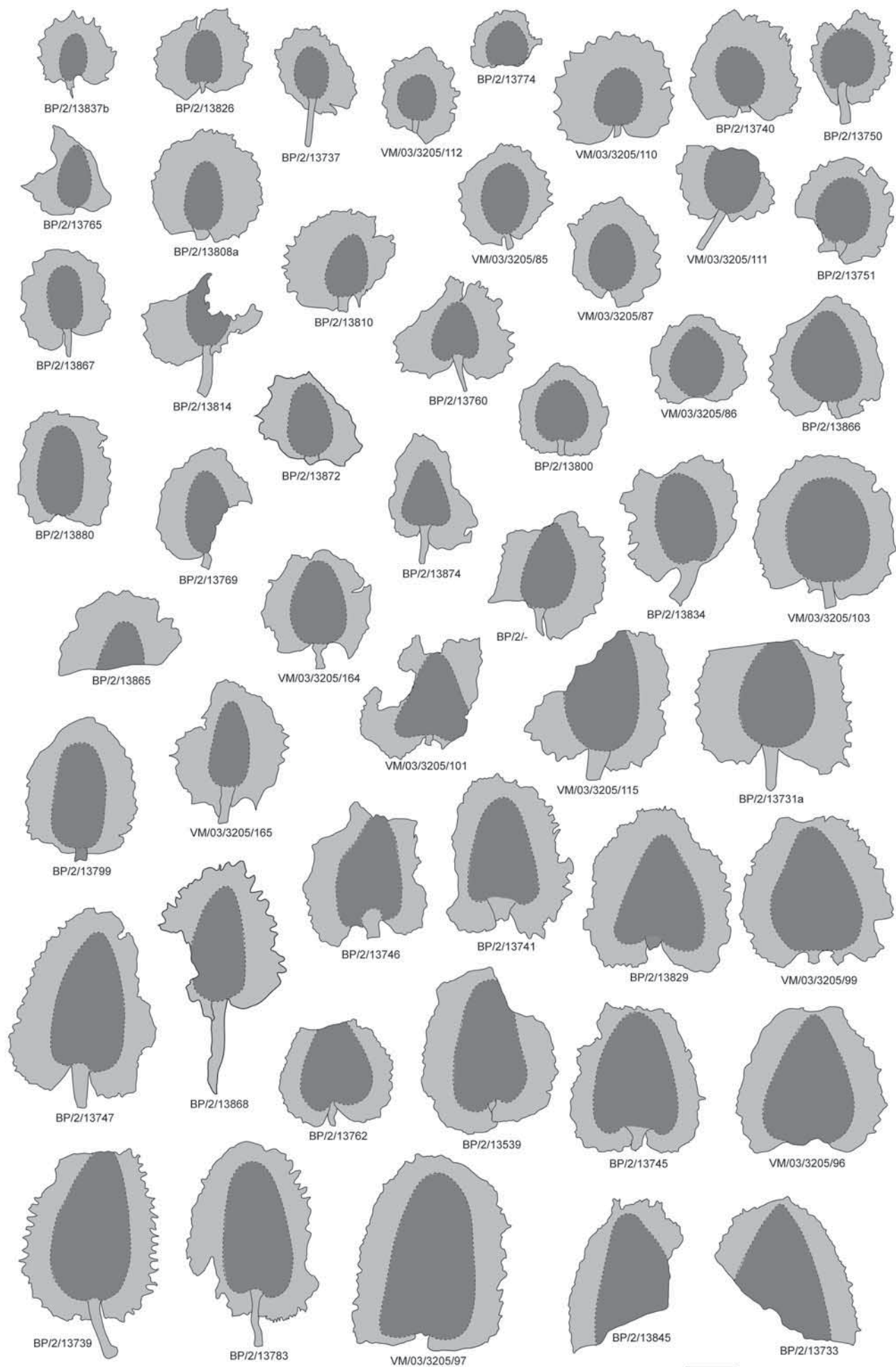


PLATE 58

PLATES 59 - 69: *Gladiopomum*

PLATE 59. *Gladiopomum dutoitides* (Plumstead) Adendorff *et al.* from Vereeniging. Figure (a): a small specimen with broad, prominent apical spine; fig. (b): a laterally compressed fructification, originally described by Plumstead (1958) as *Pluma thomsonii*; figs (c), (d): part and counterpart of a fructification, clearly showing the characteristic apical spine, broad wing and elongated elliptical receptacle; fig. (e): a particularly large specimen (fertile surface), with well-defined apical spine and wing fluting; fig. (f): the only specimen of *G. dutoitides* found at the Hlobane locality (sterile surface), showing a broad wing and narrow receptacle.

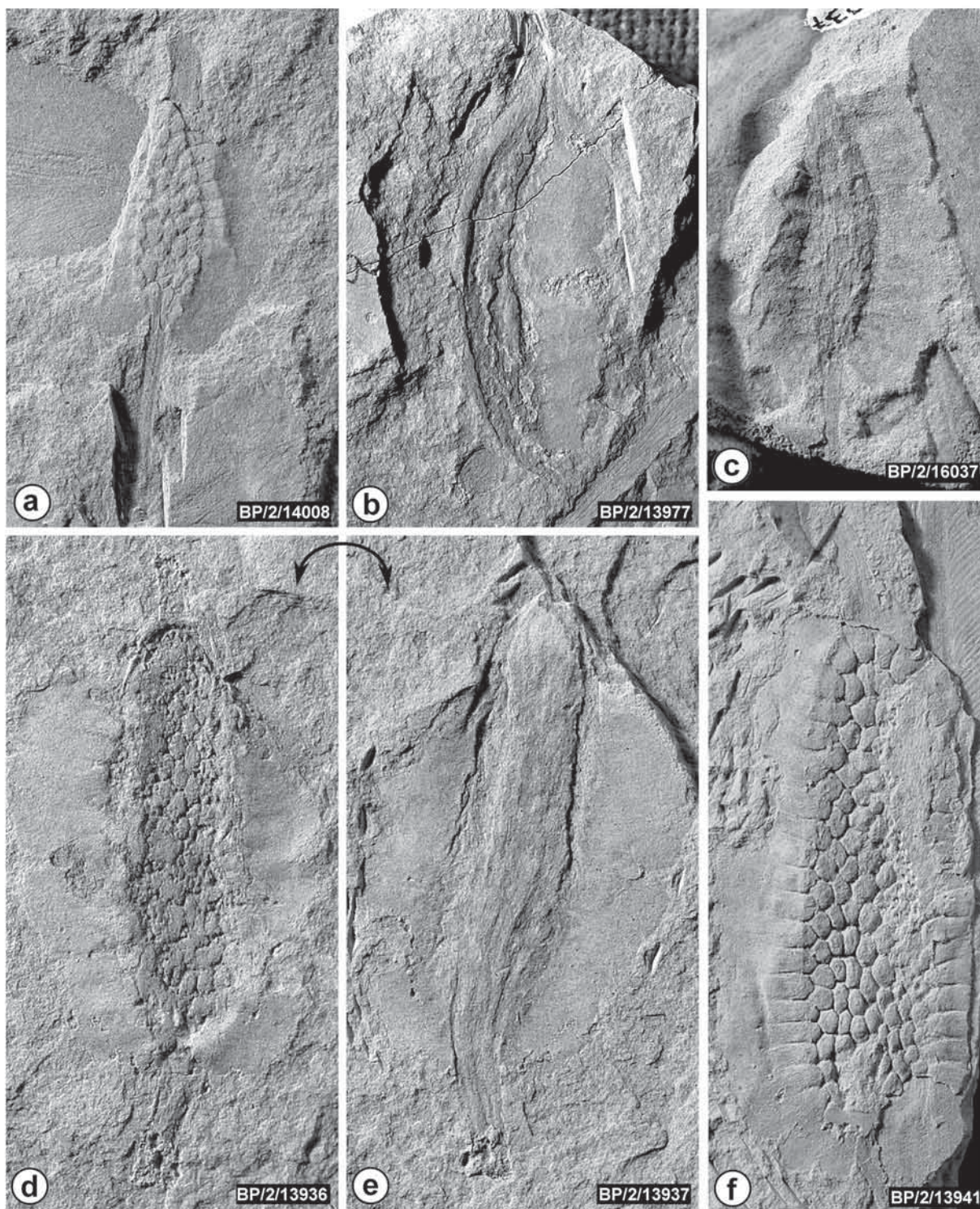


PLATE 60. Fig. (a): holotype of *Gladiopomum dutoitides* (Plumstead) Adendorff *et al.* from Vereeniging; fig. (b): detail of the fructification; fig. (c): distal portion of the attached leaf, showing venation with parallel meshes.

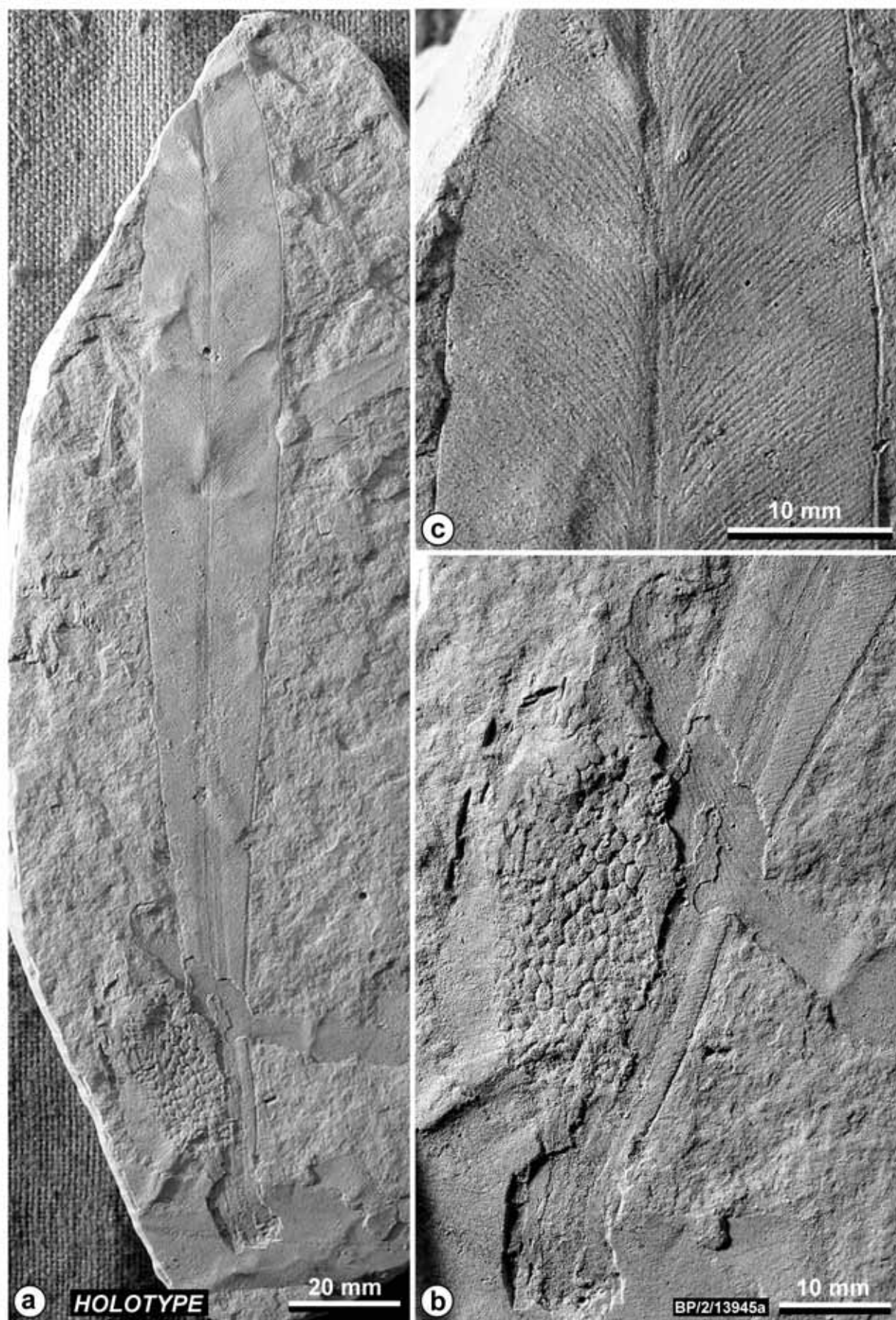


PLATE 61. Specimens of *Gladiopomum acadarens* (Anderson & Anderson) Adendorff *et al.* from Cedara with gladiate receptacles, broad wings and long petioles. Figures (c), (d): Holotype of *G. acadarens*: although the base of this specimen's pedicel overlaps the base of a *Glossopteris* petiole, a physical connection is not convincing; fig. (a): detail of the associated leaf; fig. (b): fertile surface counterpart of (d).

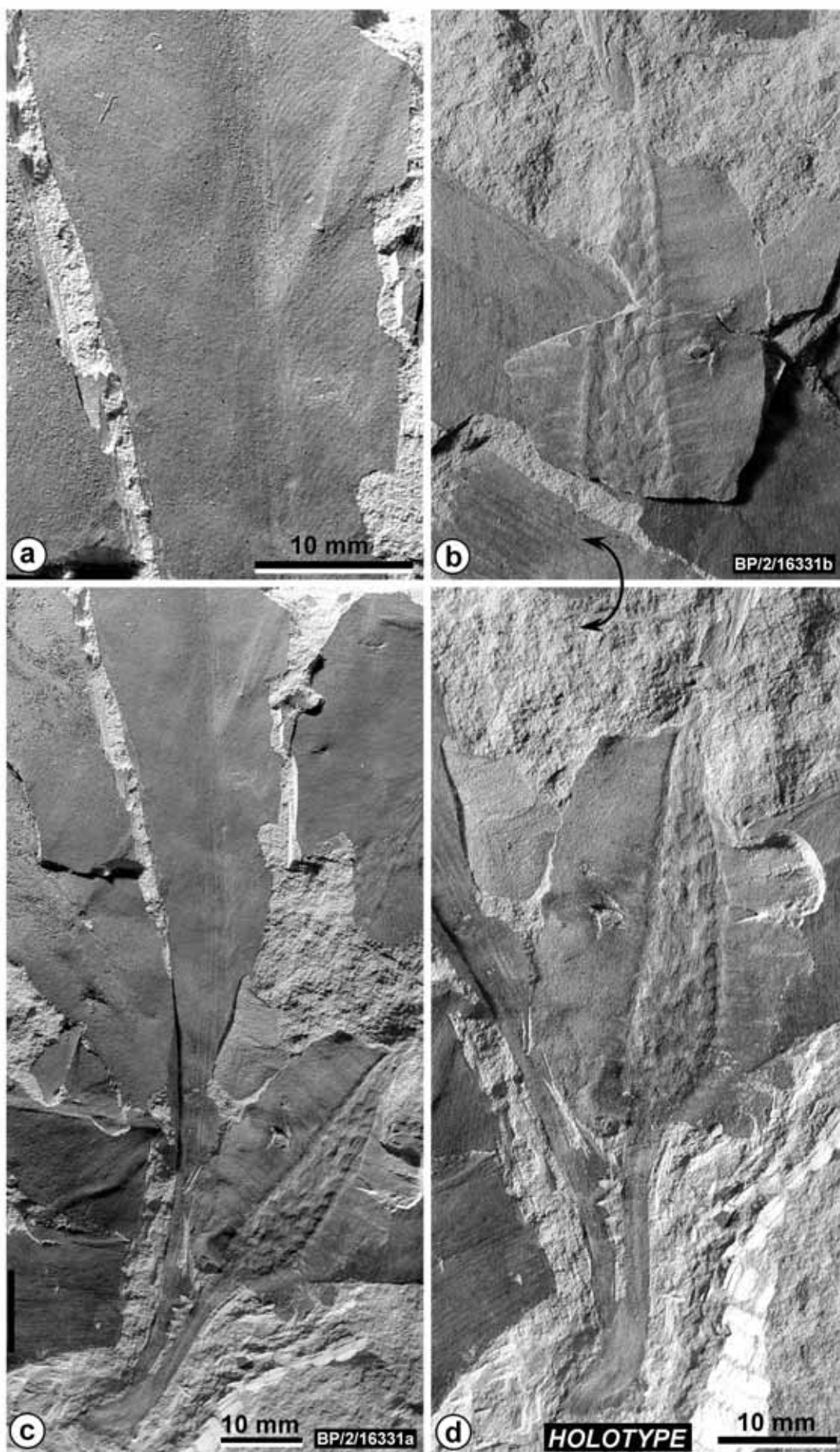
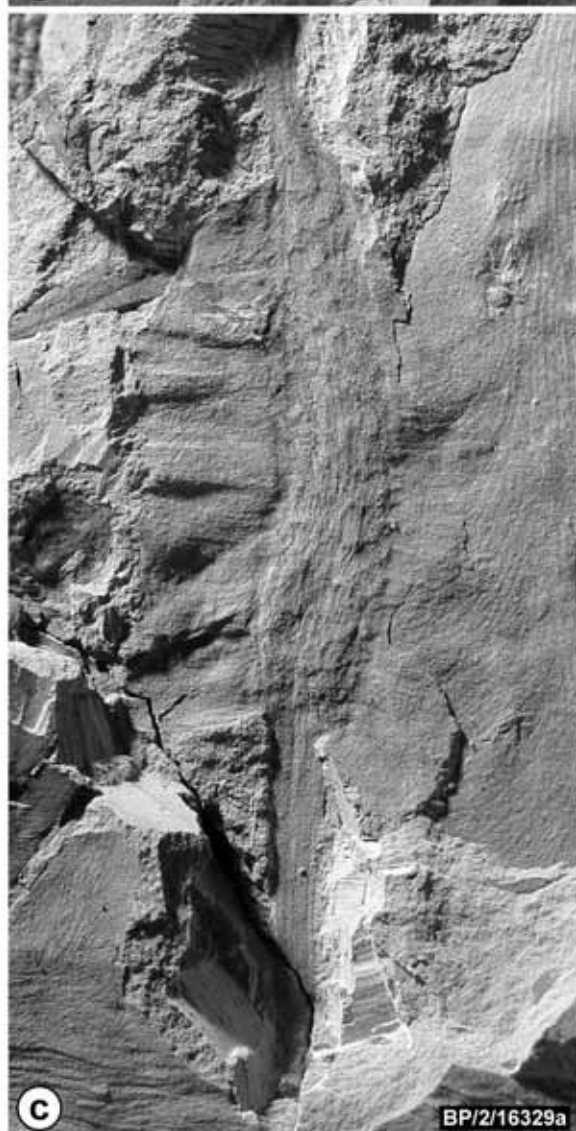
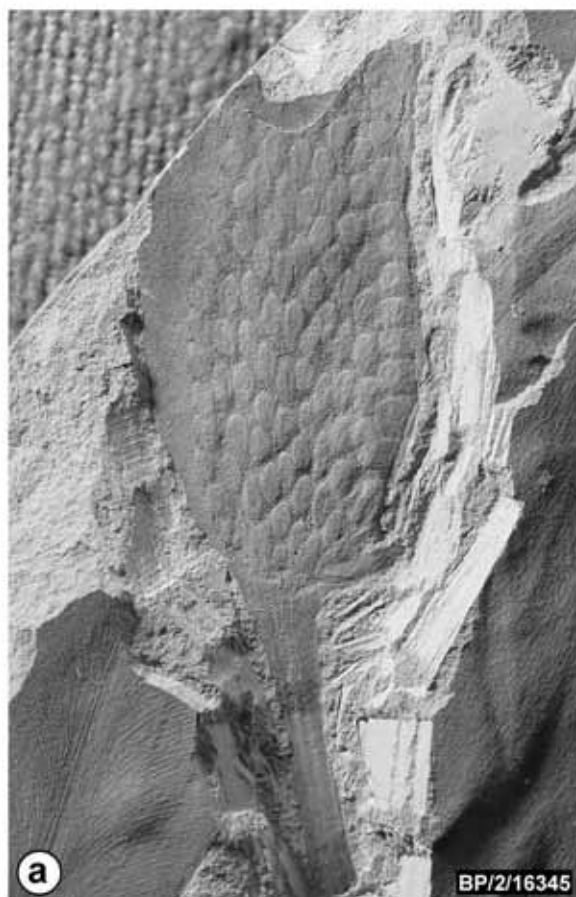


PLATE 62. Figure (a) - fertile surface of a large, broad specimen of *G. acadarens* with an incomplete wing (tapered wing base?); fig. (b): lanceolate specimen with wing that tapers abruptly at the apex; fig. (c): sterile surface of a fructification with a well-defined apical extension; fig. (d): fertile surface of a particularly robust, broadly lanceolate fructification.



10 mm

PLATE 62

PLATE 63. Figures (a), (b): the fertile and sterile surfaces of a lanceolate fructification of *G. acadarens*e with a particularly high wing width: receptacle width ratio and a pointed apex; figs (c), (d): part and counterpart of a large, oblong fructification with rounded apex.

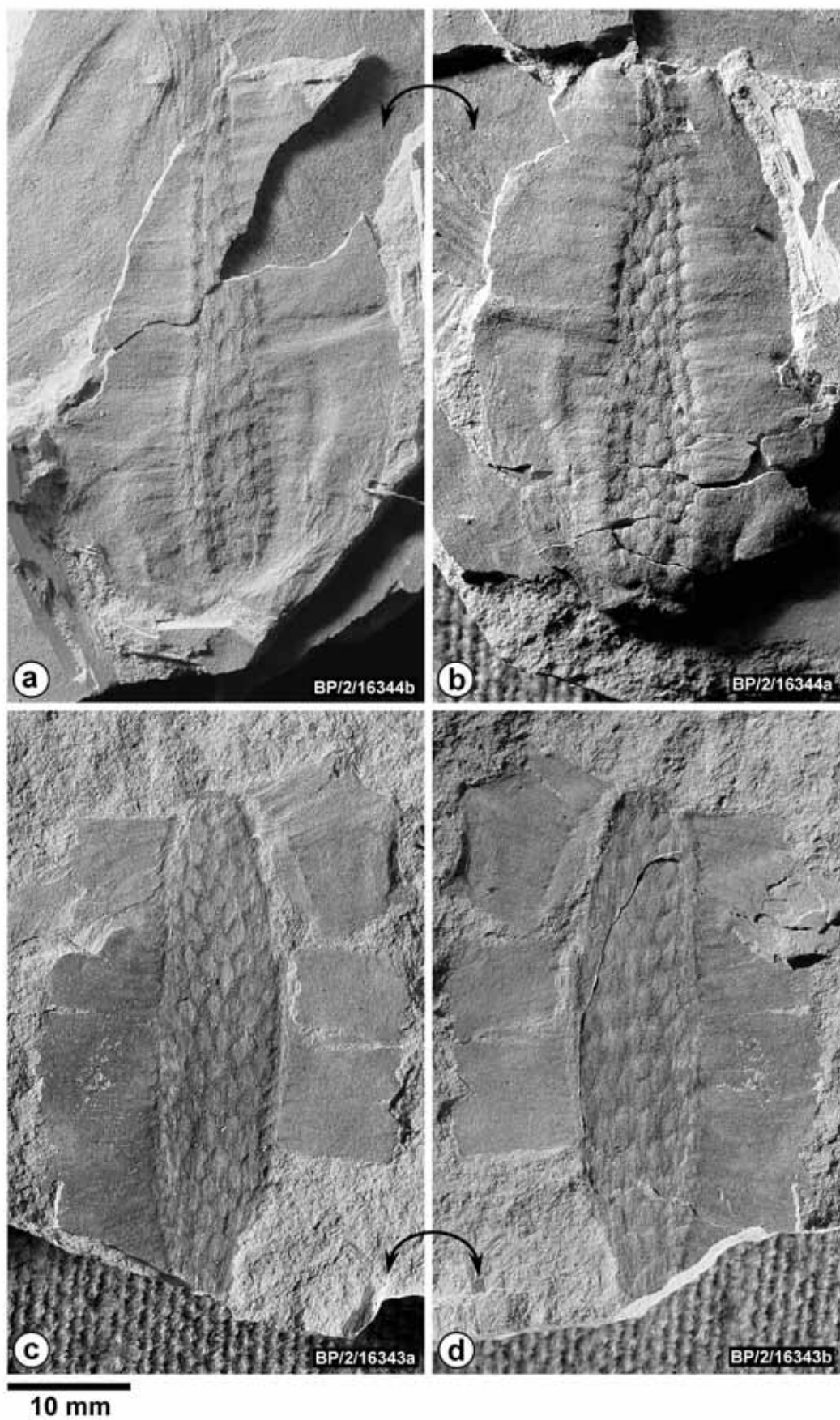


PLATE 64. Figures (a), (b): further examples of *G. acadarenses*; fig. (c): fructifications were regularly found in close association.

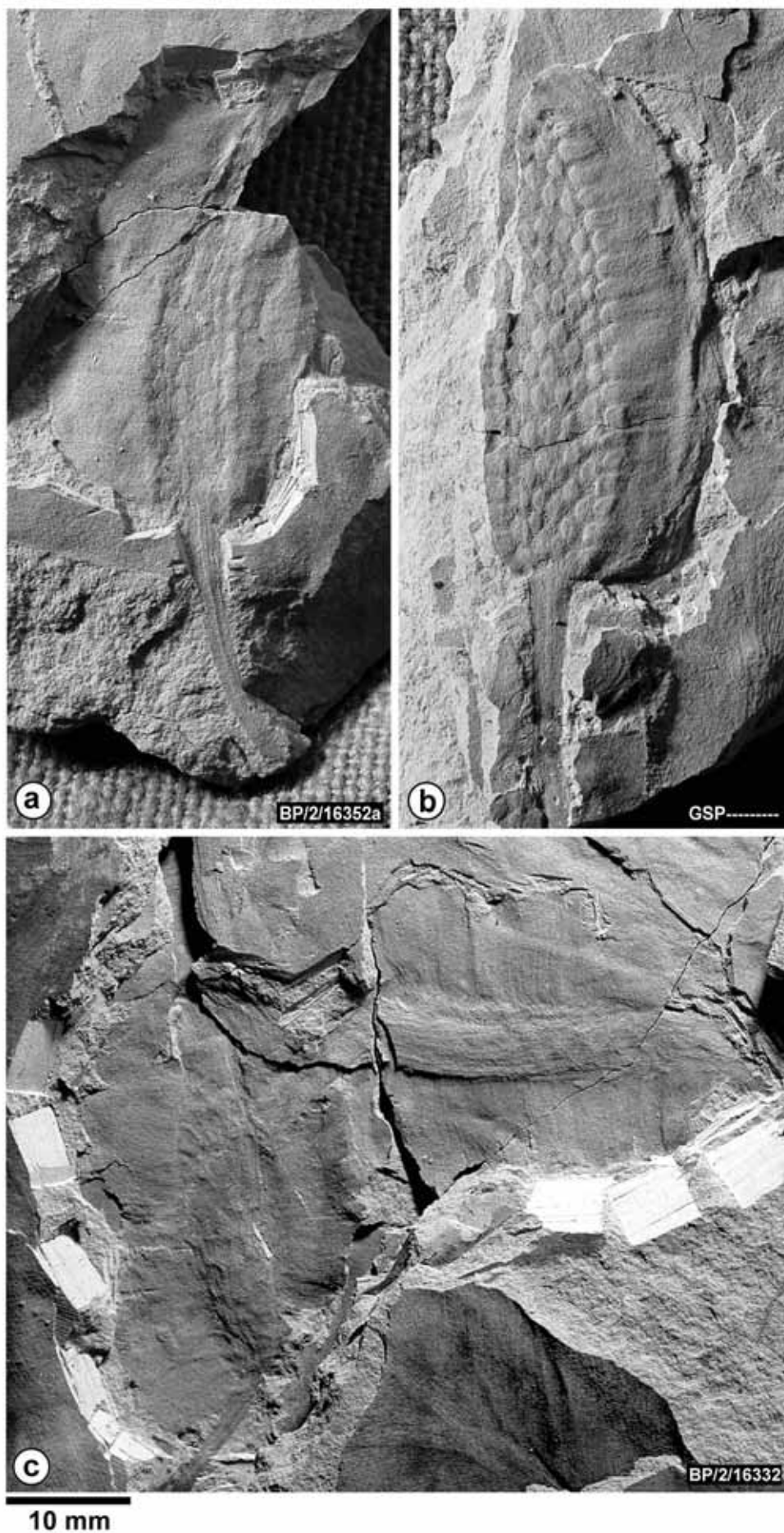
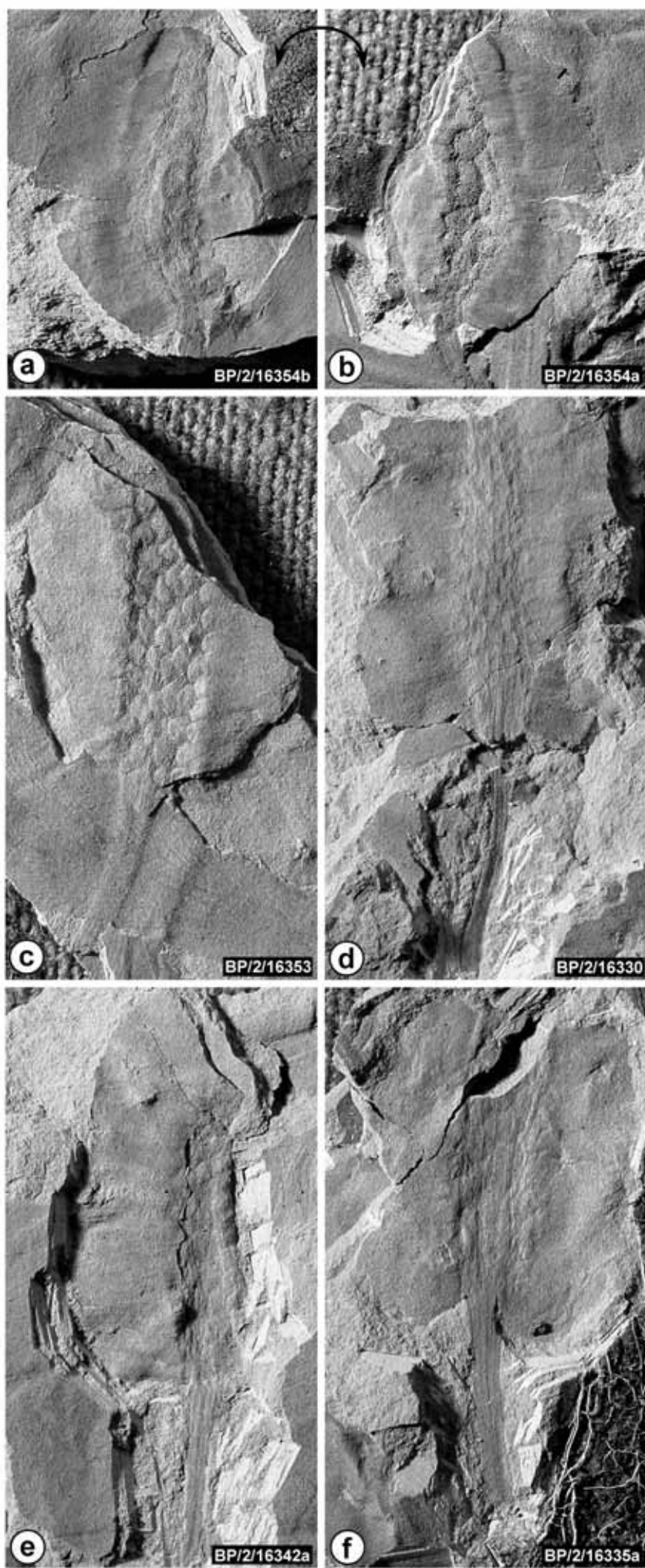


PLATE 64

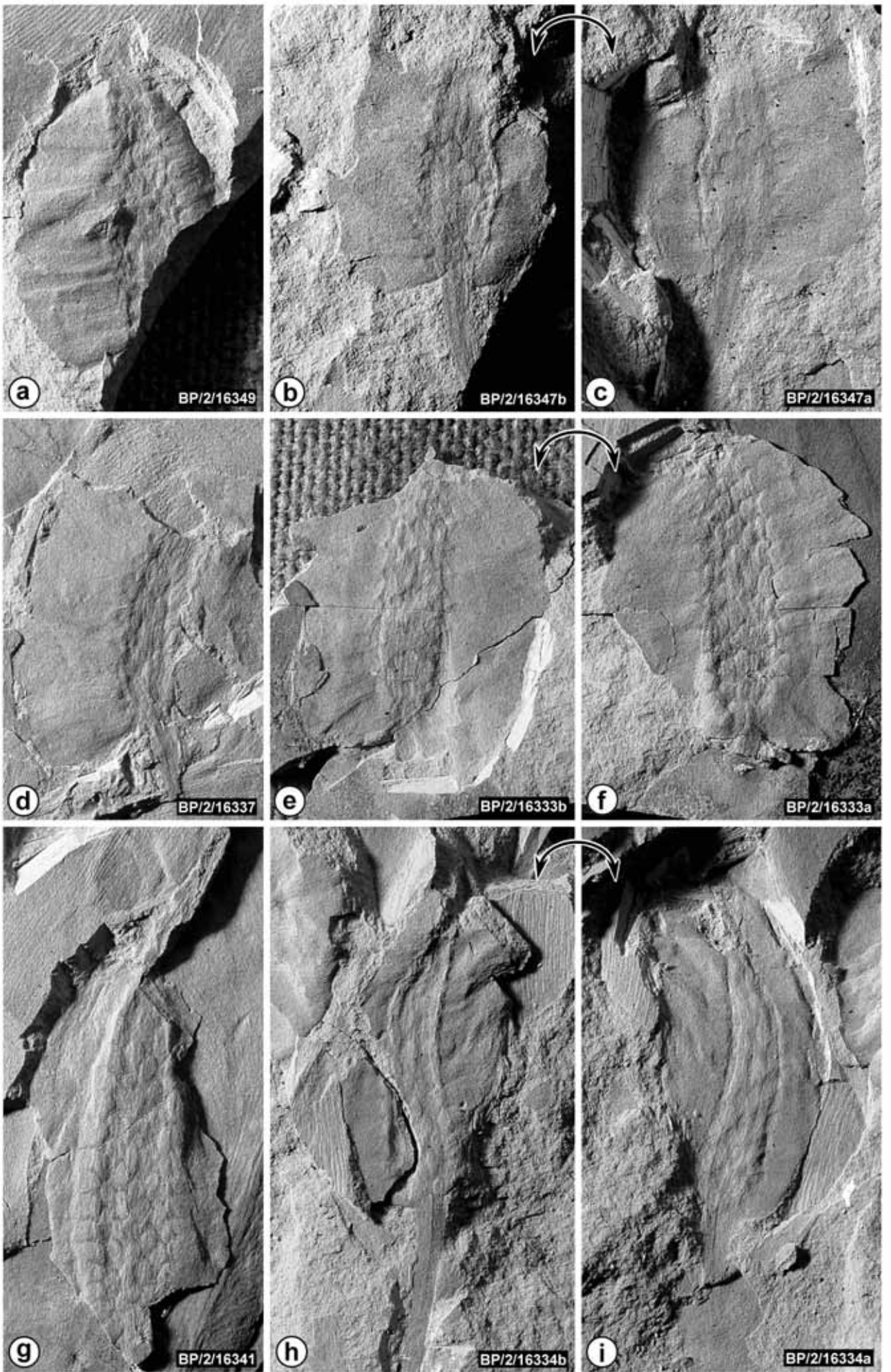
PLATE 65. Figures (a), (f): additional specimens of *G. acadarens*e, illustrating the wide range in size and morphology of the fructifications; figs (a), (b): one of the smallest specimens from Cedara.



10 mm

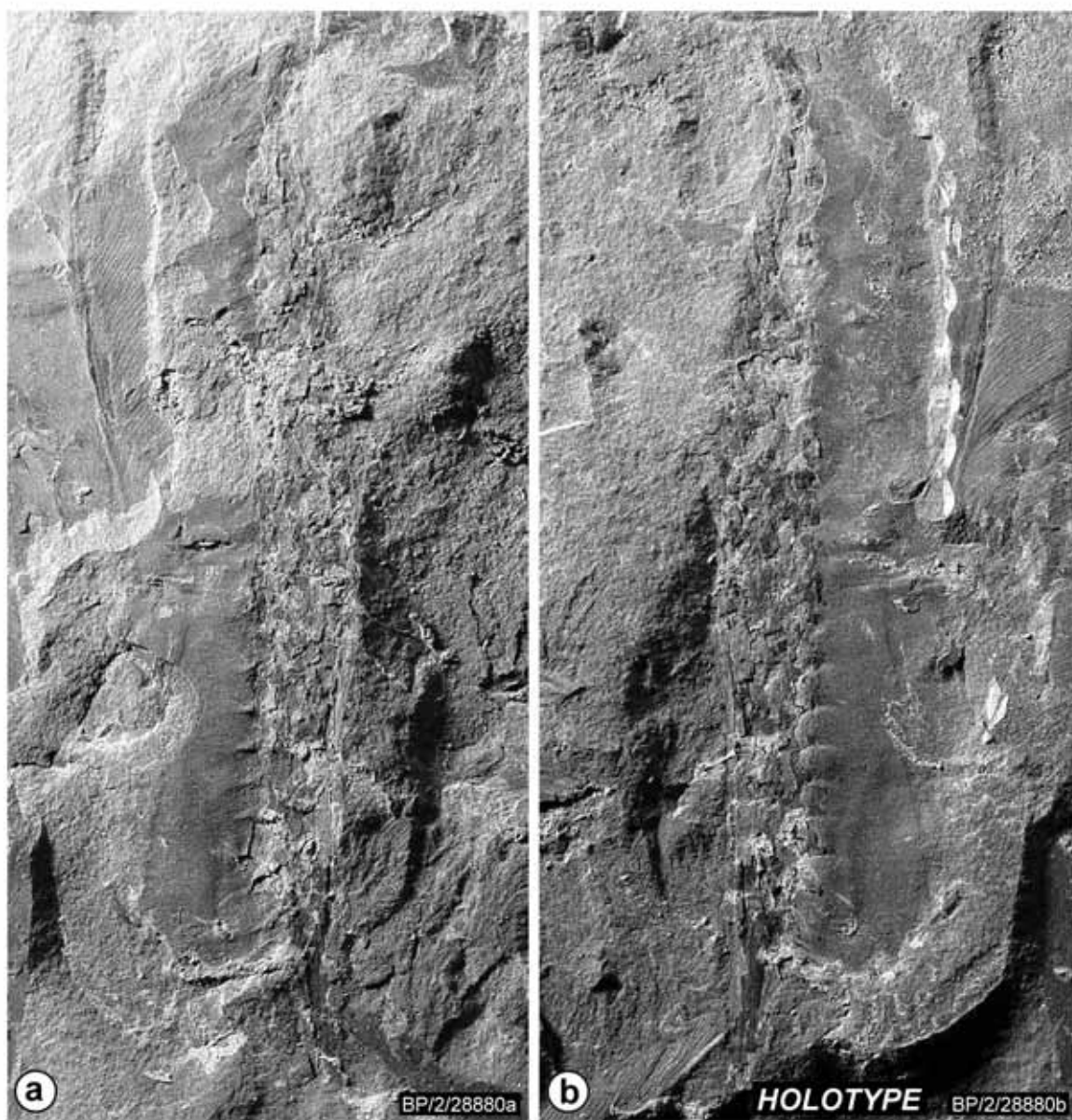
PLATE 65

PLATE 66. Figures (a) - (i): specimens of *G. acadarens*. Note the tendency of the receptacle to be falcate in figs (d), (h) & (i).



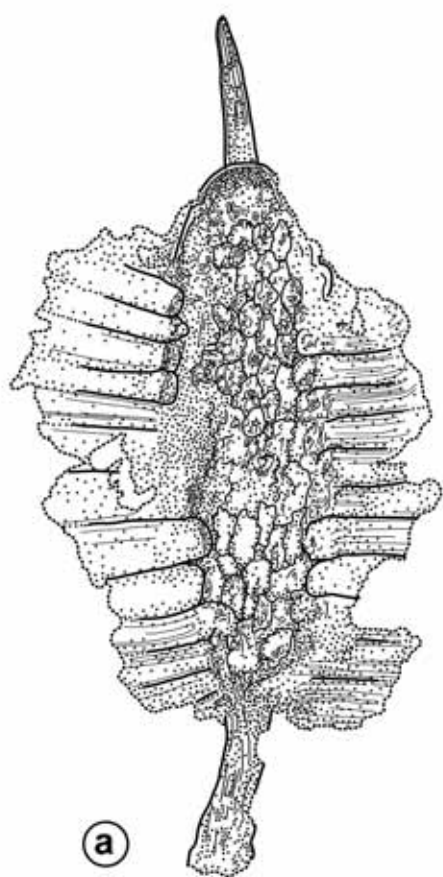
10 mm

PLATE 67. The holotype of *Gladiopomum elongatum* Adendorff *et al.* from the Rietspruit locality. Figures (a), (b): part and counterpart, note the very long, narrow receptacle and broad wing.



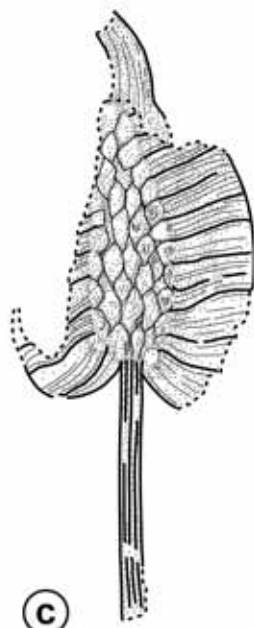
10 mm

PLATE 68. Drawings of key specimens of *Gladiopomum dutoitides* from Vereeniging and Hlobane highlighting seed scars, wing features, apical spines and pedicels. Figure (e): drawing of the holotype [pl. 59, fig. (d)].



(a)

BP/2/13936



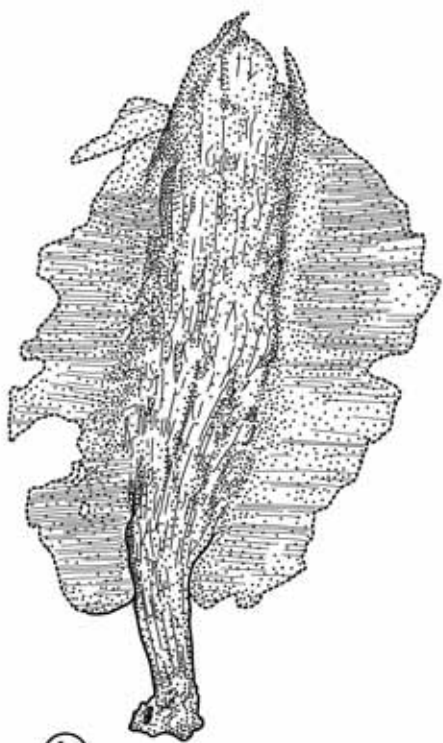
(c)

BP/2/14008



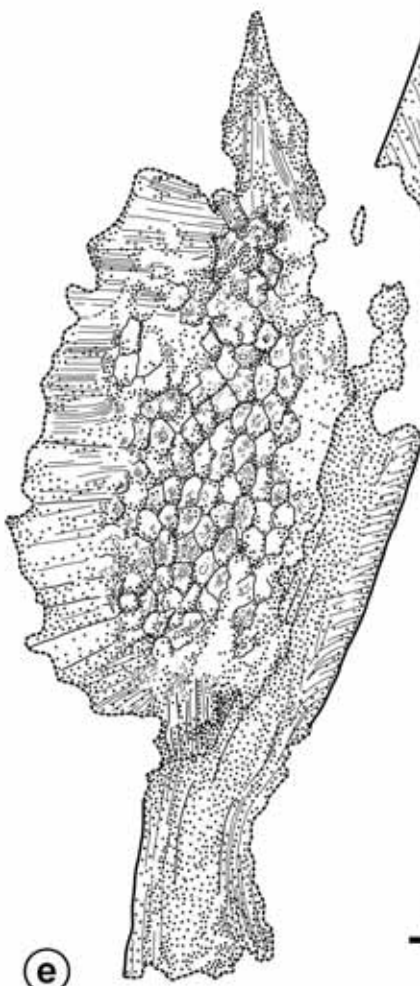
(d)

BP/2/16037



(b)

BP/2/13937

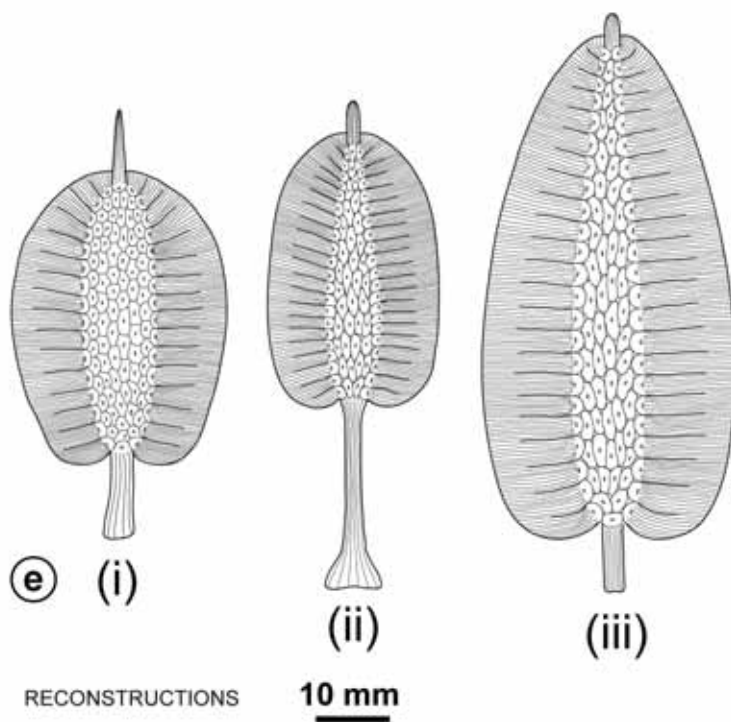
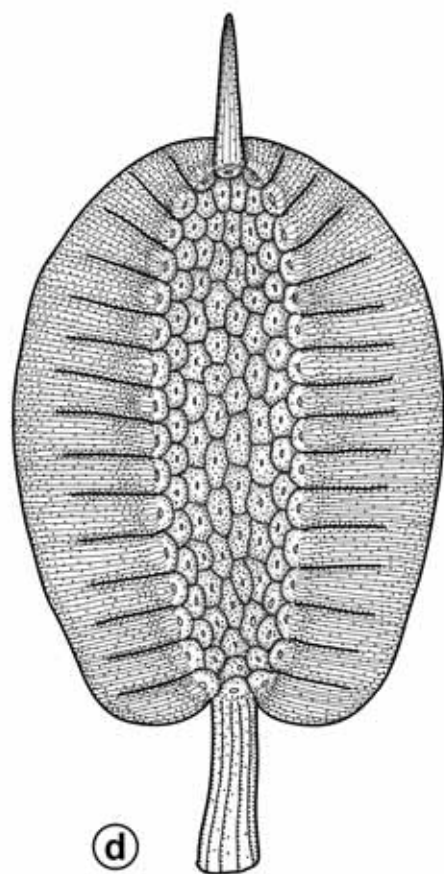
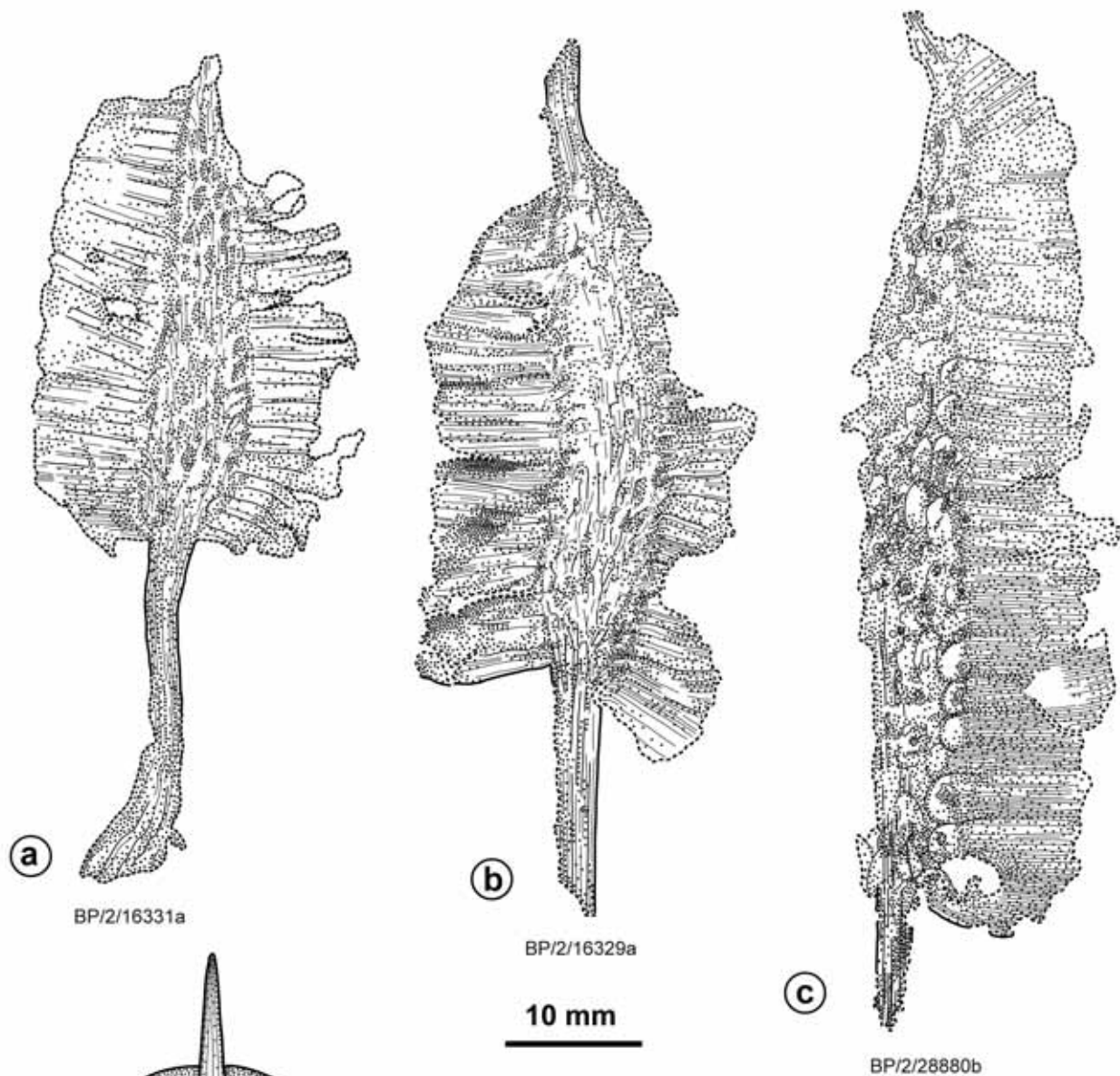


(e)

BP/2/13945a

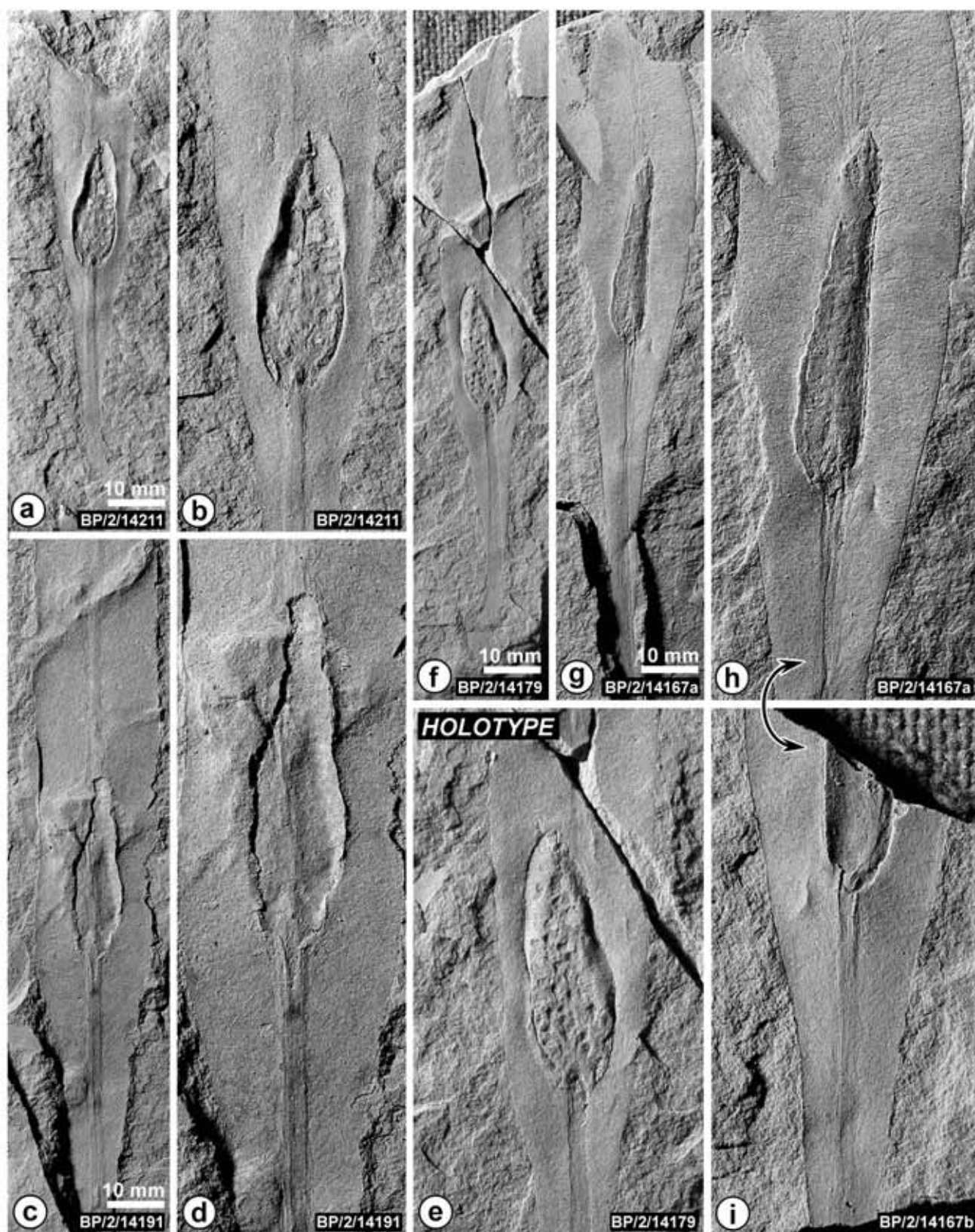
10 mm

PLATE 69. Figure (a): drawing of the holotype of *Gladiopomum acadarens* [pl. 61]; fig. (b): drawing of another specimen of *G. acadarens*, clearly illustrating the apical extension; fig. (c): line drawing of the holotype of *Gladiopomum elongatum* [pl. 67]; fig. (d): reconstruction of *Gladiopomum dutoitides*, based on BP/2/13936 [pl. 59, fig. (d)]; fig. (e): comparative reconstructions of *G. dutoitides* (i), *G. acadarens* (ii), and *G. elongatum* (iii).

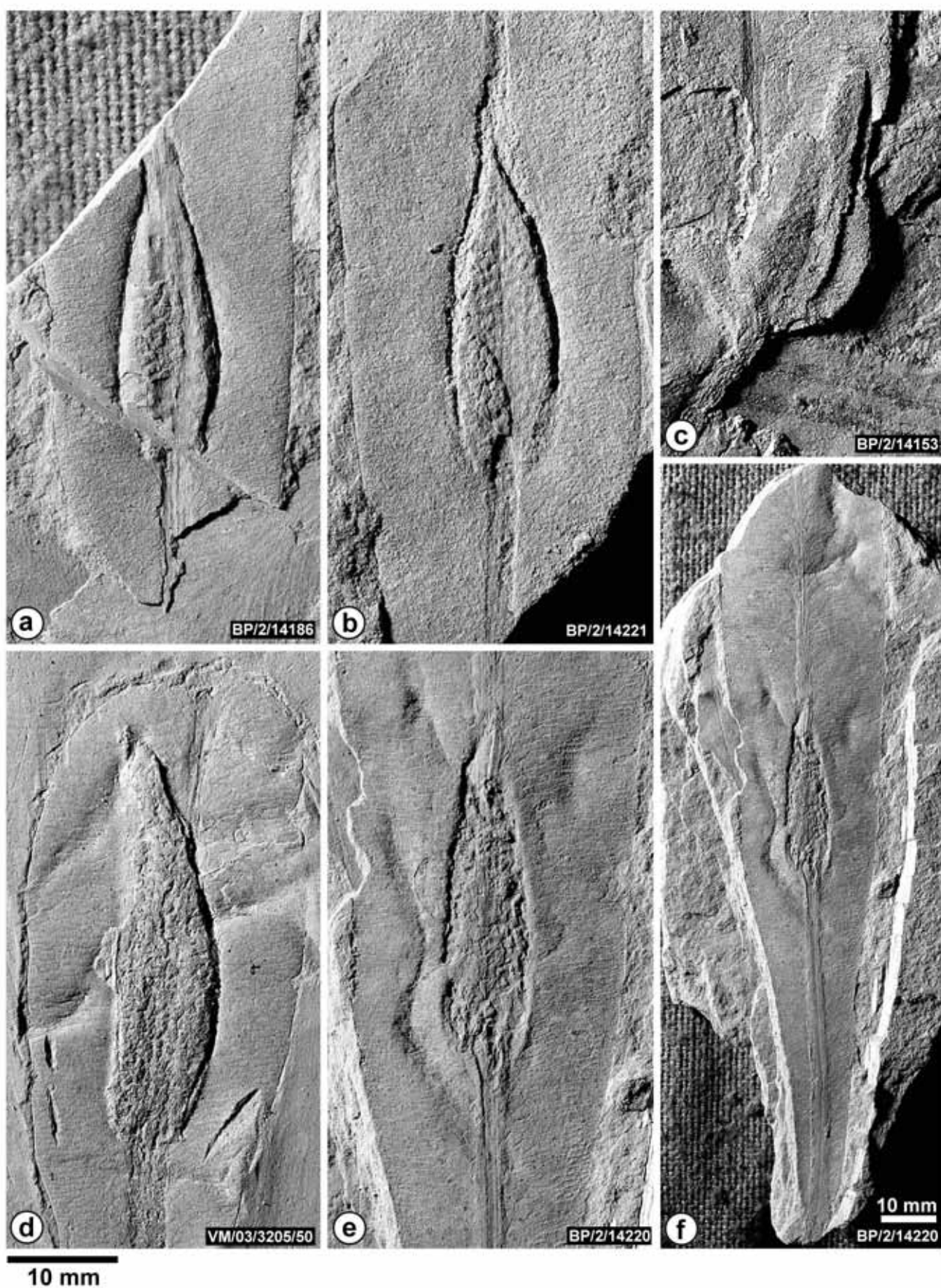


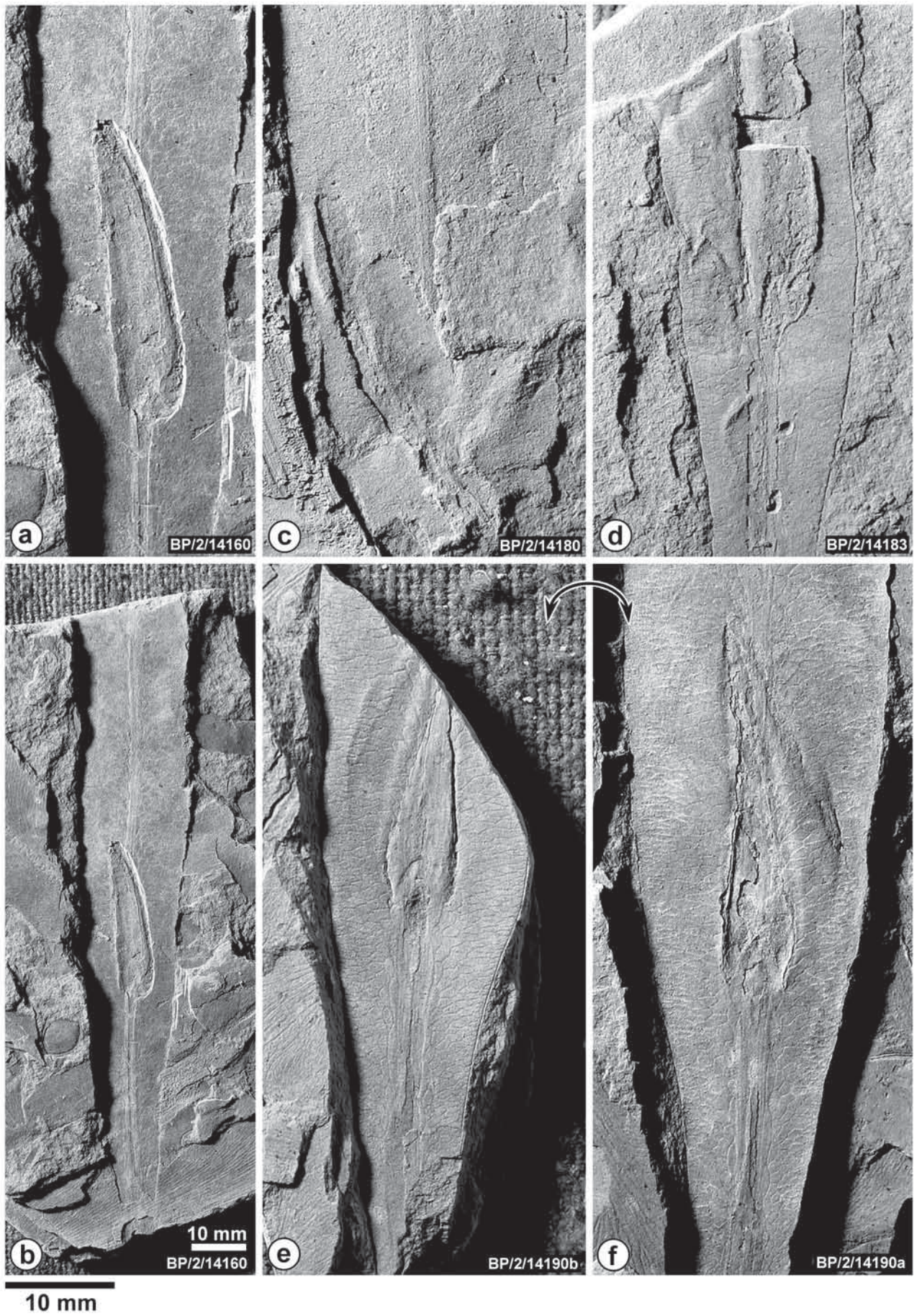
PLATES 70 - 78: *Plumsteadia* spp.

PLATE 70. Figs (a)-(i), *Plumsteadia lerouxii*: holotype part and counterpart in figs (a), (b), (e) and (f) (specimens BP/2/14211 and BP/2/14179). Note the slightly hastate base in BP/2/14191 (figs (c) and (d)), which may be due to the presence basal wing lobes.



PLATES 71-73. Further examples of *Plumsteadia lerouxii* and subtending *Glossopteris* leaves.





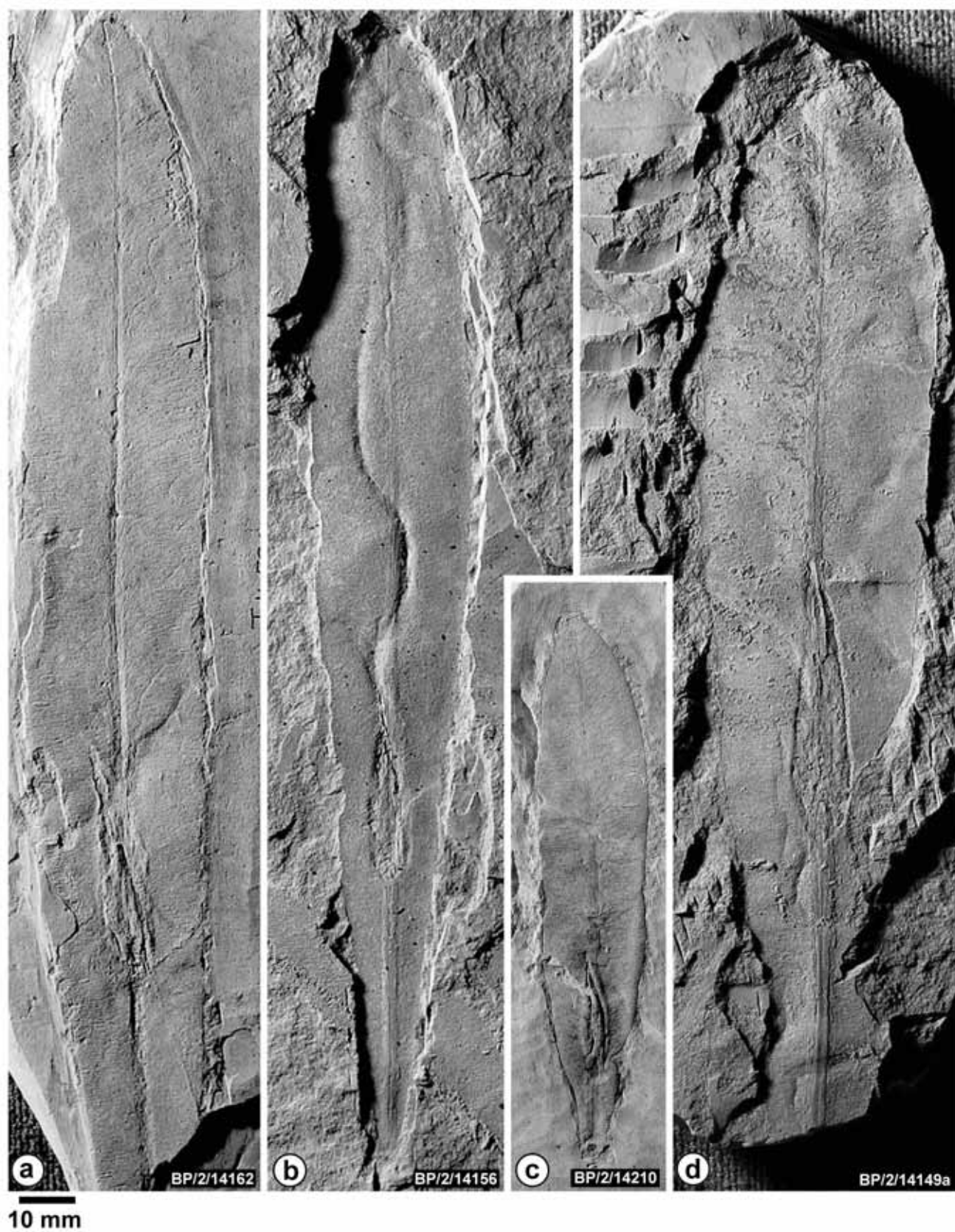
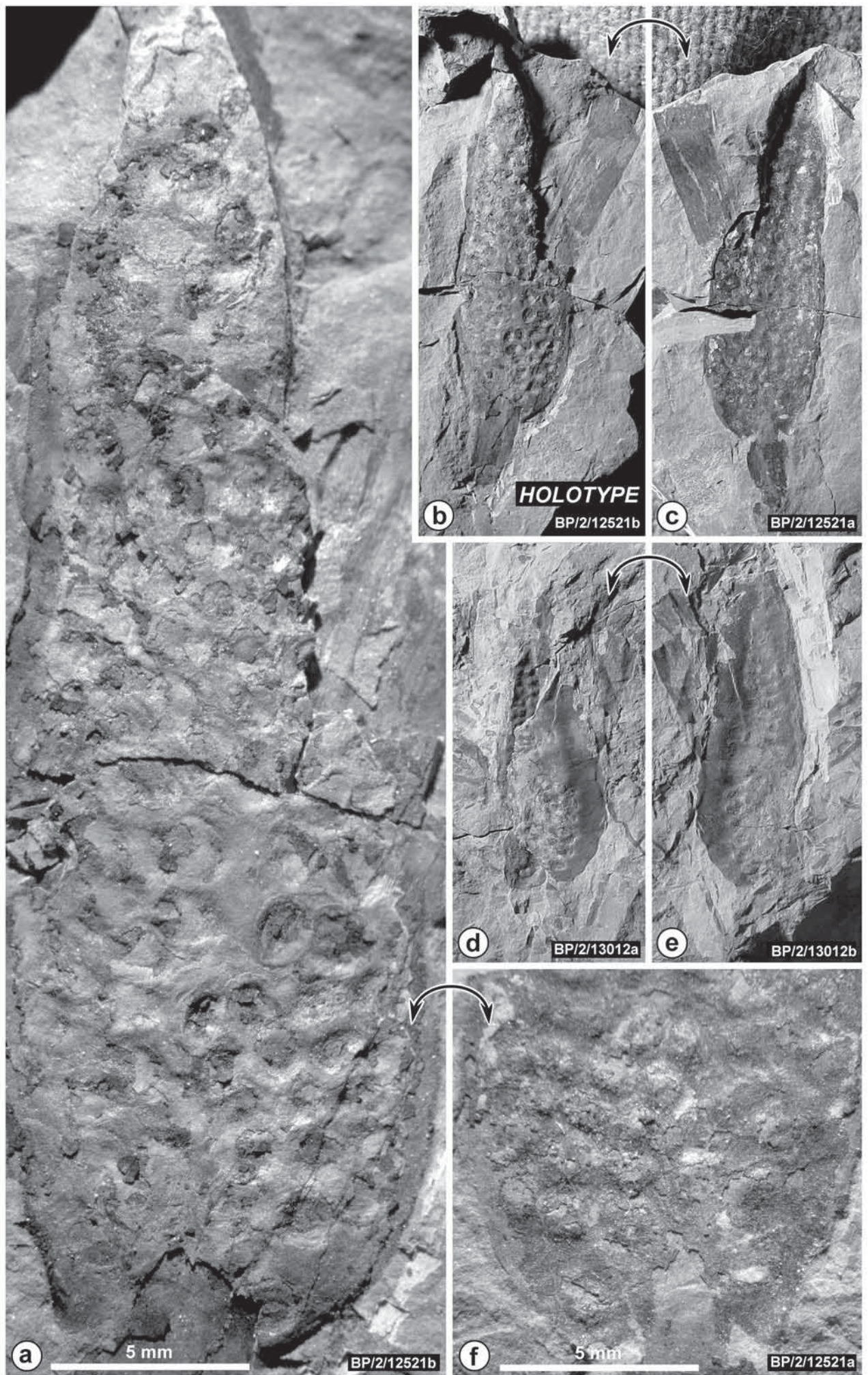


PLATE 74. *Plumsteadia gibbosa* from Loskop: part and counterpart of holotype in figs (a)-(c) and (f), illustrating the bulbous nature of the seed scars, as well as partially obscured, attached seeds; figs (d) and (e) are part and counterpart of two adjacent, partially overlapping specimens.



10 mm

PLATE 74

PLATE 75. Figs (a)-(i). Specimens of *Plumsteadia gibbosa* from Loskop. Note wing detail in enlargement of BP/2/12536, fig. (b), on lower right side of the fructification.

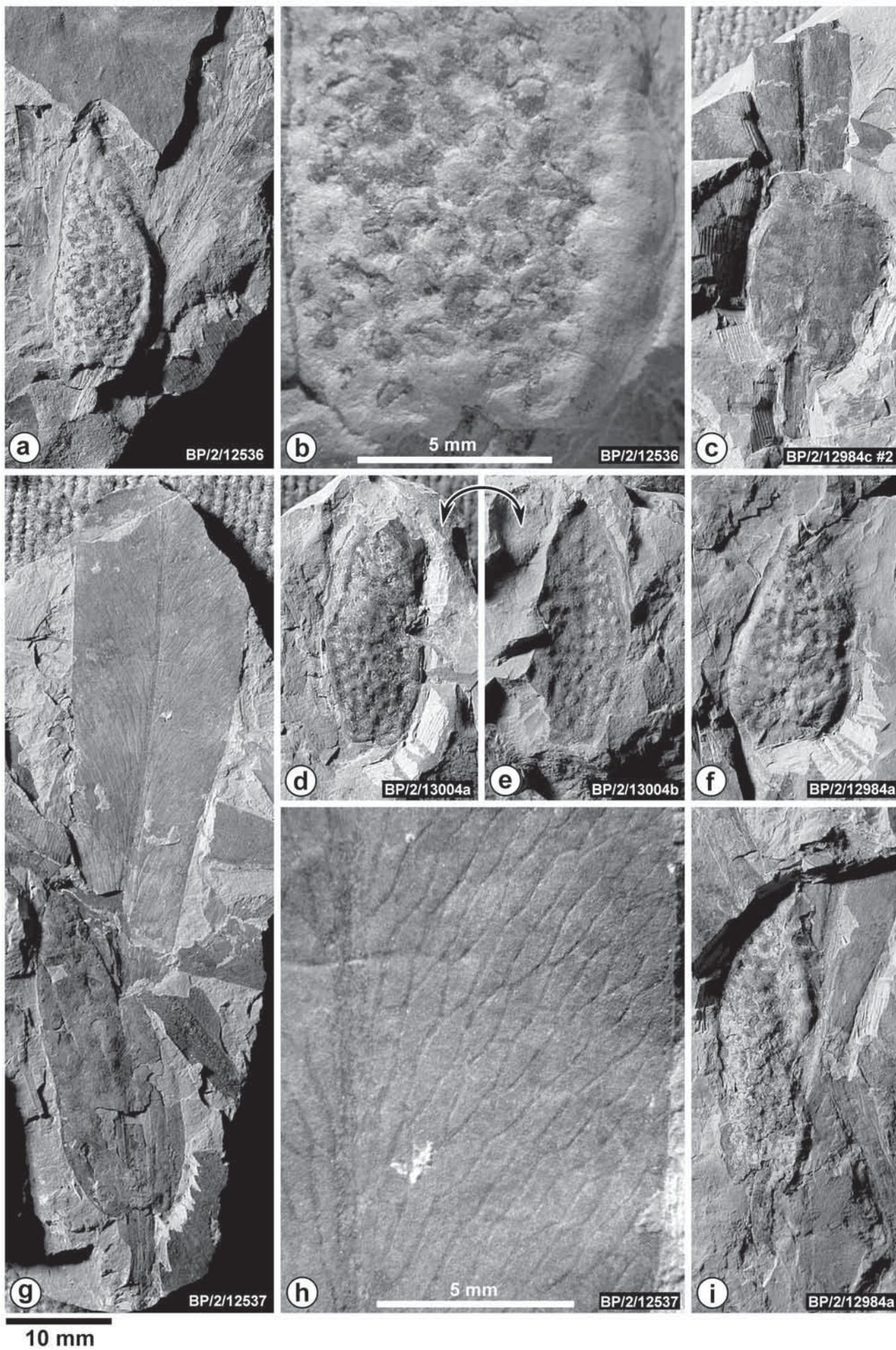
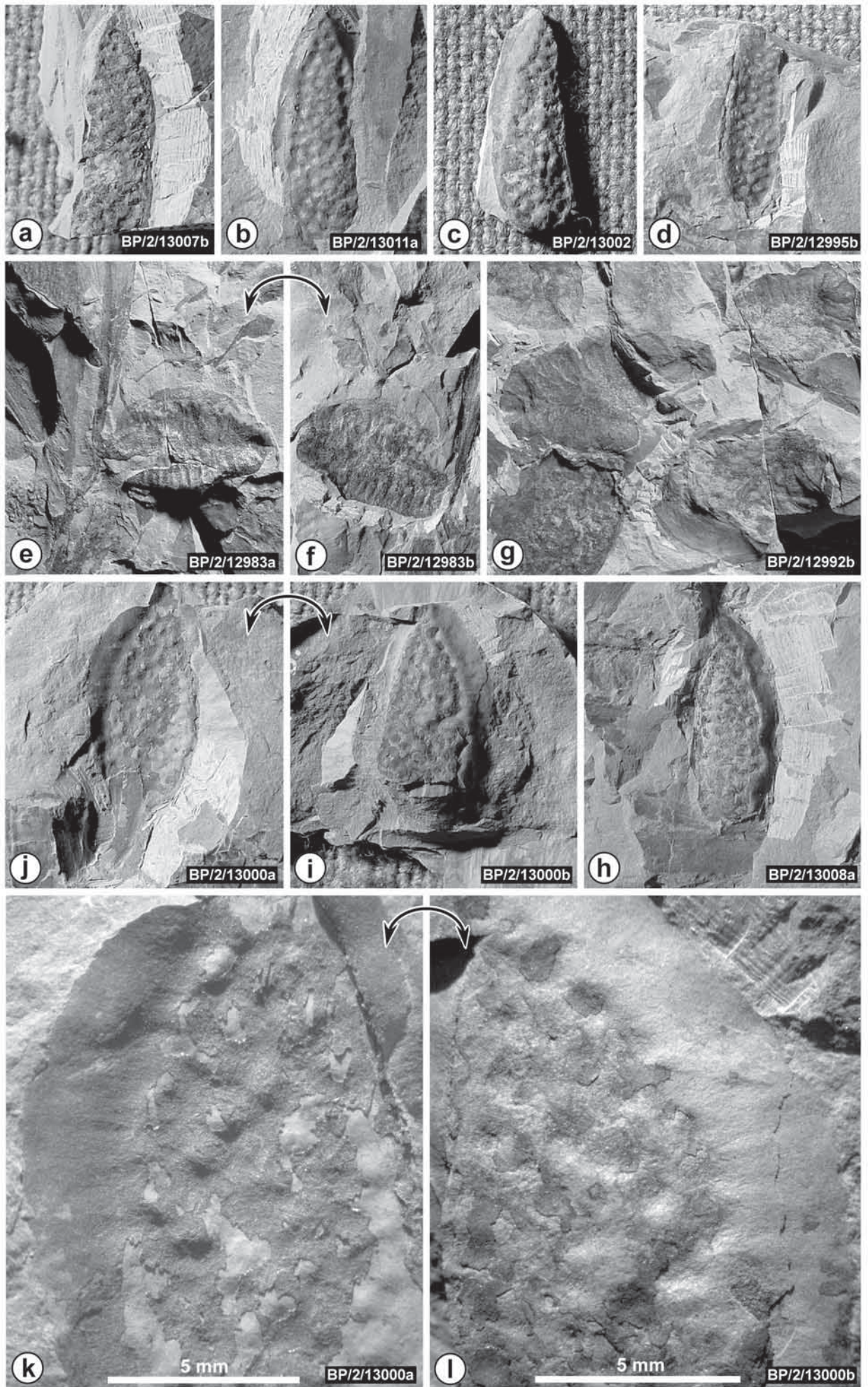


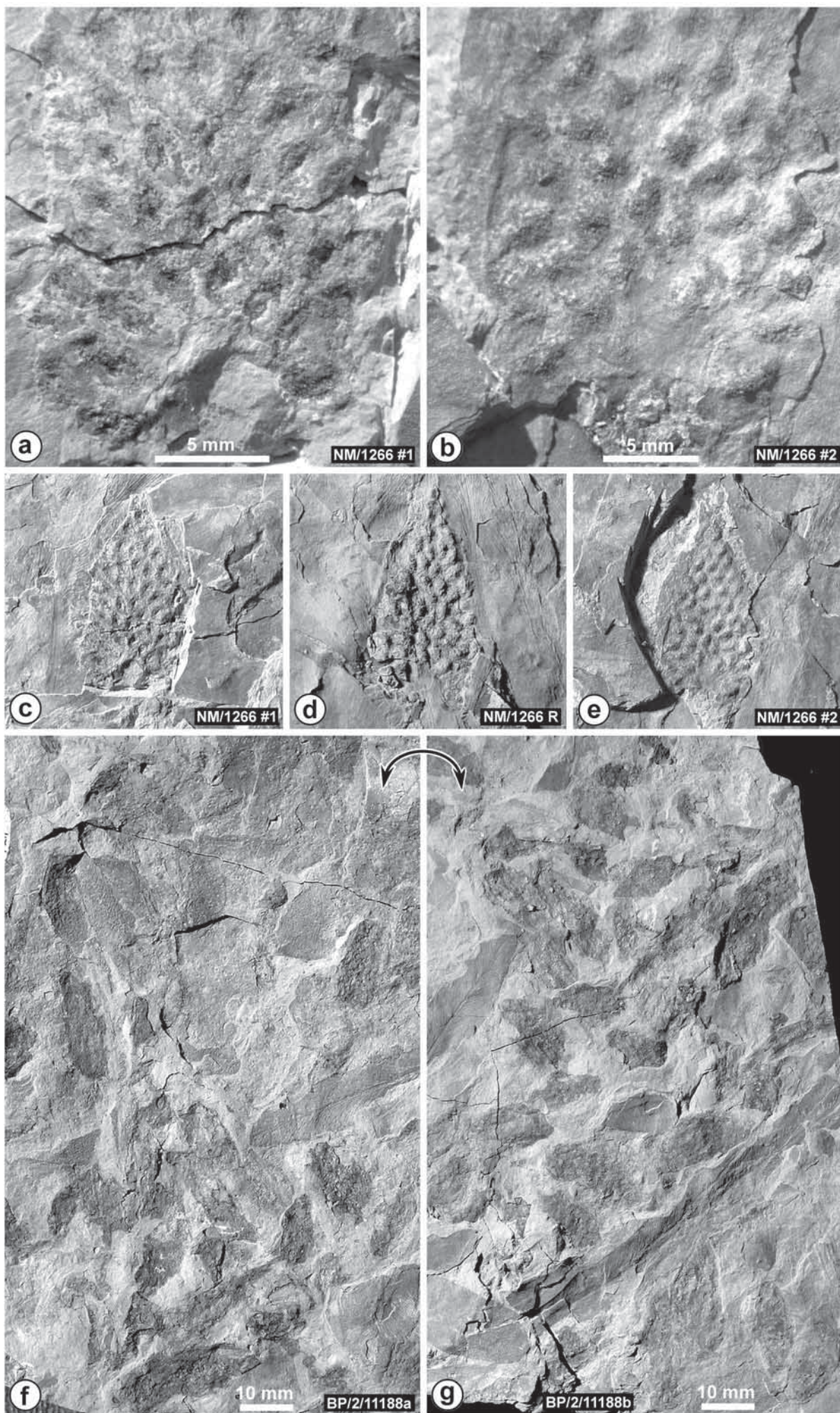
PLATE 76. Further examples of *Plumsteadia gibbosa* from Loskop. Figs (e) and (f) are part and counterpart of a fructification attached to the petiole of a *Glossopteris* leaf attached to a branch bearing other leaves. This specimen has a broad wing with prominent fluting. Wings are evident in most of the specimens figured here. *Plumsteadia* fructifications are, in many cases, found in close association, as illustrated in fig. (g). The nature of the seed scars and fluted, striated wing is clearly apparent in the enlargements of BP/13000a&b (figs. (k) and (l)).



10 mm

PLATE 77. Figs (a)-(e): *Plumsteadia gibbosa* from Mooi River. These specimens have a low L:W, and a slightly cordate base, with the prominent, bulbous seed scars typical of *P. gibbosa*.

Figs (f)-(g): *Plumsteadia gibbosa* (?) from Inhluzane. A mass of closely associated fructifications preserved on a single slab from Inhluzane. The poor preservation of the specimens made conclusive identification impossible, but the shape, dimensions and bulbous seed scars most closely affiliates these fructifications with *P. gibbosa*.



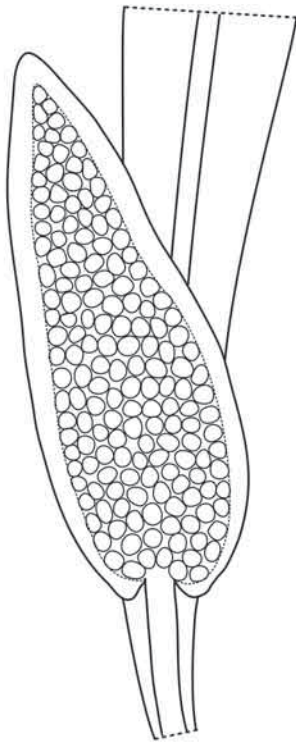
10 mm

PLATE 77

PLATE 78. Reconstructions and line drawings of *Plumsteadia gibbosa* (figs (a) and (b)); and *P. lerouxii* (figs (c)-(f)).

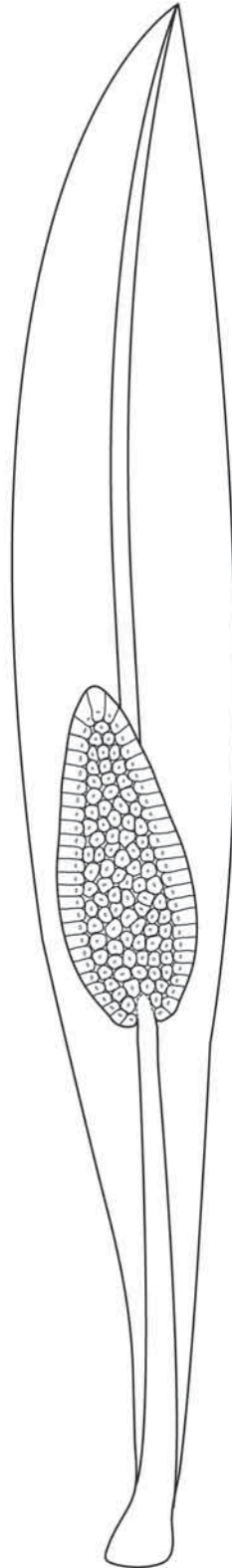


a BP/2/12521

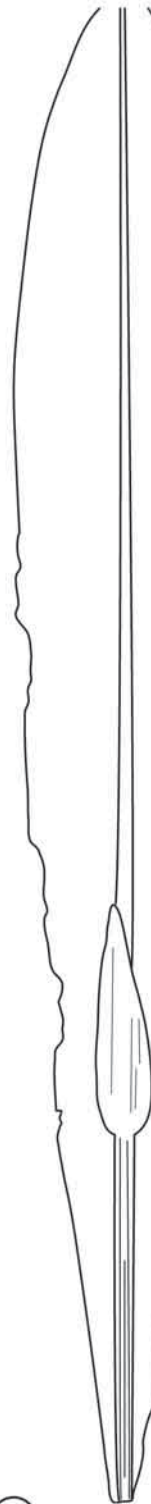


b RECONSTRUCTION
Plumsteadia gibbosa

10 mm

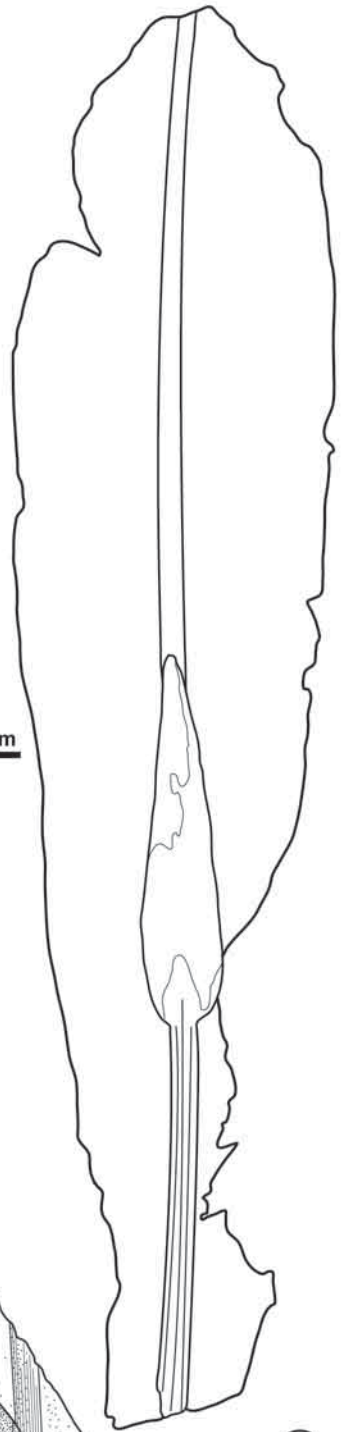


c RECONSTRUCTION
Plumsteadia lerouxii

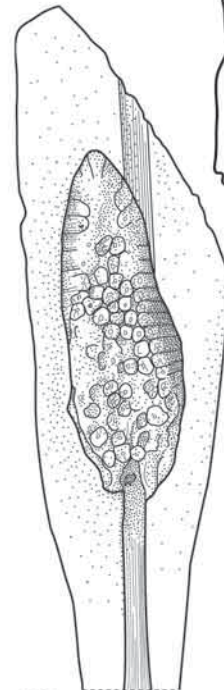


d BP/2/14156

10 mm



BP/2/14149a **e**



f BP/2/14179

PLATES 79 - 82: *Gonophylloides*

PLATE 79. Specimens of *Gonophylloides strictum*, from Vereeniging; the holotype is illustrated in figs (a) and (b). Fig. (f) is the only isolated specimen of *G. strictum* that has been found.

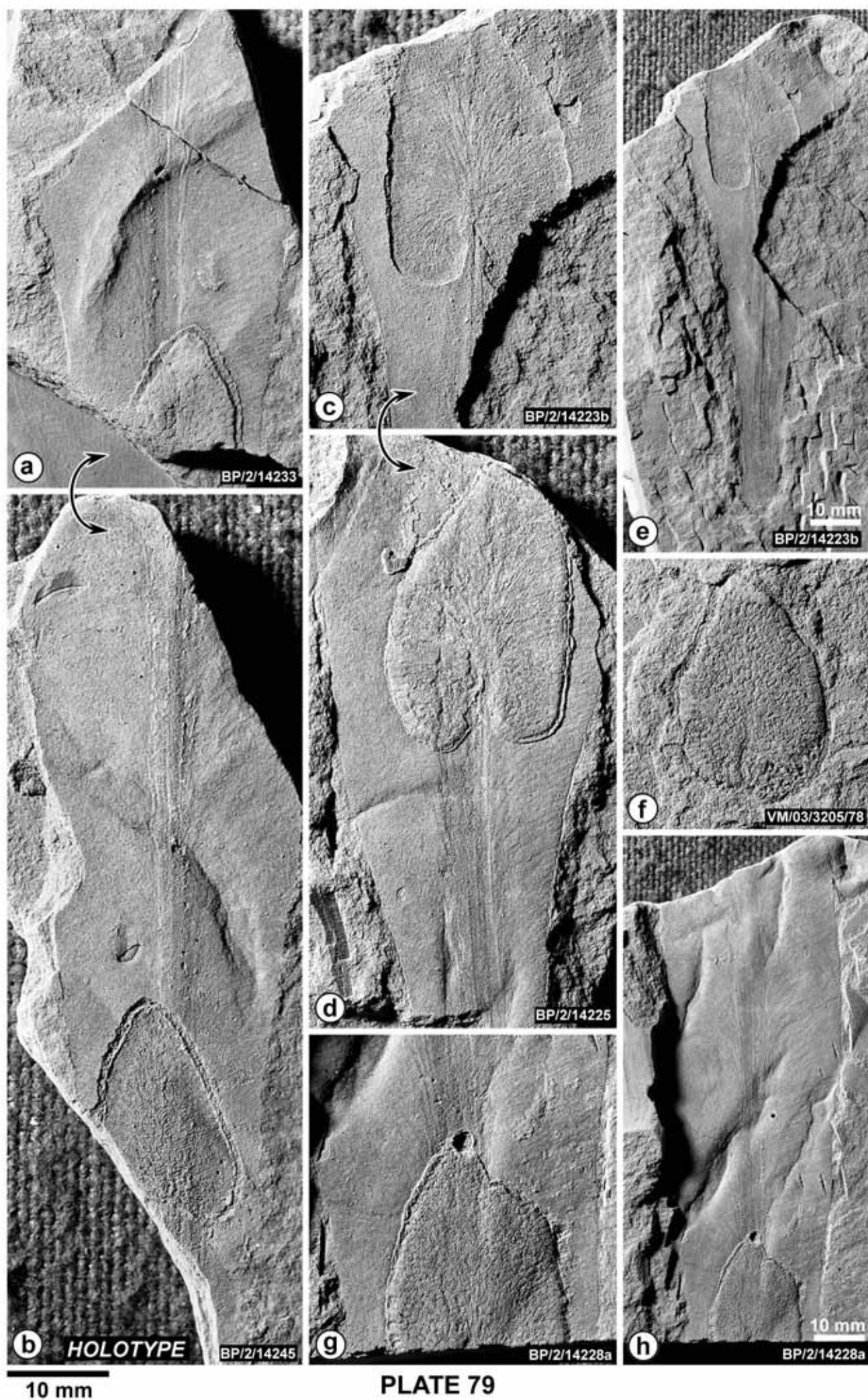


PLATE 79

PLATE 80. Additional specimens of *Gonophylloides strictum*. Specimen BP/2/14230a&b, in figs (a) and (b) has a particularly high length to width ratio for the taxon.

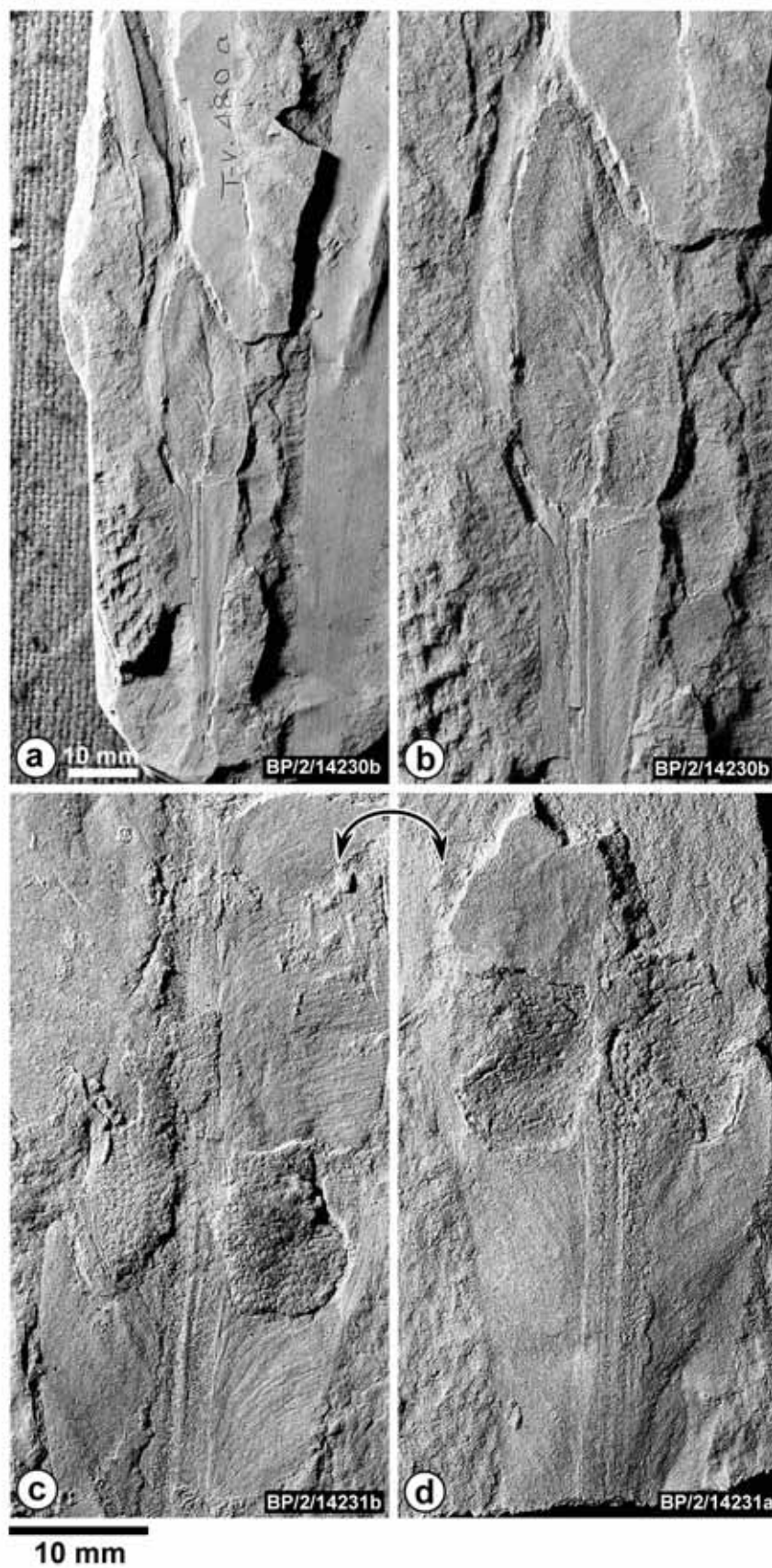


PLATE 81. Figs (a)-(d): *Gonophylloides strictum* Fig. (d) is a reproduction of a photograph from Smithies (1978; p. 90-91, fig. 16, specimen number 41 a/h), illustrating the only known specimen of *G. strictum* from the Hammanskraal locality. The specimen could not be located in the BPI collections.

Figs (e)-(i): *Gonophylloides waltonii*, with the part and counterpart of the holotype illustrated in figs (e) and (f).

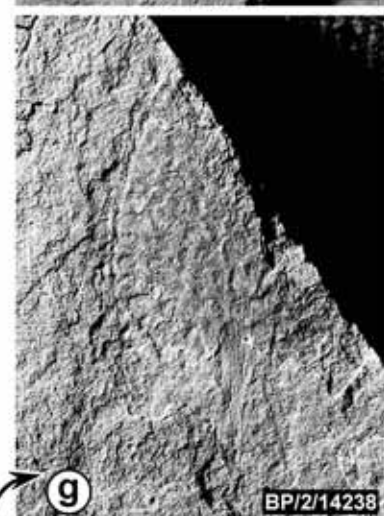
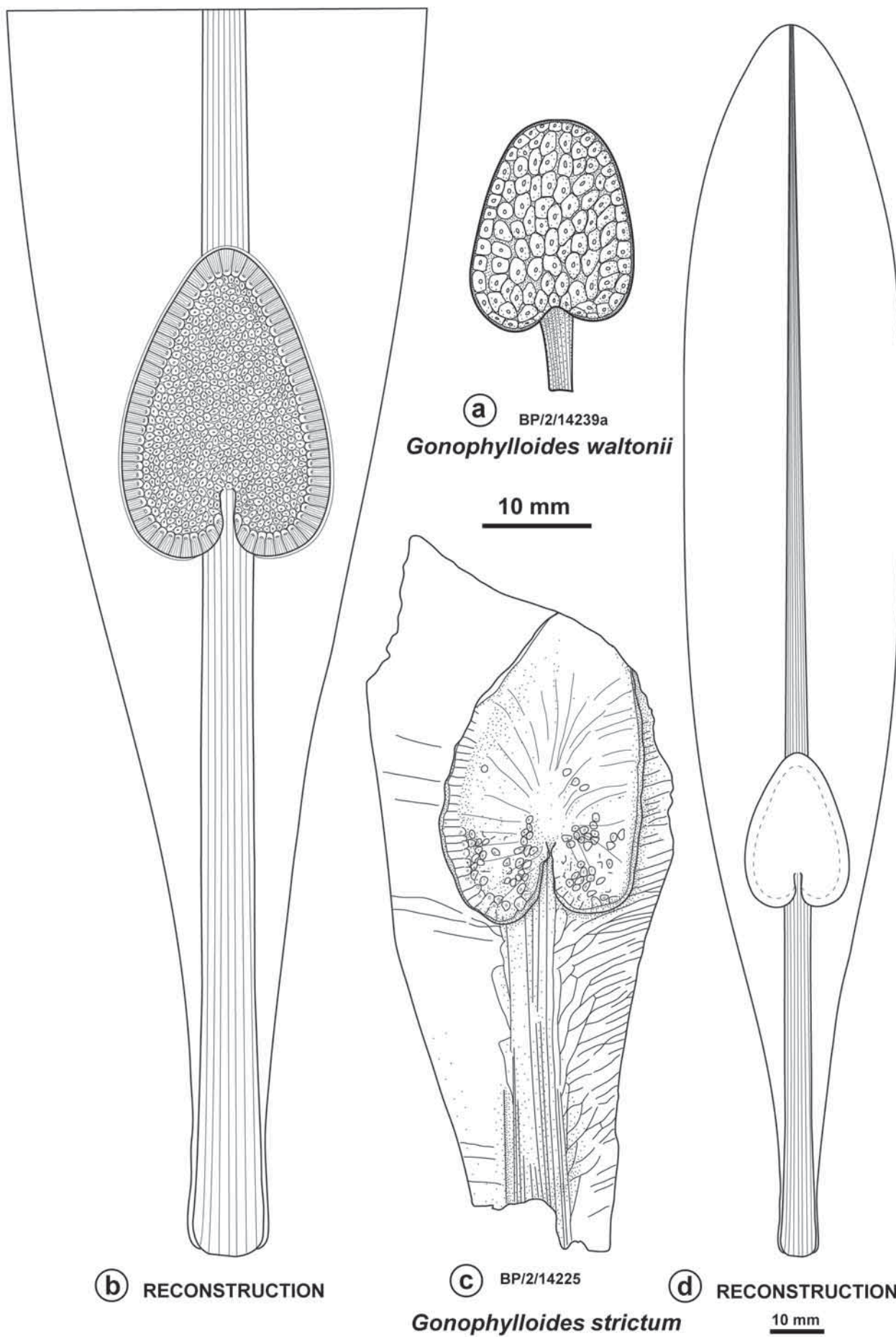


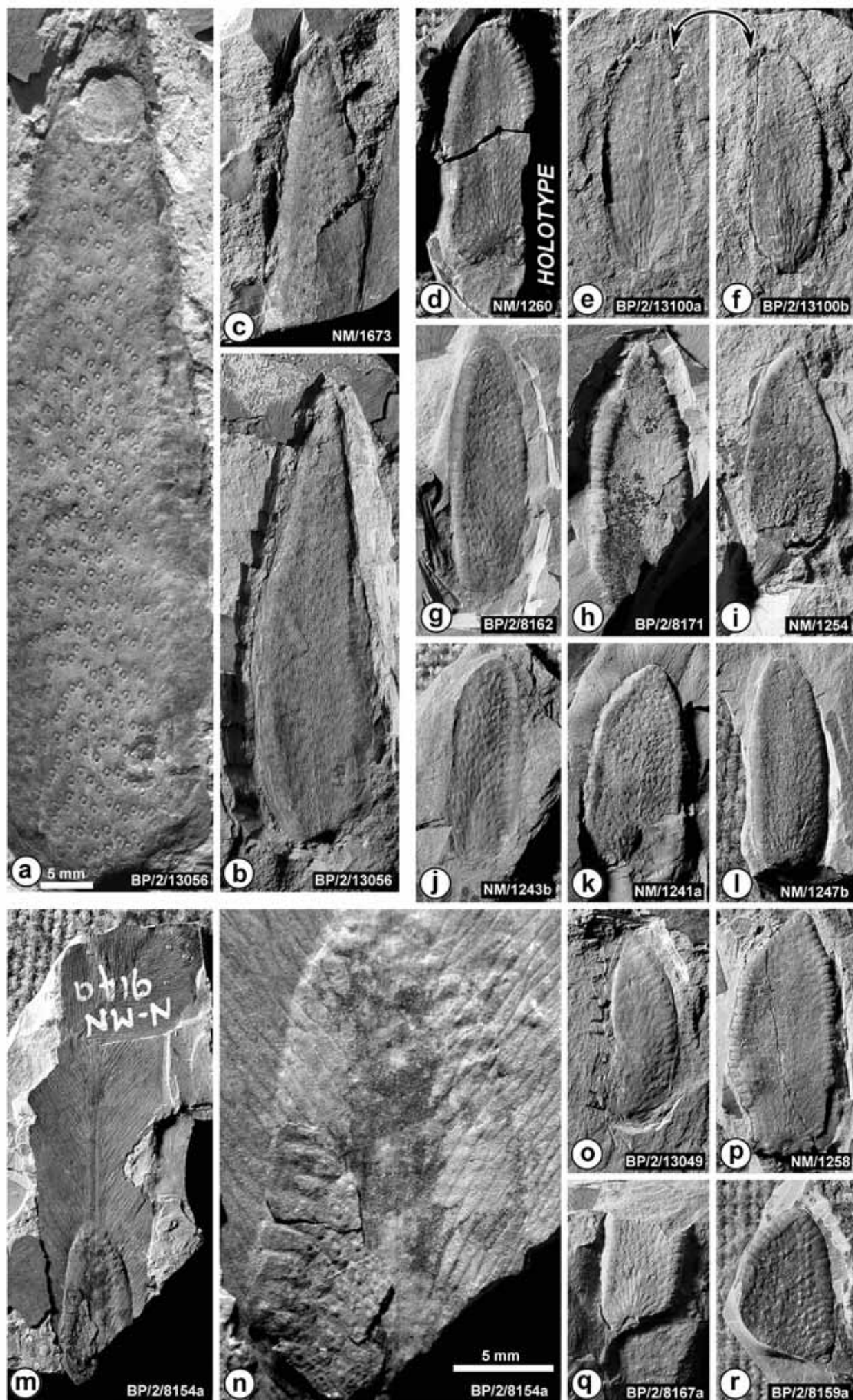
PLATE 82. Drawings and reconstructions of *Gonophylloides waltonii* (fig. (a)) and *G. strictum* (figs (b), (c) & (d)). Fig. (d) illustrates the shape of the subtending leaf of *G. strictum* and the relative sizes of the fructification and leaf (life-size).



PLATES 83 - 89: *Dictyopteridium* spp.

PLATE 83. Figs (a)-(c): two examples of fructifications from Mooi River which are probably referable to *Dictyopteridium sporiferum*; note the lanceolate shape with long, tapering apex and particularly smooth receptacle with tubercles.

Figs (d)-(r): *Dictyopteridium natalensis* from Mooi River; figs (m), (n): impression of a *D. natalensis* specimen in apparent attachment to a *Glossopteris* leaf; note the prominence of the secondary imprint or raised boss on the glossopteris leaf, marking the prior position of the fructification – only a remnant of the impression of the fructification remains in the lower left portion of the boss, as best seen in the enlargement (fig. (n)).



10 mm

PLATE 83

PLATE 84. Enlargements of examples of *D. natalensis* illustrated in pl. 83; fig. (a): apical region of specimen in pl. 83, fig. (h), showing details of the fertile surface of the receptacle, and the nature of the narrow, fluted wing; fig. (b): apical portion of specimen in pl. 83, fig. (p), with surface detail of fertile surface of receptacle, and illustration of the short wing with fluting corresponding to the positions of the marginal seed scars; figs (c), (d): enlargement of the part and counterpart illustrated in pl. 83, figs (e), (f), showing the veined nature of the sterile surface of the receptacle, with a strong medio-longitudinal concentration of veins, and the fertile surface of the receptacle with its poorly defined seed scar cushions and small tubercles.

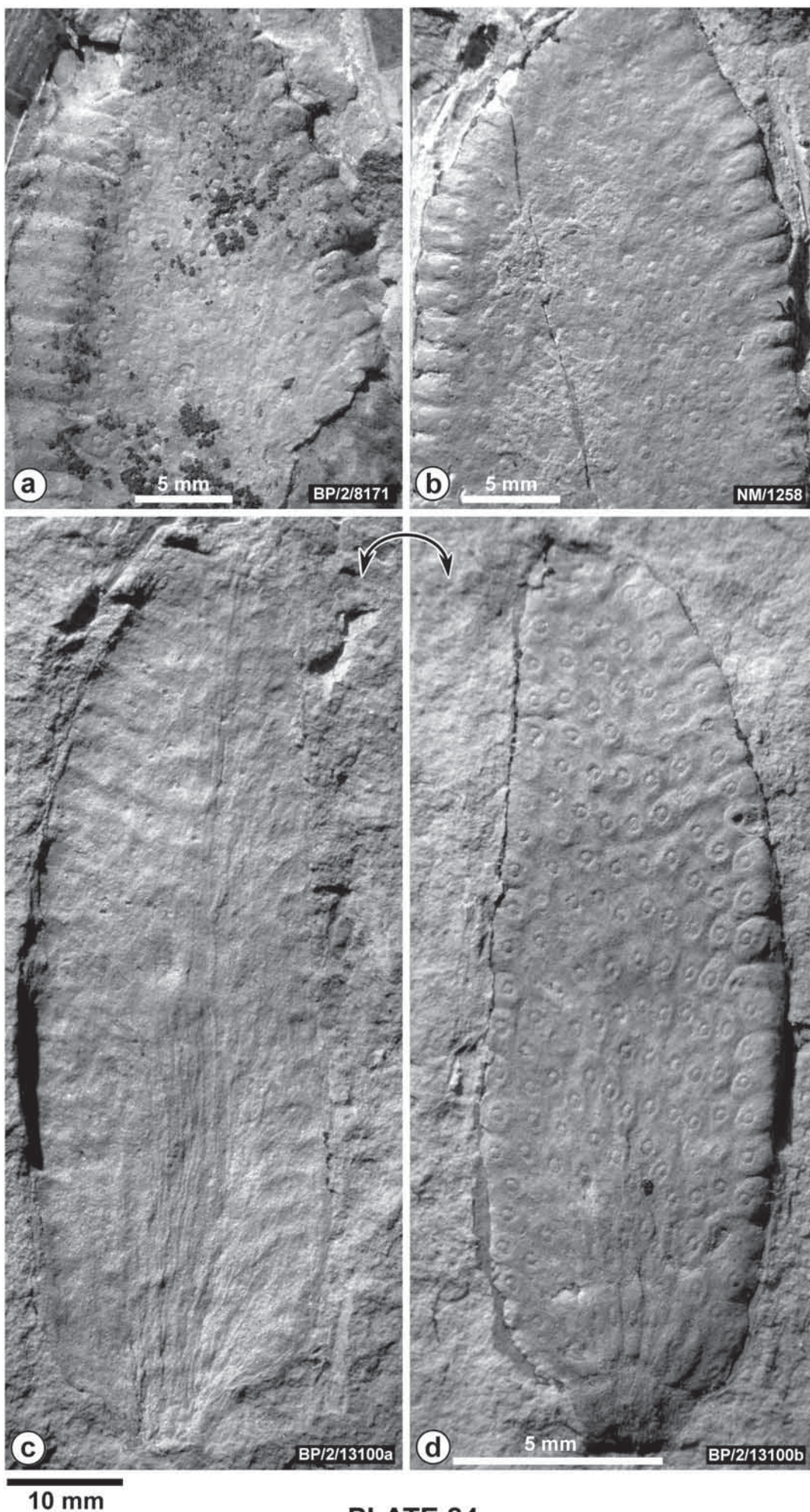


PLATE 84

PLATE 85. Further examples of *D. natalensis* from Mooi River. Fig. (b): sterile surface of a *D. natalensis* fructification; figs (d), (e): an unusual specimen with a clearly dentate wing margin; this is not the result of irregular breaking of the matrix or any other artefact, as the marginal scallops correspond to the wing fluting in the same manner as seen in other fructifications such as *Scutum*.

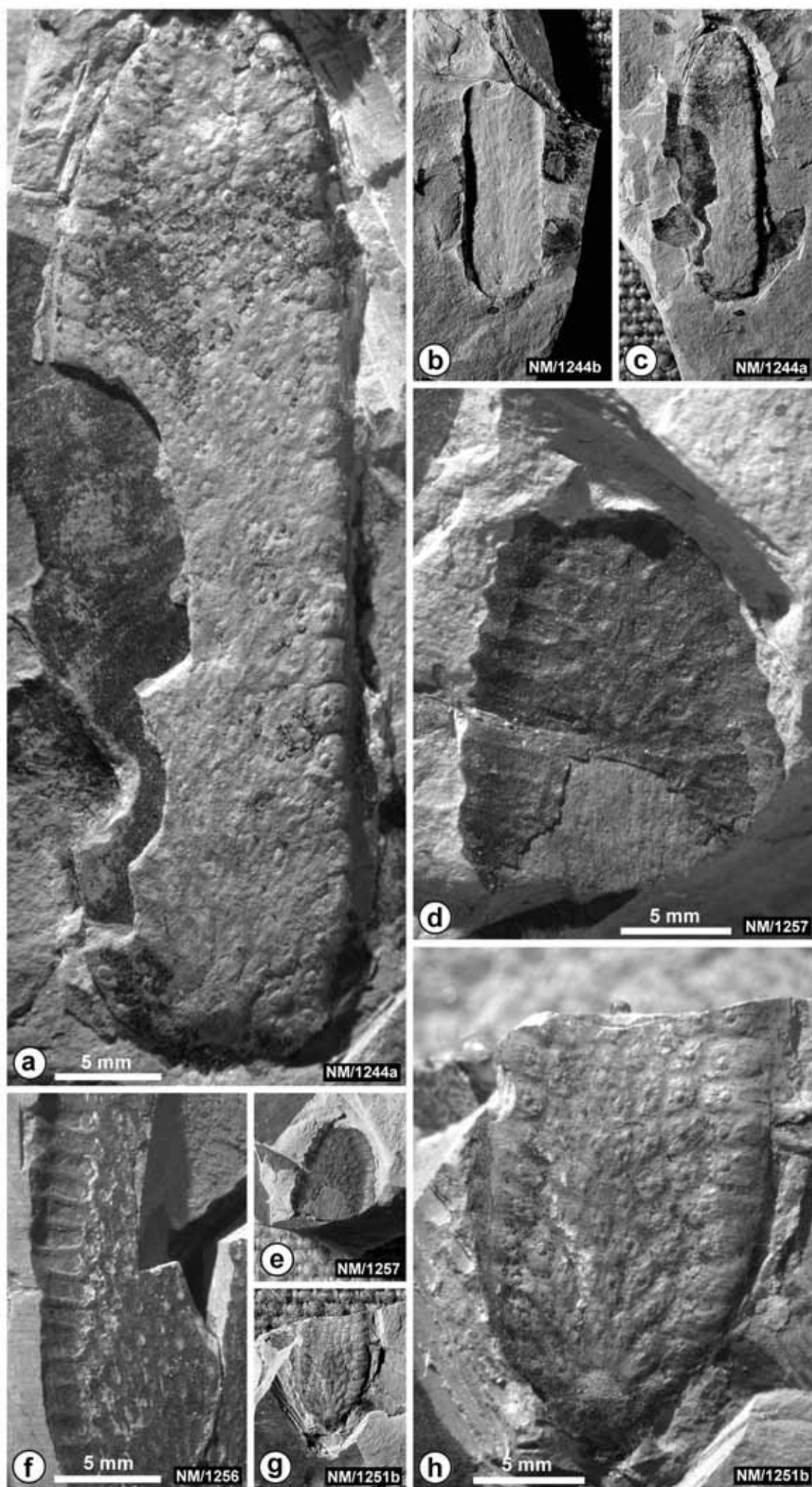
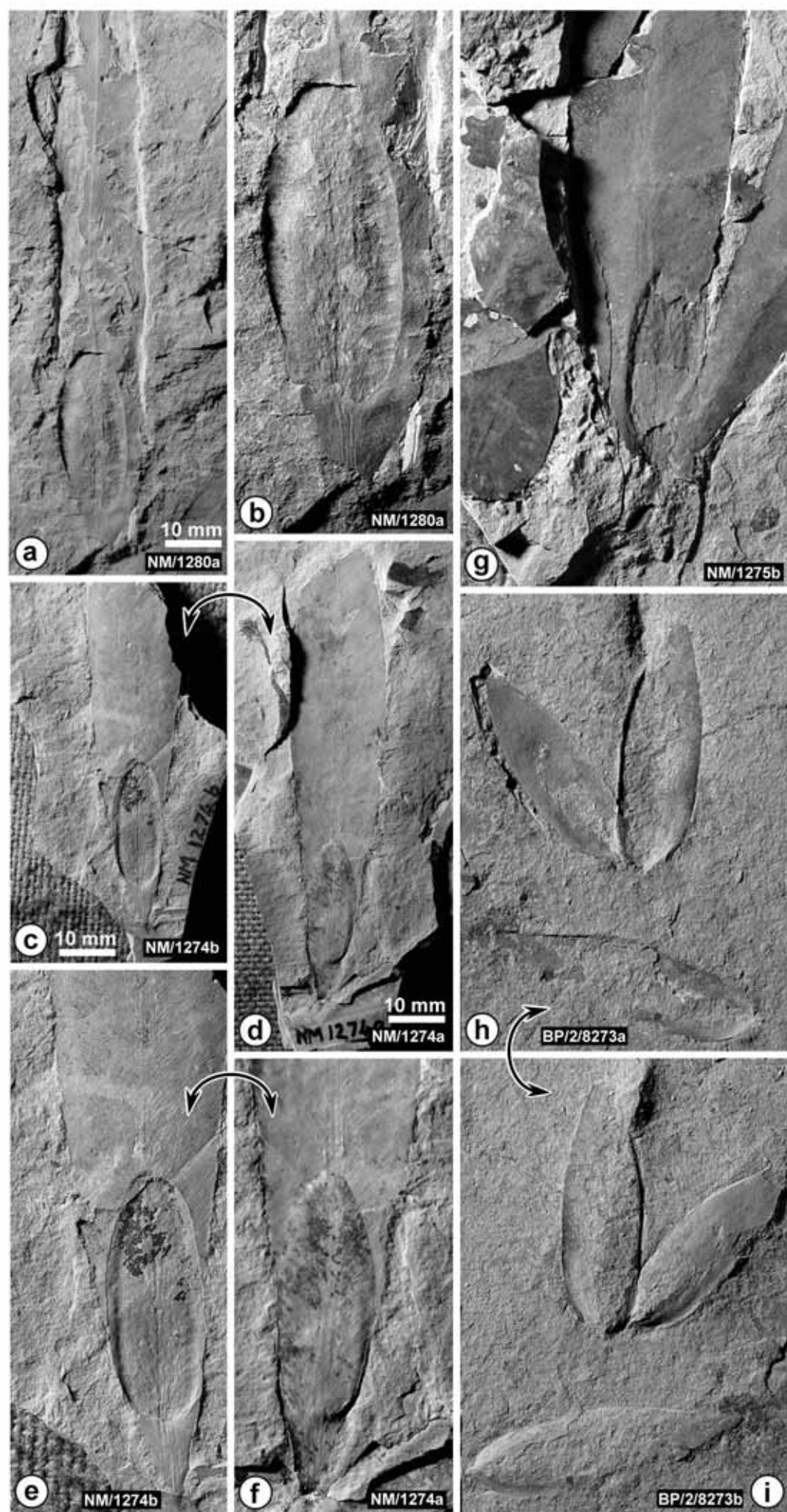


PLATE 85

PLATE 86. Figs (a)-(g): *D. natalensis* fructifications from Mooi River, in apparent attachment to *Glossopteris* leaves; figs (h), (i): an aggregation of structures which appear to be poorly preserved examples of *D. natalensis*.



10 mm

PLATE 86

PLATE 87. Members of *Dictyopteridium flabellatum*, from the Loskop locality.

Figs (a)-(c): a particularly small specimen, with a relatively broad wing with well-defined fluting; figs (d)-(g): paratype specimen clearly illustrating the pronounced venation pattern on both the sterile (fig. (d)) surface and fertile surface (fig. (g)) of the fructification; note the inclination of the wing into the sediment in figs (f), (g); fig. (h): holotype specimen, representing the fertile surface of a fructification; note how the wing has been folded over the fertile surface, and is only exposed towards the uppermost left side of the impression, where the sediment bearing the impression of the receptacle surface has been removed; the raised areolae along the margin of the receptacle are particularly well illustrated.

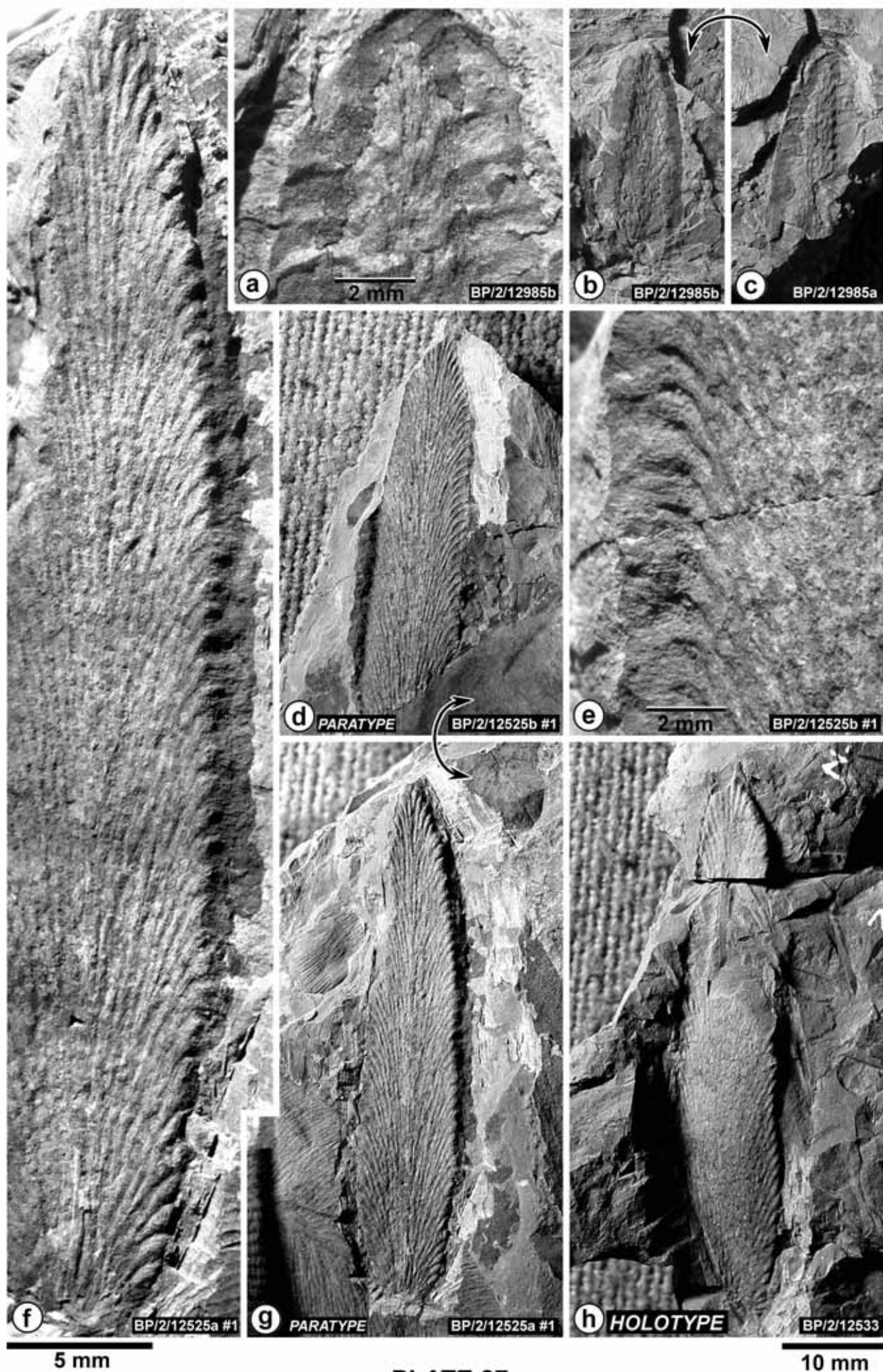


PLATE 87

PLATE 88. Additional examples of *D. flabellatum* from Loskop. The wing is particularly well preserved in the paratype specimen in figs (e), (f). Fig. (i) illustrates an example of two fructifications preserved in opposition.

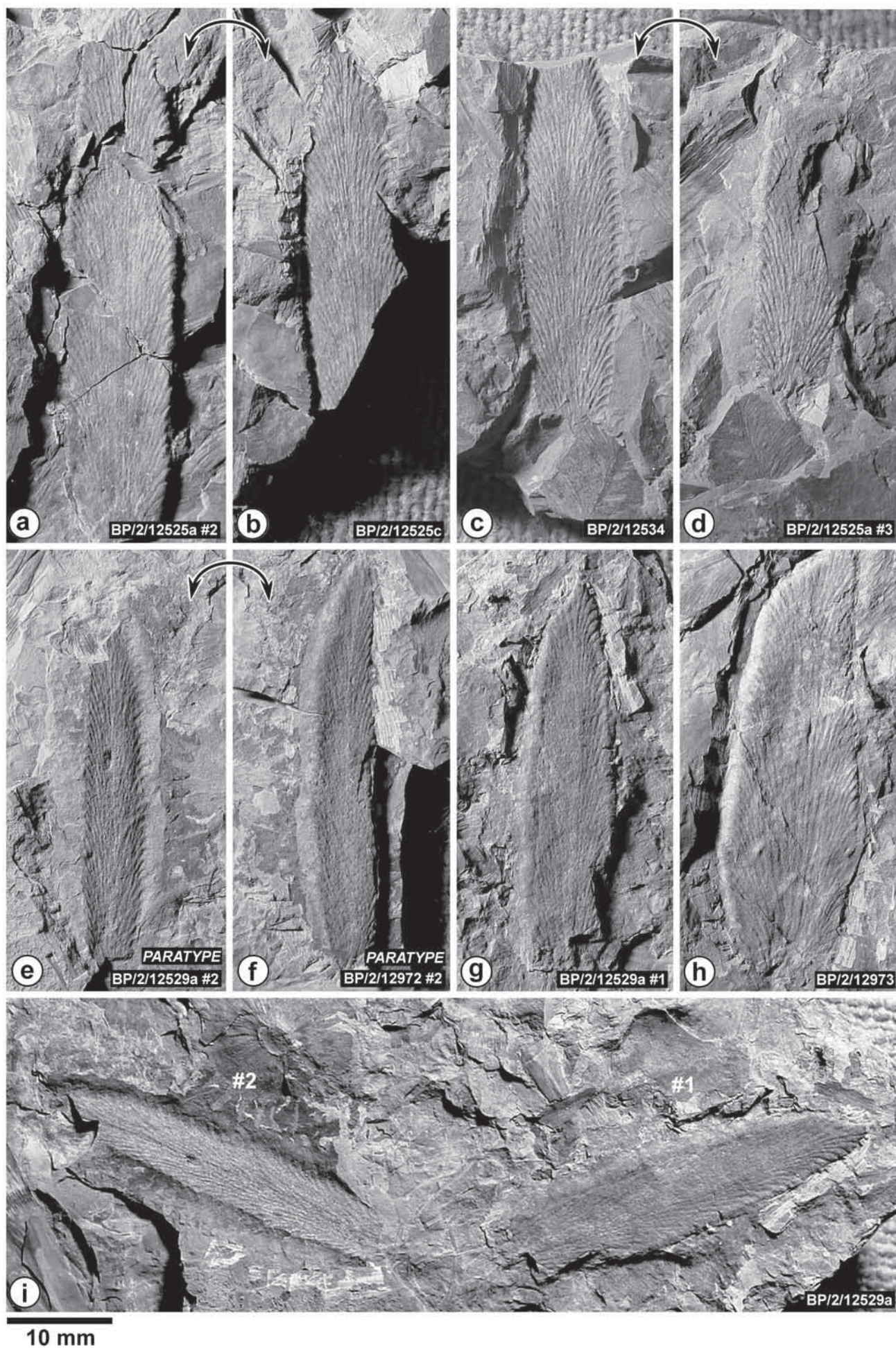
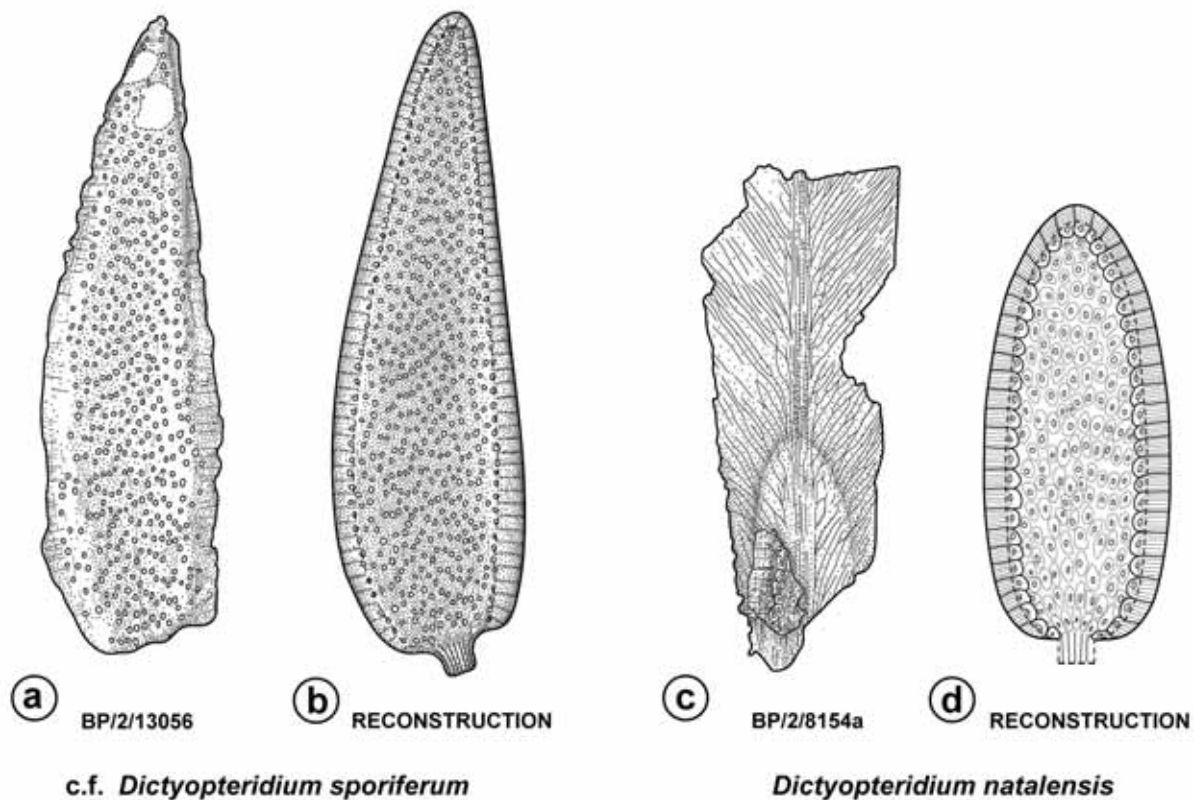
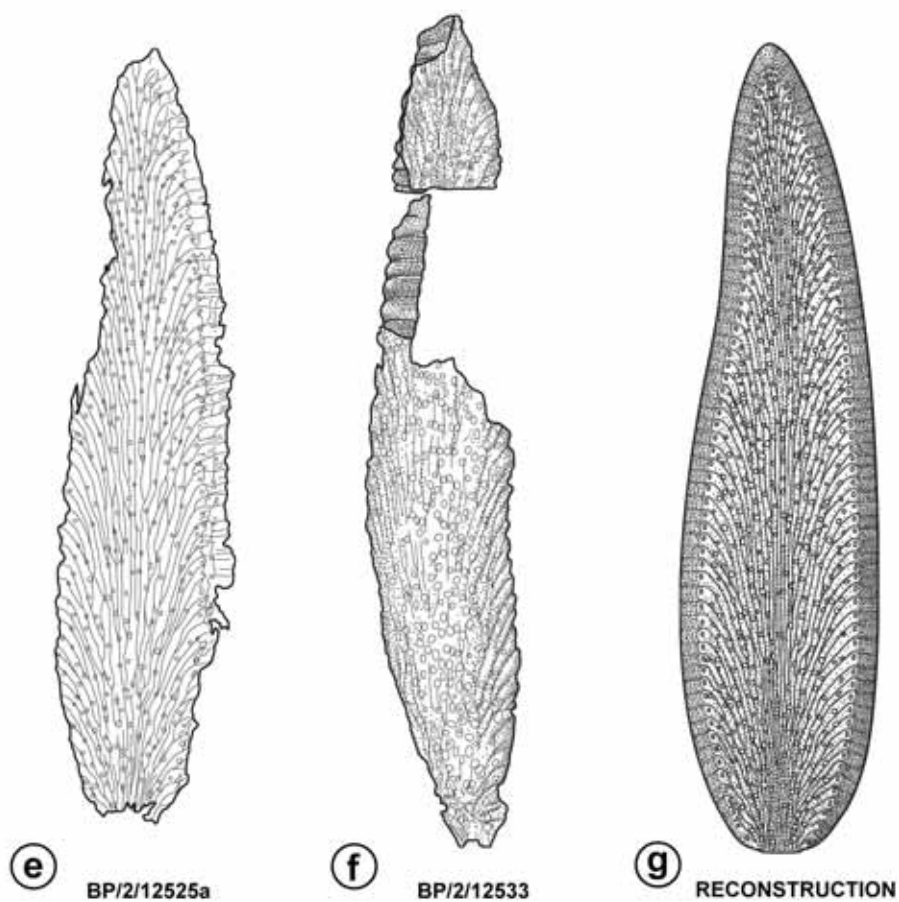


PLATE 89. Drawings and reconstructions of the three forms of *Dictyopteridium* from South Africa. Figs (a), (b): a drawing and reconstruction respectively of a fructification from Mooi River which belong within *D. sporiferum*; fig. (c): a drawing of a fragment of *D. natalensis* in apparent attachment to a glossopteris leaf; fig. (d): a reconstruction of *D. natalensis*; figs (e), (f): drawings of a paratype and holotype respectively of *D. flabellatum*; fig. (g): a reconstruction of *D. flabellatum* based on a drawing of the holotype.



10 mm



PLATES 90 - 100: *Lidgettonia* spp.

PLATE 90. Specimens of *Lidgettonia africana* from Mooi River. Fig. (h) is the specimen assigned by Anderson & Anderson (1985) as the holotype of their species *L. mooiriverensis*, here synonymised with *L. africana*.

(The 10 mm scale bar applies to figs (a)- (j); figs (f)-(k) are same-scale enlargements of the capitula and associated seeds in figs (e), (h) and (j) respectively).

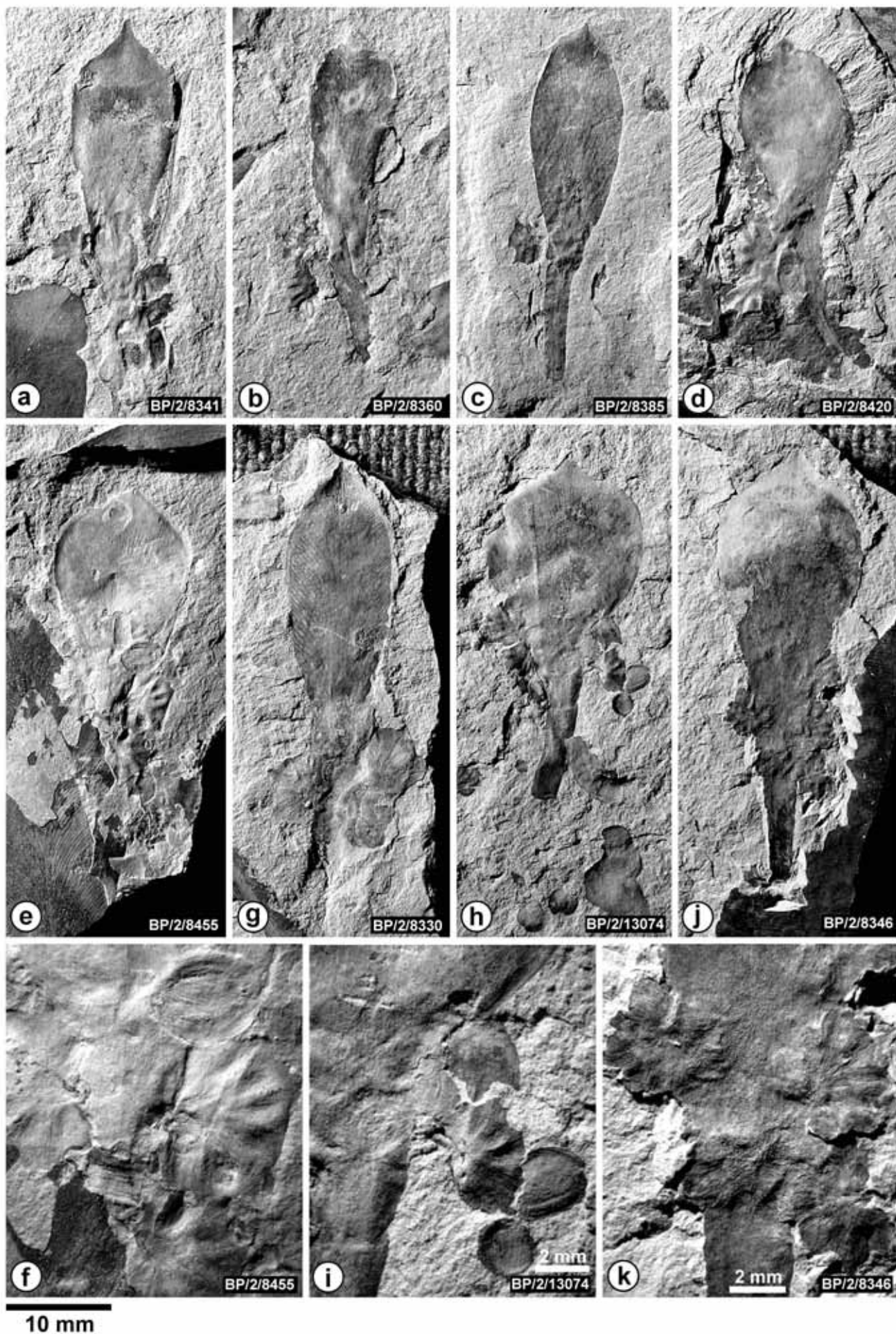
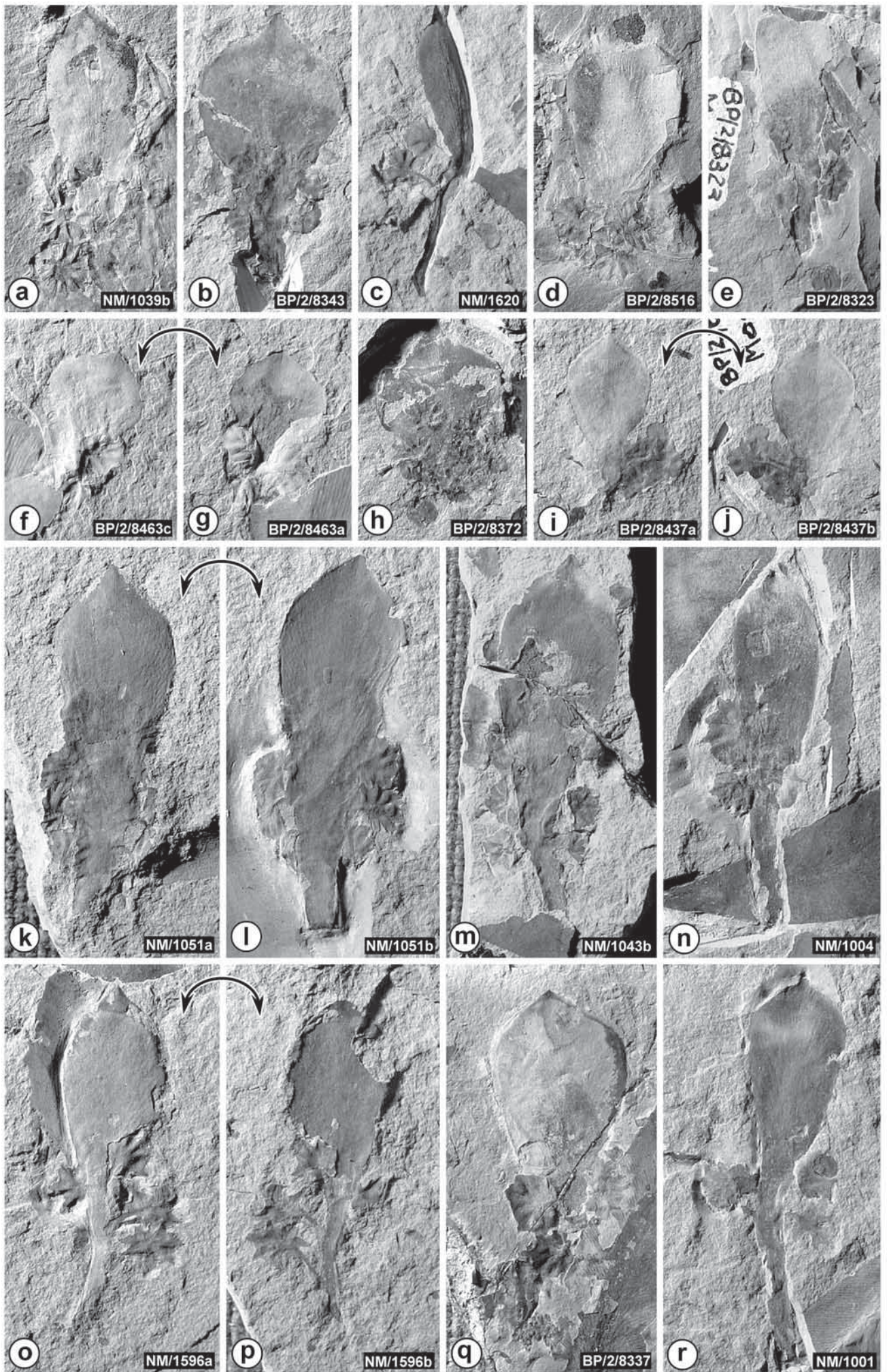


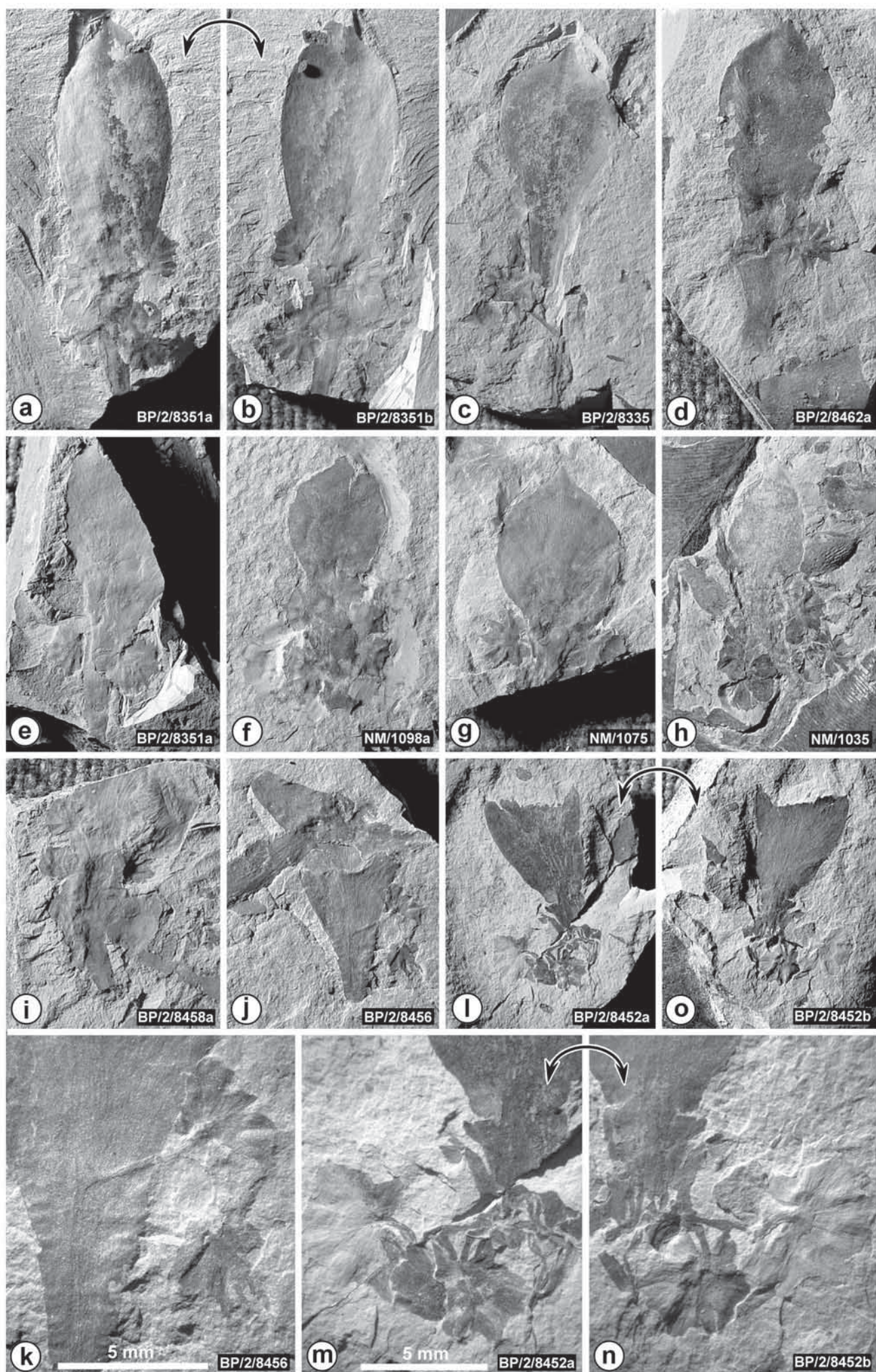
PLATE 90

PLATES 91-92. Additional specimens of *L. africana* from Mooi River, illustrating the variation in scale leaf and capitulum morphology. Figs (m) & (n) on pl. 92, are enlargements of capitula in figs (l) & (o). Note how a seed scar is visible at the base of each lobe/segment of the capitulum in (n), whereas the striations are continuous from the wing into the receptacle in (m) which illustrates the sterile surface of the capitulum.



10 mm

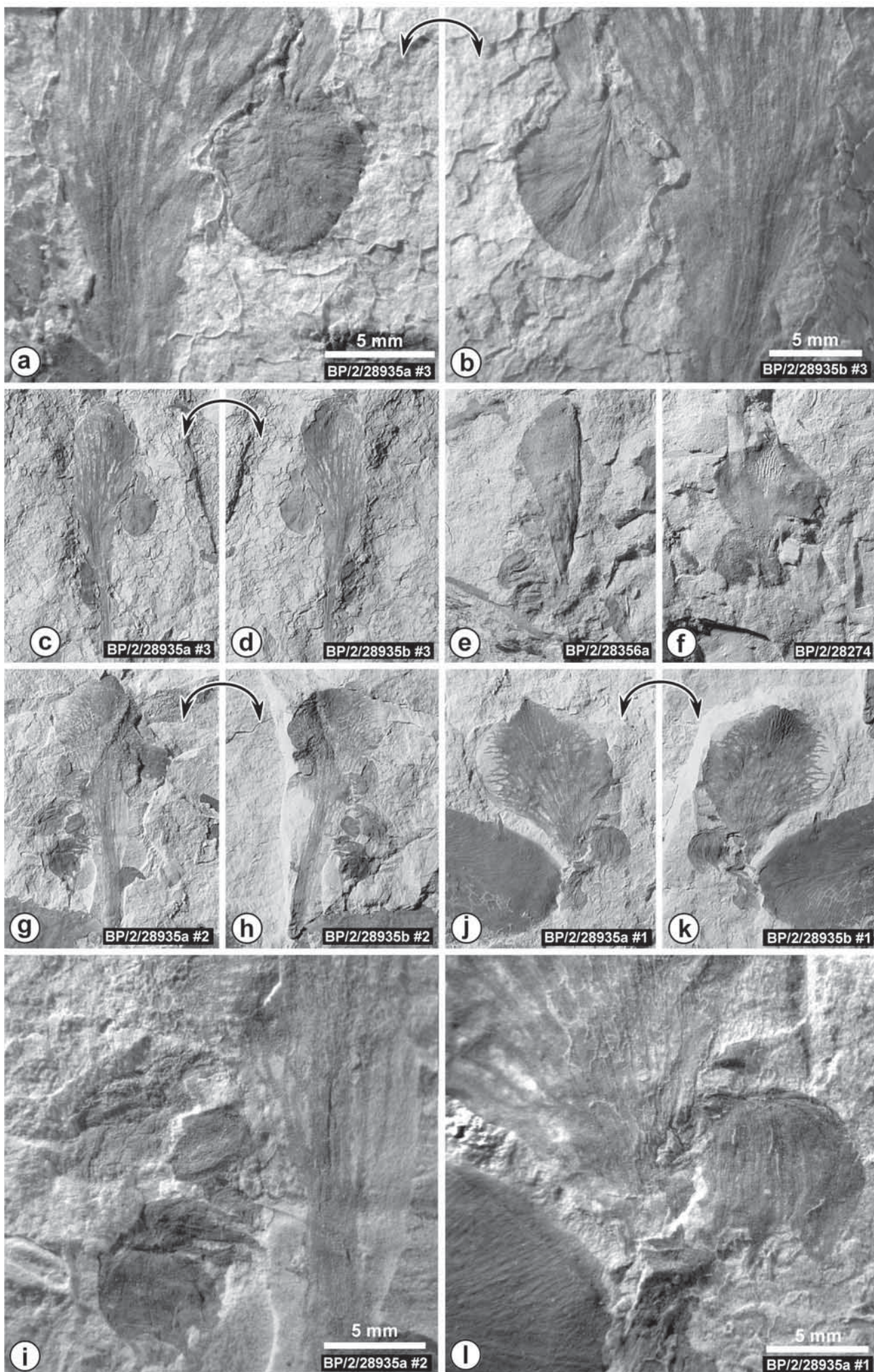
PLATE 91



10 mm

PLATE 92

PLATE 93. Specimens of *L. africana* from the Lawley locality. Note the variation in capitulum wing morphology, ranging from entire in figs (a)-(d), to scalloped with sharply pointed lobes, as in figs (j)-(l).

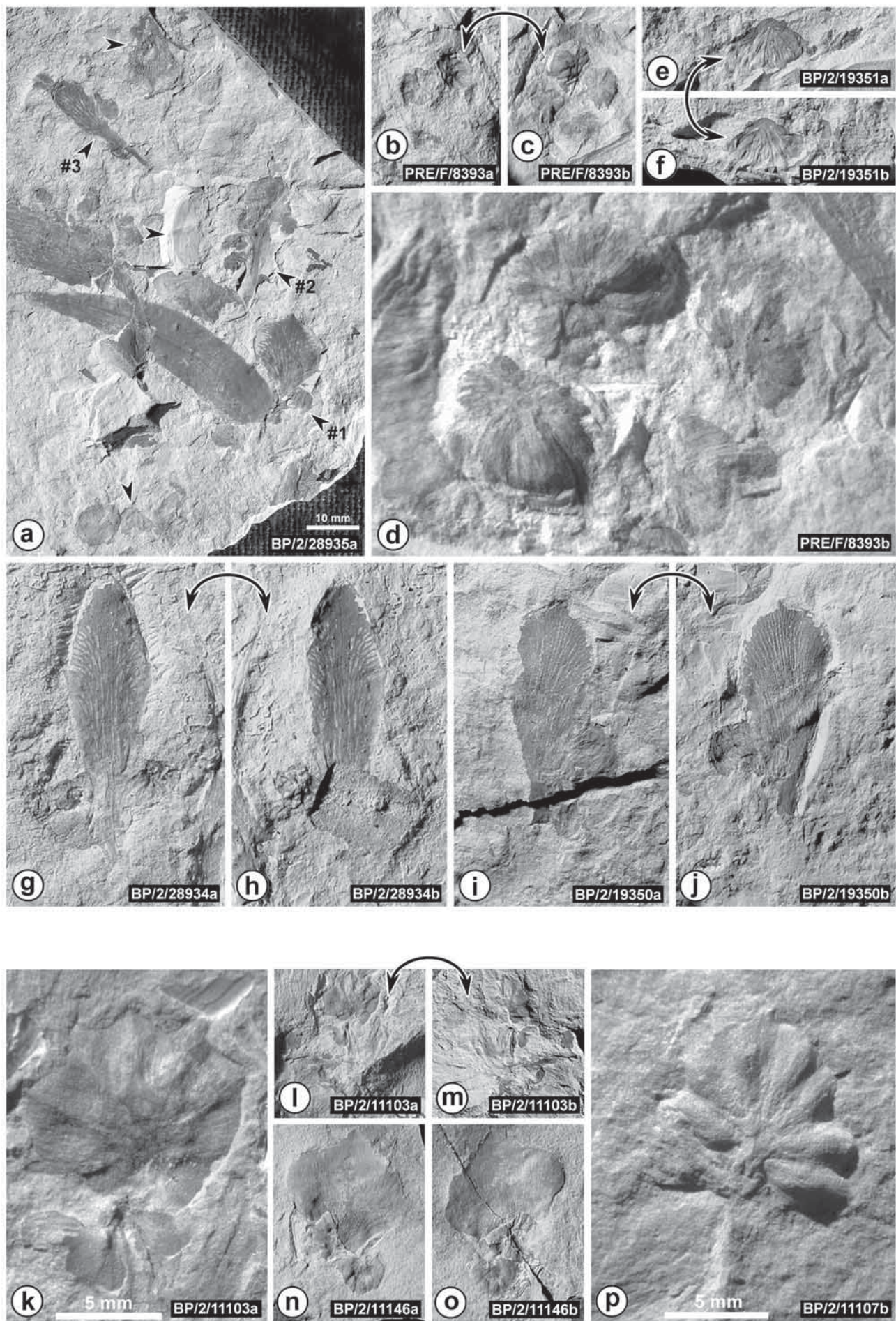


10 mm

PLATE 93

PLATE 94. Figs (a)-(j): additional specimens of *L. africana* from Lawley. Note in fig. (a) how several specimens have been preserved in close proximity on the same slab. These aggregated specimens (#1 - #3) are illustrated in pl. 93 (figs (c), (d), (g)-(l)). The uppermost, un-numbered arrow indicates an additional specimen of *L. africana*, the arrow near the centre of the photograph is pointing to a beautifully preserved insect wing, and the lowermost arrow is indicating the position of a detached capitulum. Anderson & Anderson (1985) placed the specimens from Lawley in a separate species, *L. lawleyensis*, with PRE/F/8393b (figs (b)-(d)) as the holotype. These specimens are here considered to fall within the circumscription of *L. africana*.

Figs (k)-(p): examples of *L. africana* from Inhluzane. Anderson & Anderson (1985) placed these specimens in a separate species, *L. inhluzanensis*, with BP/2/11146 as the holotype (figs (n) & (o)), but they are regarded here as being synonymous with *L. africana*.



10 mm

PLATE 95. Figs (a)-(i): *L. africana* from the type locality, Lidgetton. Note the attached seeds in figs (a), (b), with enlargements in figs (c), (d).

Figs (j)-(q): specimens of *L. africana* from the Loskop locality.

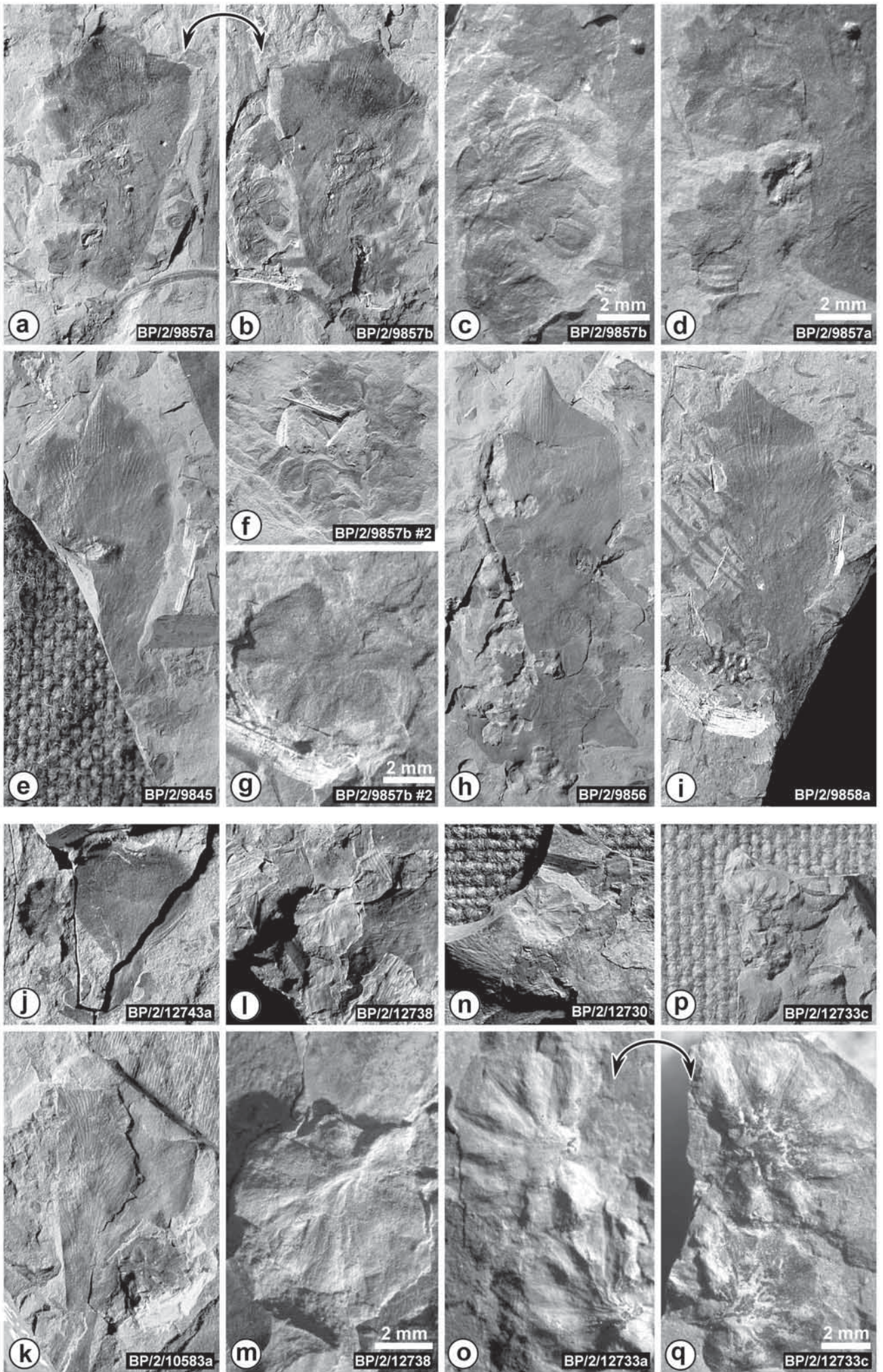
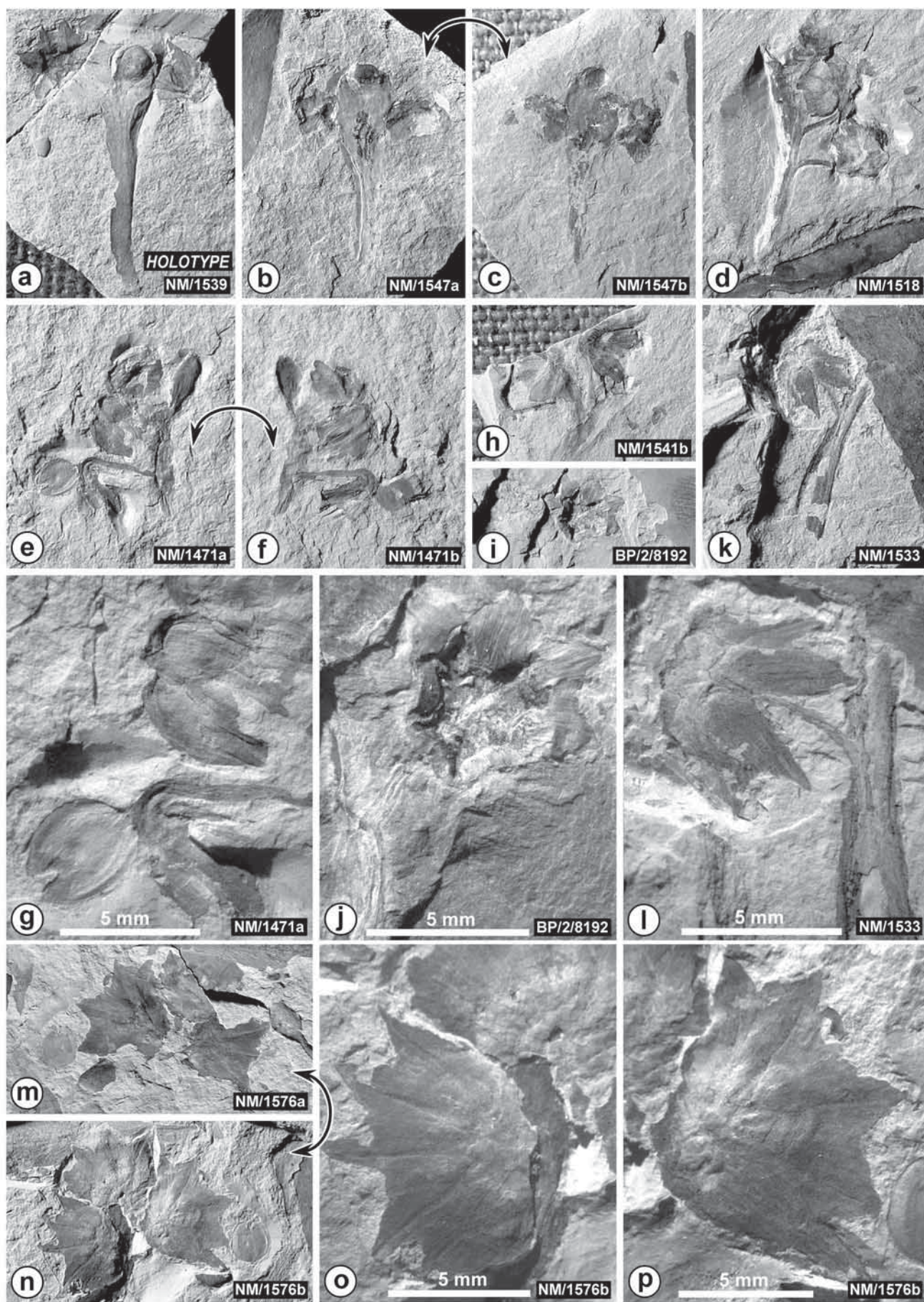


PLATE 95

PLATE 96. *Lidgettonia lidgettonioides* from Mooi River. Note the beautiful example of an attached seed in figs (e), (f), with an enlargement in fig. (g). Figs (k) and (l) illustrate the deep scalloping of the wing, and the lateral insertion of the pedicel into the capitulum.



10 mm

PLATE 97. Figs (a)-(j): additional specimens of *L. lidgettonioides* from Mooi River. Figs (k)-(m): *L. lidgettonioides* from Bulwer; figs (n), (o): *L. lidgettonioides* from Bergville.

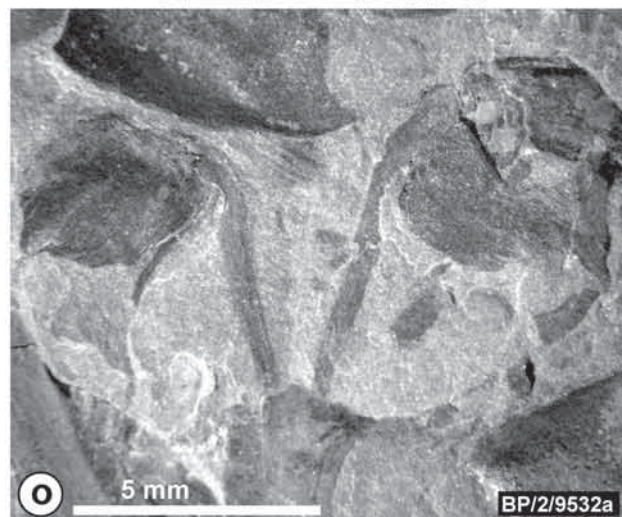
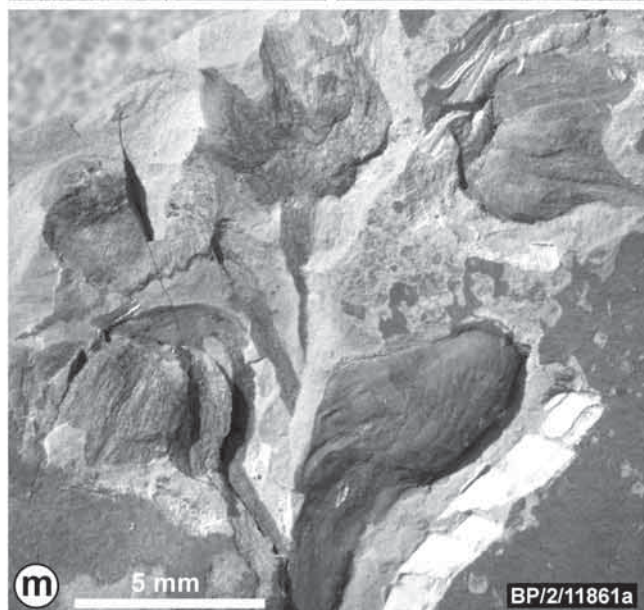
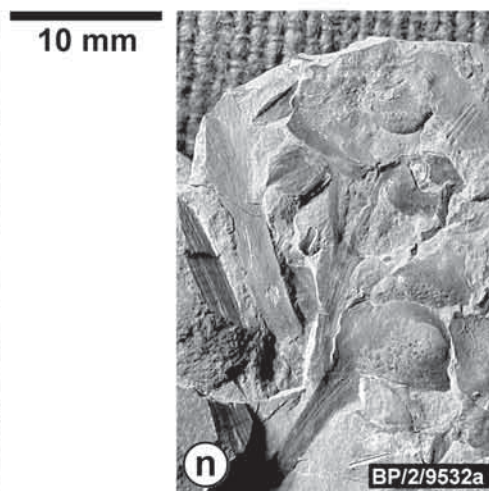
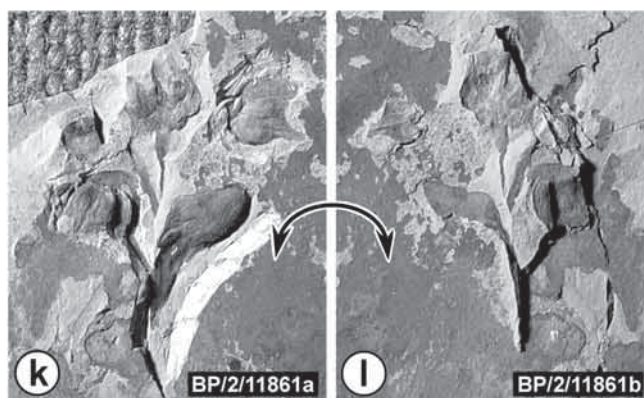
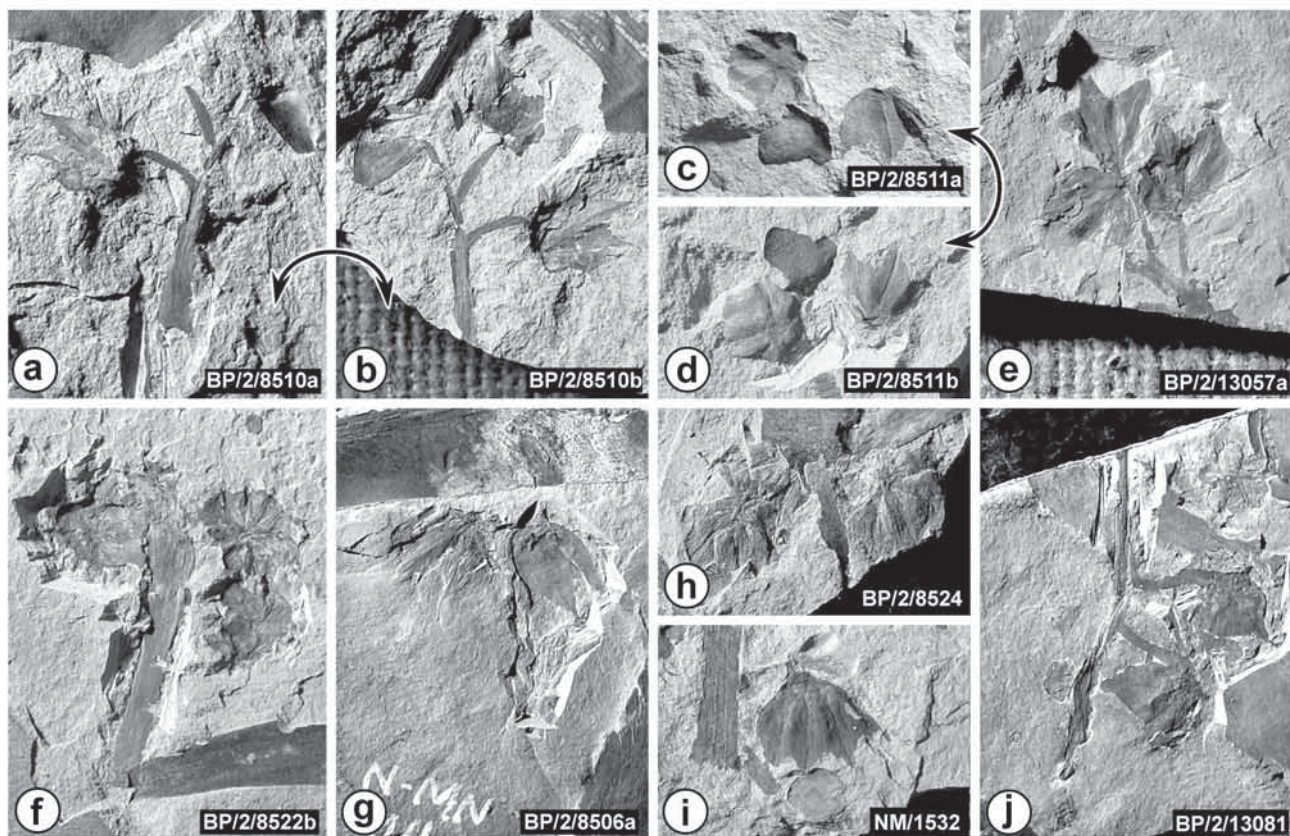


PLATE 98. *Lidgettonia elegans* from Mooi River. The holotype, figured in (a)-(d) is a magnificent specimen, clearly illustrating the capitulum morphology and with an attached seed. Figs (i)-(l) illustrate another specimen with attached seeds. Figs (g), (h) provide the clearest example of the spatulate capitulum.

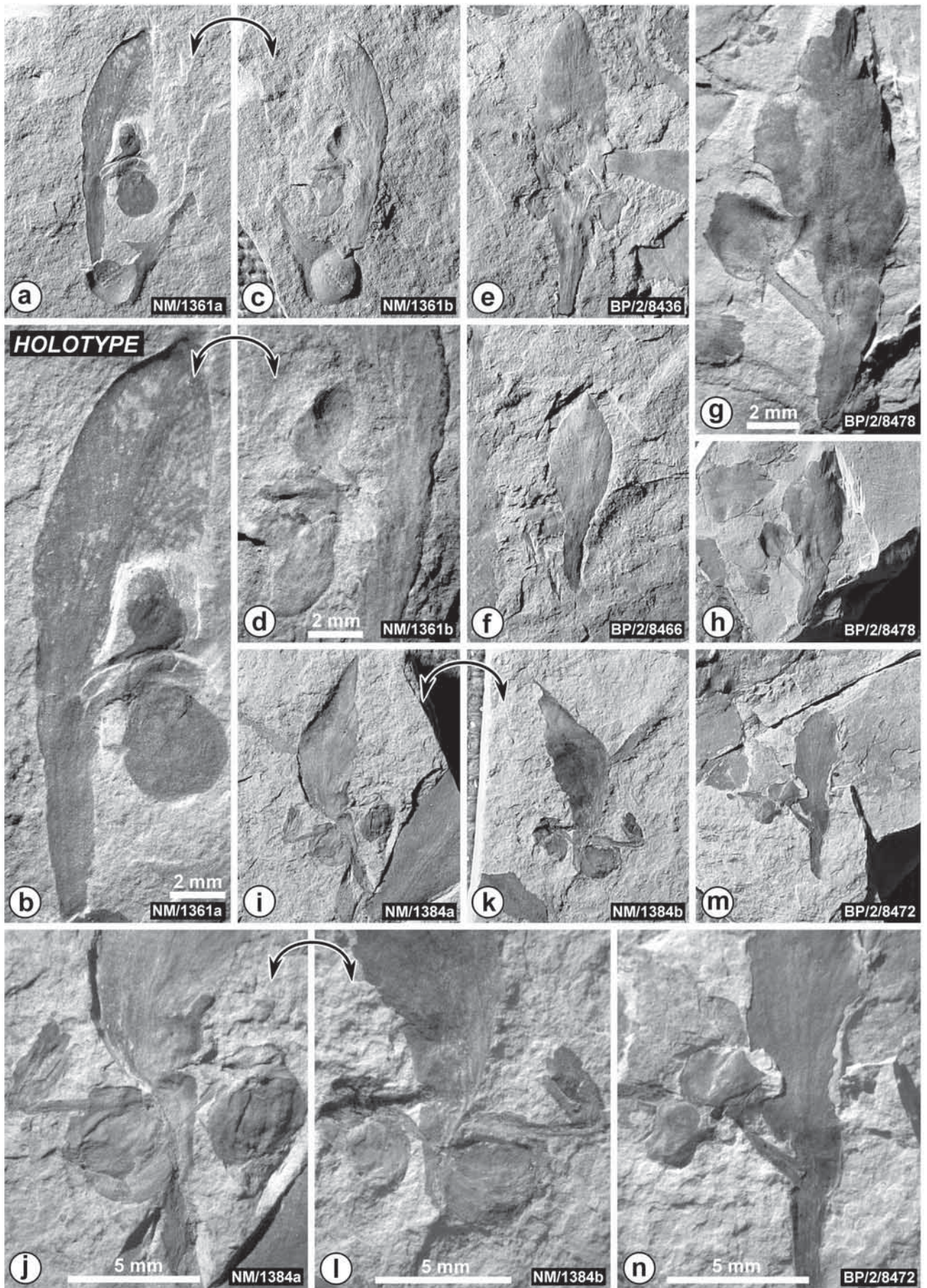
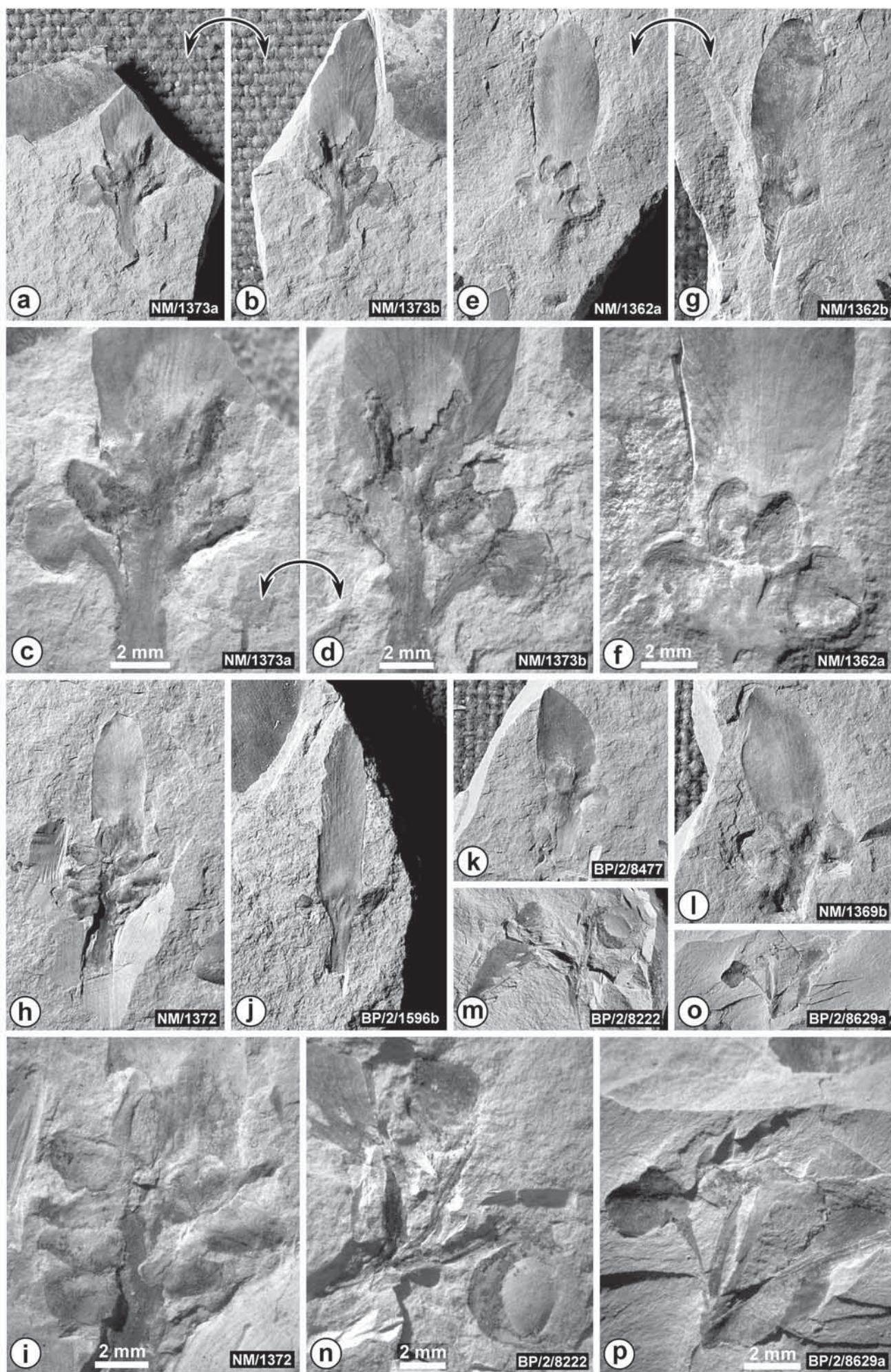


PLATE 99. Further examples of *L. elegans* from Mooi River. Specimens illustrated in (a)-(i) each have more than one pair of capitula per scale leaf. Figs (m), (n) illustrate a clear example of a seed which appears to be attached.



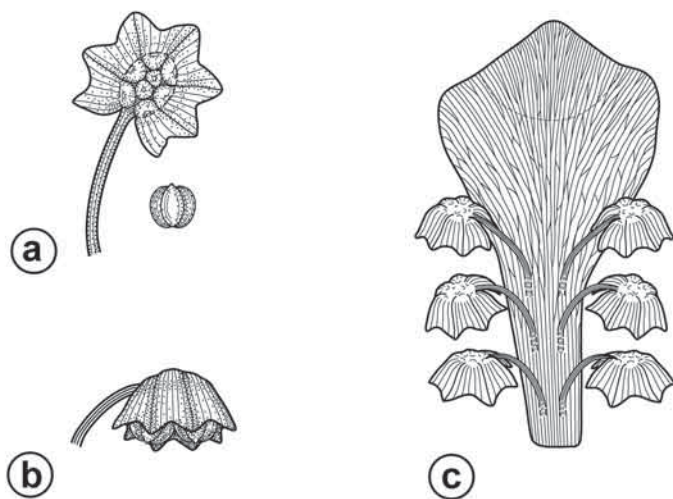
10 mm

PLATE 100. Drawings and reconstructions of the three species of *Lidgettonia* recognised here from the Upper Permian of South Africa.

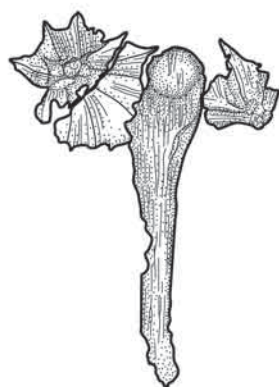
Figs (a)-(c): reconstructions of *Lidgettonia africana*; fig. (a) fossil reconstruction of the fertile surface of a single, dorsiventrally compressed capitulum, and a seed of the type found attached to *L. africana* capitula; fig. (b) plant reconstruction of a single capitulum with two attached seeds; fig. (c) plant reconstruction of a *L. africana* scale leaf with three pairs of attached, umbrella-like capitula.

Figs (d), (e): a drawing and a reconstruction of *Lidgettonia lidgettonioides* and a seed of the type found in attachment.

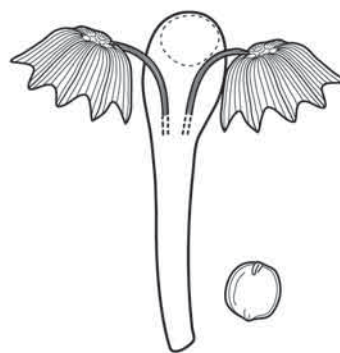
Figs (f), (g): *Lidgettonia elegans*; fig. (f) a drawing of a single, dorsiventrally compressed capitulum of *L. elegans*; fig. (g) a reconstruction of *L. elegans* and its unusually shaped seed.



RECONSTRUCTIONS
Lidgettonia africana



(d) NM/1539

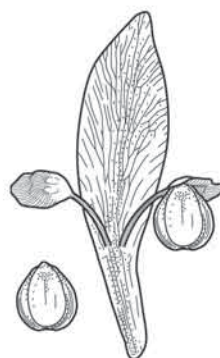


(e) RECONSTRUCTION

Lidgettonia lidgettonioides



(f) BP/2/8478
5 mm



(g) RECONSTRUCTION

Lidgettonia elegans

10 mm