

# ON THE GRAPTOLITES DESCRIBED BY BAILY (1871) FROM THE SILURIAN OF NORTHERN IRELAND AND THE GENUS *STREPTOGRAPTUS* YIN

by DAVID K. LOYDELL

**ABSTRACT.** The graptolite faunas described by Baily in 1871 from County Down, N. Ireland are re-examined and assigned to the middle part of the *Monograptus turriculatus* Biozone of the Telychian (Upper Llandoverly). One of Baily's new species, *Graptolithus plumosus*, is redescribed and a neotype selected. It is suggested that *G. plumosus* is the valid type species of the genus *Streptograptus* Yin, 1937, but was misidentified by Yin as *M. nodifer* Törnquist, 1881. An emended generic diagnosis for *Streptograptus* is given.

IN 1871 William Hellier Baily described the fossils collected during the mapping by the Geological Survey of Ireland of Sheets 49, 50 and part of 61 (including the country around Downpatrick, and the shores of Dundrum Bay and Strangford Lough, County of Down). These were exclusively graptolites and were collected from three localities only (Baily 1871): (a) Loc. 1. Railway cutting, 0.75 mile SE of Annacloy Bridge, 3 miles NW of Downpatrick; (b) Loc 2. Ballytrustan, 4 miles E of Downpatrick; (c) Loc. 3. Tieveshilly, a little N of Carrstown Burn, 2 miles SE of Portaferry.

Baily assigned the graptolites to three species, *Graptolithus priodon*, *G. plumosus* and *G. gradatus*, the latter two of which he considered to be new species. Baily's work subsequently received scant attention in the literature, especially after Lapworth (1876) placed *G. plumosus* into synonymy with *Monograptus exiguus* Nicholson, and did not include it or *G. gradatus* in his '*Graptolites of County Down*, (Lapworth 1877).

The author has recently re-examined some of the specimens described by Baily after their location in the Ulster Museum (abbreviated BELUM) by Mr John Wilson. Apart from one slab, from Loc. 1, all the material comes from the Tieveshilly locality (Loc. 3). This re-examination has shown that *G. plumosus* is not a synonym of *M. exiguus*, and the resurrection of *G. plumosus* will solve a number of complex taxonomic problems which have been hampering the progress of Upper Llandoverly graptolite research for some time. In addition, a fairly precise age for the graptolite assemblage (which includes more species than Baily originally identified) can be determined.

## DESCRIPTION OF THE GRAPTOLITE FAUNA

All the graptolites are preserved in very low relief in pyrite in dark grey mudstone. There is no evidence of any tectonic distortion.

The single slab from Locality 1 bears three specimens of *Stimulograptus halli* (Barrande, 1850) (Pl. 1, fig. 7) (misidentified by Baily as *G. priodon*), two specimens of *Streptograptus plumosus* (see Systematic Palaeontology below), a proximal end of a robust pristiograptid (probably *Pristiograptus bjerringus* (Bjerreskov, 1975)), and one specimen of *Monograptus* cf. *barrandei* sensu Bjerreskov, 1975, (Pl. 1, fig. 2).

The Tieveshilly fauna comprises six species: *M. turriculatus* (Barrande, 1850) sensu lato; *M. planus* (Barrande, 1850) (Pl. 1, fig. 1) (= Baily's *G. gradatus*); an indeterminate small diplograptid;

*S. plumosus*; and *Stimulograptus halli* and *M. tuvaensis* Obut in Kul'kov and Obut, 1973 (Pl. 1, figs 5 and 6) (both of which had been identified by Baily as *G. priodon*).

### SYSTEMATIC PALAEOLOGY

#### *Streptograptus plumosus* (Baily, 1871)

Plate 1, figs 3 and 4; Text-fig. 1

- v\* 1871 *Graptolithus plumosus*; Baily, pp. 22–23, fig. 1a–c.  
 vp 1913 *Monograptus nodifer* Törnquist; Elles and Wood, pp. 454–6, pl. 46, fig. 2a–d; text-fig. 313b (non a, c, d).  
 1937 *Streptograptus nodifer* (Törnquist); Yin, p. 297.  
 1943 *Monograptus* (*Streptograptus*) *exiguus primulus* Bouček and Přibyl, p. 7, pl. 1, fig. 4; text-fig. 3e–f.  
 1975 *Monograptus exiguus primulus* Bouček and Přibyl; Bjerreskov, p. 62, pl. 9, fig. D; text-fig. 18H.  
 1986 *Streptograptus nodifer* (Törnquist, 1881); Chen, pp. 134–6, pl. 1, figs 1–12; pl. 2, figs 1–12; pl. 3, figs 1–12.

*Type specimen.* The specimen illustrated by Baily (1871, fig. 1a–c) is no longer present within his collection. A neotype has therefore been selected: BELUM: K12275a, a proximal end with thecae up to th7 (figured herein as Pl. 1, fig. 4 and Text-fig. 1). This is from the *Monograptus turriculatus* Biozone of Tieveshilly, County Down, Northern Ireland.

*Material.* Approximately 100 specimens on slabs BELUM: K12274, 12275, 12277 and 12280. Many are fragmentary, but a few are more complete and include proximal ends.

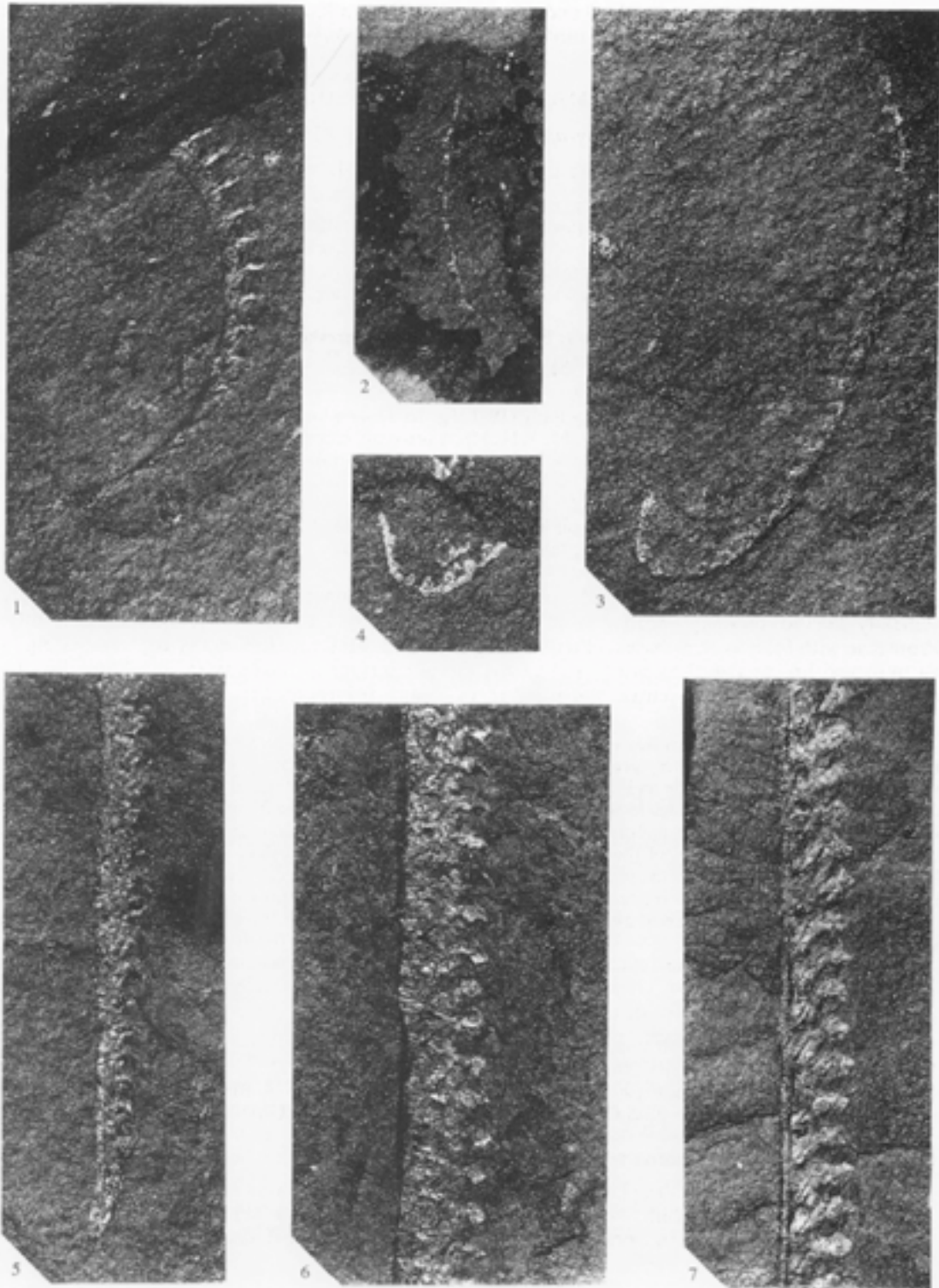
*Diagnosis.* Rhabdosome hook-shaped; straight or very gently dorsally curved proximally, strongly ventrally curved mesially, becoming more gently ventrally curved or even straight distally. Prothecae with folds at their bases, otherwise parallel-sided. Metathecae retroverted, terminating in an upturned lip causing the central part of the thecal aperture to face proximally. Laterally, the aperture is slit-like. Dorso-ventral width increases from c. 0.4 mm at th1 to c. 0.7 mm at th30.

*Description.* The rhabdosome is hook-shaped, although the degree of curvature is somewhat variable. From th1 to 2 or 3 it is straight or very gently dorsally curved: to th6–9 it is strongly ventrally curved: thereafter ventral curvature is more gentle and distally the rhabdosome may appear straight. The sicula has a length of 0.95–1.2 mm and its apex reaches to from just above the top of th1 to half way up th2. Its apertural width is 0.21–0.22 mm. The thecae are uniform throughout the rhabdosome and take up approximately half of its dorso-ventral width. The bases of the thecae are expanded laterally into prothecal folds (poorly seen on this low relief material), after which the prothecae are parallel-sided. The metathecae are retroverted, but terminate in an upturned lip which causes the central part of the thecal aperture to face proximally. Laterally the aperture is very narrow and slit-like. Thecal overlap is negligible. Details of dorso-ventral and thecal spacing are given in Table 1.

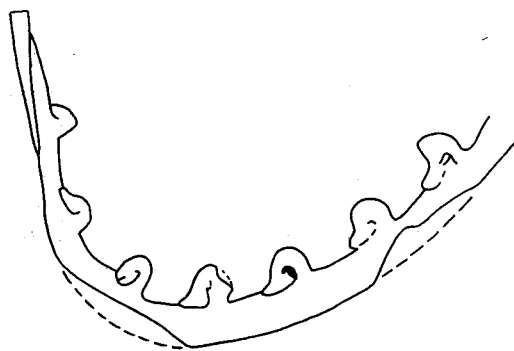
#### EXPLANATION OF PLATE 1

- Fig. 1. *Monograptus planus* (Barrande, 1850), BELUM: K12274.  
 Fig. 2. *Monograptus* cf. *barrandei* sensu Bjerreskov, 1975, BELUM: K12277.  
 Figs 3 and 4. *Streptograptus plumosus* (Baily, 1871). 3, BELUM: K12274b. 4, BELUM: K12274d, neotype.  
 Figs 5 and 6. *Monograptus tuvaensis* Obut in Kul'kov and Obut, 1973, BELUM: K12280. 5, proximal end. 6, distal end of same specimen.  
 Fig. 7. *Stimulograptus halli* (Barrande, 1850), BELUM: K12276.

All figures  $\times 5$ . All specimens, except *Stimulograptus halli* (Fig. 7), are from the middle part of the *Monograptus turriculatus* Biozone, Tieveshilly, County Down, Northern Ireland (Baily's 1871 Loc. 3); the specimen of *S. halli* is from the same horizon from the railway cutting, SE of Annacloy Bridge, County Down, Northern Ireland (Baily's 1871 Loc. 1).



LOYDELL, *Monograptus*, *Streptograptus*, *Stimulograptus*



TEXT-FIG. 1. Neotype of *Streptograptus plumosus* (Baily, 1871), BELUM: K12274d, middle *Monograptus turriculatus* Biozone, Tieveshilly, County Down, Northern Ireland,  $\times 20$ .

TABLE 1. Measurements of dorso-ventral width and thecal spacing (2TRD, Howe 1983) for *Streptograptus plumosus* (Baily, 1871), based on the ten specimens with proximal ends preserved in Baily's collection.

Theca	Width (mm)	2TRD (mm)
1	0.39-0.52	
2	0.36-0.44	1.22-1.74
3	0.38-0.48	1.30-1.52
5	0.44-0.58	1.34-1.46
10	0.51-0.56	1.30
20	0.63-0.66	1.36-1.59
30	0.70	1.60

*Horizon.* Bjerreskov (1975) records an almost identical fauna from the middle part of the *Monograptus turriculatus* Biozone (Lower Telychian, Llandovery) on Bornholm. The author has also found the same assemblage of species (except for *M. tuvaensis*) at this level in central Wales. It would seem very likely, therefore, that Baily's material is of middle *turriculatus* Biozone age.

#### THE GENUS *STREPTOGRAPTUS* YIN

The history of this genus is highly complex, involving, in particular, the misidentification of the type species by the author of the genus and the misinterpretation of thecal morphology in imperfectly preserved material.

Lapworth's (1876) incorrect synonymy of *Streptograptus plumosus* with his *Monograptus exiguus* is mentioned above. The species differ in terms of thecal morphology, rate of increase of rhabdosome width and stratigraphical horizon (*S. plumosus* does not range into the uppermost *turriculatus* Biozone and *M. crispus* Biozone, whereas in all correct references to *M. exiguus* the associated fauna is indicative of these horizons).

Far more serious, however, particularly when viewed in the light of later events, was the misidentification of *Monograptus nodifer* Törnquist, 1881 by Elles and Wood (1901-18) in their enormously influential *A Monograph of British Graptolites*. This work became the standard guide for graptolite identification over much of the world for the next fifty years and is still widely used. In their text-figures Elles and Wood illustrated more than one species as *M. nodifer*, but all 4 figures on their plate 46 are undoubtedly *S. plumosus* from the *turriculatus* Biozone of Aberystwyth, Wales. *M. nodifer* s.s. does not occur in this zone, but is characteristic in particular of the uppermost Telychian *Monoclimacis crenulata* Zone. Although rhabdosome form is occasionally similar to that seen in *S. plumosus*, thecal morphology in *M. nodifer* s.s. has been shown by Rickards *et al.* (1977, text-fig. 32) to be quite different.

Yin (1937, p. 297) erected the genus *Streptograptus*, for which he gave the following diagnosis: 'Polypary with dorsal, ventral or more frequently dorso-ventral curvature, thecae essentially uniform, being tubes with the whole apertural region coiled into a definite lobe and more or less twisted; overlap usually insignificant: thecal aperture visible from the obverse view.' He designated *Monograptus nodifer* Törnquist the type species of the genus. However, his specimens from Shihtien had been collected from a horizon also yielding *Monograptus turriculatus* and were thus clearly not *M. nodifer* s.s. Chen (pers. comm.) has stated that in China all references to *M. nodifer* are sensu Elles and Wood and not sensu Törnquist, and indeed this is borne out by examination of the Chinese graptolite literature. Mu *et al.* (1962), N.I.G.P. (1974), Wang *et al.* (1977), Wang (1978), Chen (1984) and Chen (1986) have all based their identifications upon Elles and Wood's (1901-18) description.

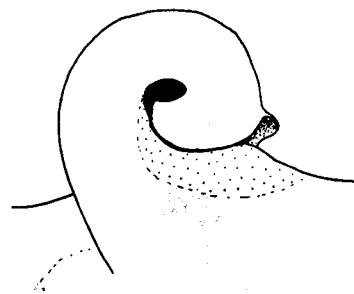
The situation was further complicated by Bouček and Přibyl (1943). They considered *Streptograptus* to be a subgenus of *Monograptus* and emended Yin's diagnosis (Bouček and Přibyl 1943, p. 3): 'Polyparium schwächer, nach innen gebogen oder s-artig gekrümmt, seltener gerade. Zellen wenigstens teilweise auf der ventralen Seite der Stöcke. Die Zellenspitzen nach innen eingerollt.' Unfortunately, the imperfectly preserved material on which they based their diagnosis resulted in a misinterpretation of the thecal apertural structure. In addition, they created a subspecies of *Monograptus exiguus* which they named *Streptograptus exiguus primulus*. This is a junior synonym of *M. plumosus* and is thus, therefore, identical to Elles and Wood's *M. nodifer*. It is accordingly surprising, as Strachan (1971, p. 54) points out, that Bouček and Přibyl placed Elles and Wood's *M. nodifer* into synonymy with *M. nodifer* sensu Törnquist (i.e. sensu stricto).

*Streptograptus* has subsequently been widely used outside Britain and North America, either as a genus or subgenus, for a wide variety of species having or appearing to have lobed, coiled or retroverted metathecae. These undoubtedly belong to a number of different phyletic groupings.

In Britain a very conservative attitude has quite rightly been followed with regard to the erection and use of monograptid genera and subgenera. Bulman and Rickards (1970, p. V150) state: 'The main objection to most such genera is that their erection was not accompanied by any addition to our imperfect knowledge of their morphology and phylogeny; their context is ill-defined and their application correspondingly uncertain.' This has been very much the case with *Streptograptus*. However, the time would now seem to be ripe for a re-evaluation of the situation, particularly in the light of the redescription of Baily's collection above and the description by Chen (1986) of chemically isolated specimens of *S. plumosus* (refigured herein as Text-fig. 2) originally identified by him as *Streptograptus nodifer* but now (Chen pers. comm.) recognized as *S. plumosus*.

As Yin clearly based his generic diagnosis for *Streptograptus* on *Monograptus plumosus* and not on *Monograptus nodifer* s.s., *G. plumosus* should be made the type species of the genus *Streptograptus* Yin, 1937, and the generic diagnosis should, on the basis of both Baily's (1871) and Chen's (1986) material, be emended. I propose to submit an application to the International Commission on Zoological Nomenclature to designate the nominal type species *Graptolithus plumosus* Baily, 1871 as the type species of *Streptograptus* Yin, 1937 since the original type was based on misidentified material.

TEXT-FIG. 2. Metathecal morphology of *Streptograptus plumosus* (Baily, 1871) (modified from Chen 1986, text-fig. 4) in a chemically isolated specimen,  $\times 75$ .



*Emended generic diagnosis.* Rhabdosome ventrally, dorsally or dorsoventrally curved, rarely straight. Metathecae retroverted, terminating in an upturned lip causing the central part of the thecal aperture to face proximally. Laterally the aperture is slit-like. The bases of the prothecae are usually expanded into prothecal folds. Thecal overlap insignificant. Sacula small.

This emended diagnosis would result in the genus including the following species: *Graptolithus plumosus* Baily, 1871; *Monograptus pseudoruncinatus* Bjerreskov, 1975; *Streptograptus filiformis* Chen, 1984; *M. petilus* Hutt, 1975; *M. ansulosus* Törnquist, 1892; *M. runcinatus* sensu Perner, 1897; *Monoclimacis labialis* Chen, 1984 (= *Monograptus exiguus* A of Bjerreskov, 1975); *S. linearis* Chen, 1984; *Pernerograptus sidiachenkoi* Obut and Sobolevskaya, 1965; and a number of as yet unnamed species which have been compared to *Monograptus barrandei* sensu Elles and Wood (e.g. Hutt *et al.* 1970; Bjerreskov 1975).

*M. (S.) pseudobecki* Bouček and Přibyl, 1943 and *M. exiguus* Lapworth, 1876 (see Loydell 1989) probably also belong in this genus, but examination of well-preserved material will be necessary before this can be confirmed. It is worth noting here that the specimens described by Hutt *et al.* (1970) and by Bulman and Rickards (1970) as *M. exiguus* are not this species but are an as yet unnamed species with apertures laterally expanded and different to those of *Streptograptus* as defined herein. The objections of Bulman and Rickards to the genus, based on this material, are thus unfounded.

*Acknowledgements.* The author is very grateful to Mr John Wilson of the Ulster Museum, Belfast for arranging the loan of the specimens and for much useful information. Dr A. G. Sleeman of the Geological Survey of Ireland initially suggested to me that Baily's graptolites might be housed there. Useful discussions were had with Prof. Chen Xu, whilst I was in Nanjing in November, 1988 regarding the *Streptograptus* problem. He also made his collections available for study. Petr Štorch kindly sent me material of *M. (S.) exiguus primulus*. Dr P. D. Taylor and an anonymous referee made useful criticisms of the original manuscript. Dr J. D. D. Smith gave advice on ICZN matters. Research for this paper was carried out while in the tenure of a University of Wales Postgraduate Studentship.

#### REFERENCES

- BAILY, W. H. 1871. Palaeontological remarks. 22–23. In TRAILL, W. A. and EGAN, F. W. *Explanatory memoir to accompany Sheets 49, 50 and part of 61 of the maps of the Geological Survey of Ireland including the country around Downpatrick, and the shores of Dundrum Bay and Strangford Lough, County of Down.* Alexander Thom, Dublin and London, 71 pp.
- BARRANDE, J. 1850. *Graptolites de Bohême.* Prague, vi + 74 pp., pls 1–4.
- BJERRESKOV, M. 1975. Llandoveryan and Wenlockian graptolites from Bornholm. *Fossils and Strata*, **8**, 1–94, pls 1–13.
- BOUČEK, B. and PŘIBYL, A. 1943. Über böhmische Monograpthen aus der Untergattung *Streptograptus* Yin. *Mitteilungen der Tschechischen Akademie der Wissenschaften*, **52**, 1–23, pls 1–3.
- BULMAN, O. M. B. and RICKARDS, R. B. 1970. Classification of the graptolite family Monograptidae Lapworth, 1873. V149–157. In TEICHERT, C. (ed.). *Treatise on invertebrate paleontology. Part V. Graptolithina, with sections on Enteropneusta and Pterobranchia.* Geological Society of America and University of Kansas Press, Boulder, Colorado and Lawrence, Kansas, xxxii + 163 pp.
- CHEN XU 1984. Silurian graptolites from Southern Shaanxi and Northern Sichuan with special reference to the classification of Monograptidae. *Palaeontologica Sinica, New Series B*, **166**, No. 20, 1–102, pls 1–19.
- 1986. On *Streptograptus* and its paleoautecology. *Selected papers from the 13th and 14th Annual Conventions of the Palaeontological Society of China*, 115–137, pls 1–3.
- ELLES, G. L. and WOOD, E. M. R. 1901–18. A monograph of British graptolites. Edited by C. Lapworth. *Monograph of the Palaeontographical Society*, i–clxxi + a–m + 539 pp., 52 pls.
- HOWE, M. P. A. 1983. Measurement of thecal spacing in graptolites. *Geological Magazine*, **120**, 635–638.
- HUTT, J. E. 1975. The Llandovery graptolites of the English Lake District. Part 2. *Monograph of the Palaeontographical Society*, 57–137, pls 11–26.
- RICKARDS, R. B. and SKEVINGTON, D. 1970. Isolated Silurian graptolites from the Bollerup and Klubbudden stages of Dalarna, Sweden. *Geologica et Palaeontologica*, **4**, 1–23.

- KUL'KOV, N. P. and OBUT, A. M. 1973. New finds of Lower Silurian graptolites and Chitinozoa in Tuva. *Doklady of the Academy of Sciences U.S.S.R. Earth Sciences Sections*, **209**, 226–30.
- LAPWORTH, C. 1876. On Scottish Monograptidae. *Geological Magazine*, (2), **3**, 308–321, 350–360, 499–507, 544–552, pls 10–13, 20.
- 1877. On the graptolites of County Down. *Proceedings of the Belfast Naturalists' Field Club*, Appendix, **1876–7**, 125–147, pls 5–7.
- LOYDELL, D. K. 1989. *Monograptus exiguus* (Graptolithina): proposed conservation of accepted usage by the citation of Lapworth (1876) as author. *Bulletin of Zoological Nomenclature*, **46**, 33–34.
- MU, A. T., LI JI-JIN, GE MEI-YU and YIN JI-XIANG 1962. Graptolite fauna from the Chilian Mountain. *Geology of Chilianshan*, **4**, 1–168.
- NANJING INSTITUTE OF GEOLOGY AND PALAEOLOGY, ACADEMIA SINICA (NIGP) 1974. *Handbook of stratigraphy and palaeontology of Southwest China*. Science Press, Beijing, 454 pp., 202 pls.
- NICHOLSON, H. A. 1868. On the graptolites of the Coniston Flags; with notes on British species of the genus *Graptolites*. *Quarterly Journal of the Geological Society of London*, **24**, 521–545, pls 19–20.
- OBUT, A. M., SOBOLEVSKAYA, R. F. and BONDAREV, R. F. 1965. Graptolitit silura Taymira. *Akademii Nauk SSSR, Sibirskoe Otdelenie, Institut Geologii Geofiziki. Ministerstvo Geologii SSSR, Nauchno-issledovatelskie Institut Geologii Arktiki*, 1–120, pls 1–19. [In Russian].
- PERNER, J. 1897. *Etudes sur les Graptolites de Bohême. IIIième Partie. Monographie des Graptolites de l'Etage E. Section a*, 1–25, pls 9–13, Prague.
- RICKARDS, R. B., HUTT, J. E. and BERRY, W. B. N. 1977. Evolution of the Silurian and Devonian Graptoloids. *Bulletin of the British Museum (Natural History)*, (Geology), **28**, 1–120, pls 1–6.
- STRACHAN, I. 1971. A synoptic supplement to 'A monograph of British graptolites by Miss G. L. Elles and Miss E. M. R. Wood'. *Monograph of the Palaeontographical Society*, 130 pp.
- TÖRNQUIST, S. L. 1881. Om några graptolitarter från Dalarna. *Geologiska Föreningens i Stockholm Förhandlingar*, **5**, 434–445, pl. 17.
- 1892. Undersökningar öfver Siljansområdets graptoliter. II. *Lunds Universitets Årsskrifter*, **28**, 1–47, pls 1–3.
- WANG XIAO-FENG 1978. A restudy of the graptolites and the age of the Wentoushan Formation from Liantan, Kwangtung. *Acta Geologica Sinica*, **4**, 303–17, pls 1–4.
- JIN YU-QIN, WU ZHAO-TONG, FU HAN-YIN, LI ZHO-CHONG and MA GUO-GAN 1977. *A palaeontological atlas of central-south China*. Geological Publishing House, Beijing, 470 pp., 116 pls.
- YIN, T. H. 1937. Brief description of the Ordovician and Silurian fossils from Shihtien. *Bulletin of the Geological Society of China*, **16**, 281–302, pls 1–2.

DAVID K. LOYDELL

Institute of Earth Studies  
 University College of Wales, Aberystwyth  
 Dyfed, SY23 3DB, UK

Typescript received 15 October 1989

Revised typescript received 19 February 1990