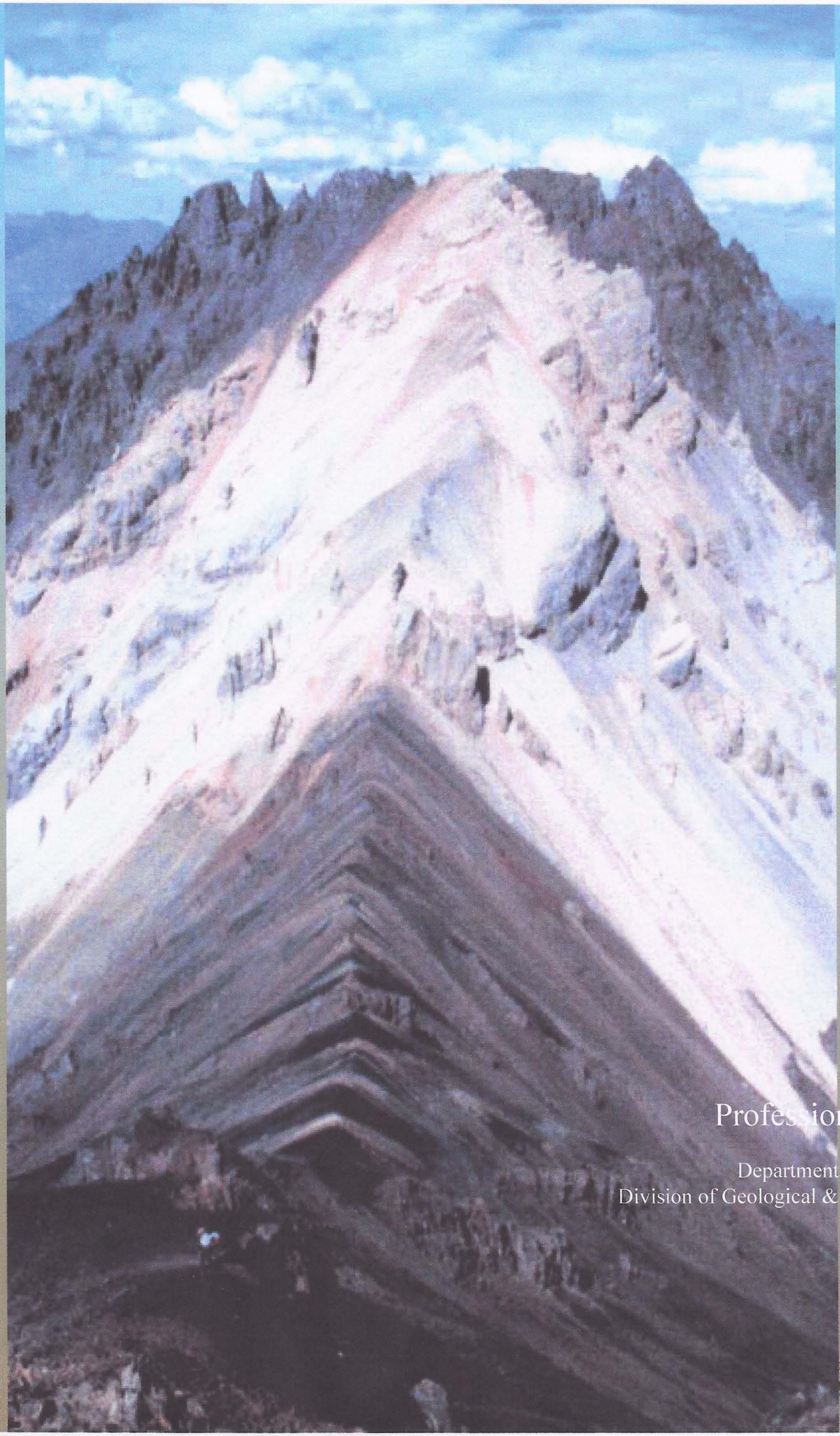

Short Notes on Alaska Geology 1999

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Front cover photo: *Marine sedimentary rocks of the Nutzotin Mountains sequence (black strata in the foreground) in fault contact with the Wrangellia composite terrane in the Nutzotin Mountains, eastern Alaska Range. White strata in the midground is the Nizina Limestone. Gray strata in the backgroumd at the ridge crest is the Nikolai Greenstone. For scale, a person with a blue shirt can be seen on the ridgeline. View is to the north. (Photo by Jeffrey D. Manuszak)*

Back cover photo (top): *View eastward along the west fork of Atigun River of prominent anticlinal hinge in the upper Kanayut Conglomerate (Lower Mississippian to Upper Devonian) within the Toyuk thrust zone, a major thrust zone in the central Brooks Range. See Chmielowski and others (this volume). "Duplex structure and Paleocene displacement of the Toyuk thrust zone near the Dalton Highway, north-central Brooks Range." (Photo by Reia M. Chmielowski)*

Back cover photo (bottom): *Excavator and bulldozer trench on Lewis Ridge, Donlin Creek property, southwestern Alaska. Trench is approximately 1,300 feet long and part of a 3.7-mile trenching program by Placer Dome Exploration Inc. during the 1997 and 1998 field seasons. Light-colored rocks are igneous dikes and sills, and darker rocks are Kuskokwim Group shale and graywacke. Note the core drill rig in the background to the right of center. (Photo by David J. Szumigala)*

LATE DEVONIAN (EARLY FRASNIAN) CONODONTS FROM DENALI NATIONAL PARK, ALASKA

Norman M. Savage,[1] Robert B. Blodgett,[2] and Phil F. Brease[3]

INTRODUCTION

A brachiopod-bearing sample, collected in 1980 by Dr. Norman Silberling from dark gray, nodular argillaceous limestone beds in the upper part of an undated and unnamed shale unit in Denali National Park, was processed for conodonts by Savage but yielded only a few broken specimens of general Middle to Late Devonian aspect. New samples were collected in 1994 by Csejtey (Csejtey and others, 1996; Dumoulin and others, 1998), and by Blodgett and Brease from the site (locality 2 herein) and a nearby site (locality 1 herein) at the base of an overlying, unnamed massive limestone unit. These two localities, each yielding conodonts and brachiopods, are located on the north side of a prominent saddle in NE¼ NE¼ sec. 30, T.17 N., R.12 W., Healy B-6 Quadrangle (fig. 1).

At locality 1, the overlying limestone unit is at the base of a prominent, south-facing limestone cliff, about 18.3 m (60 ft) below the ridge crest. Conodonts from the upper limestone unit include *Playfordia* aff. *P. primitiva* (Bischoff and Ziegler, 1957), *Polygnathus* cf. *P. robustus* Klapper and Lane, 1985, *Polygnathus webbi* Stauffer, 1938, *Ancyrodella pristina* Khalymbadzha and Chernysheva, 1970, *Mesotaxis* cf. *M. falsiovalis* Sandberg, Ziegler, and Bultynck, 1989, *Icriodus symmetricus* Branson and Mehl, 1934, and *Mehlina* sp. The interesting feature of the conodont fauna is the abundance of *Playfordia* aff. *P. primitiva*, which is the most common species present. The presence of this species, and *Mesotaxis* cf. *M. falsiovalis*, indicates the *transitans* to *punctata* Zones of Ziegler and Sandberg

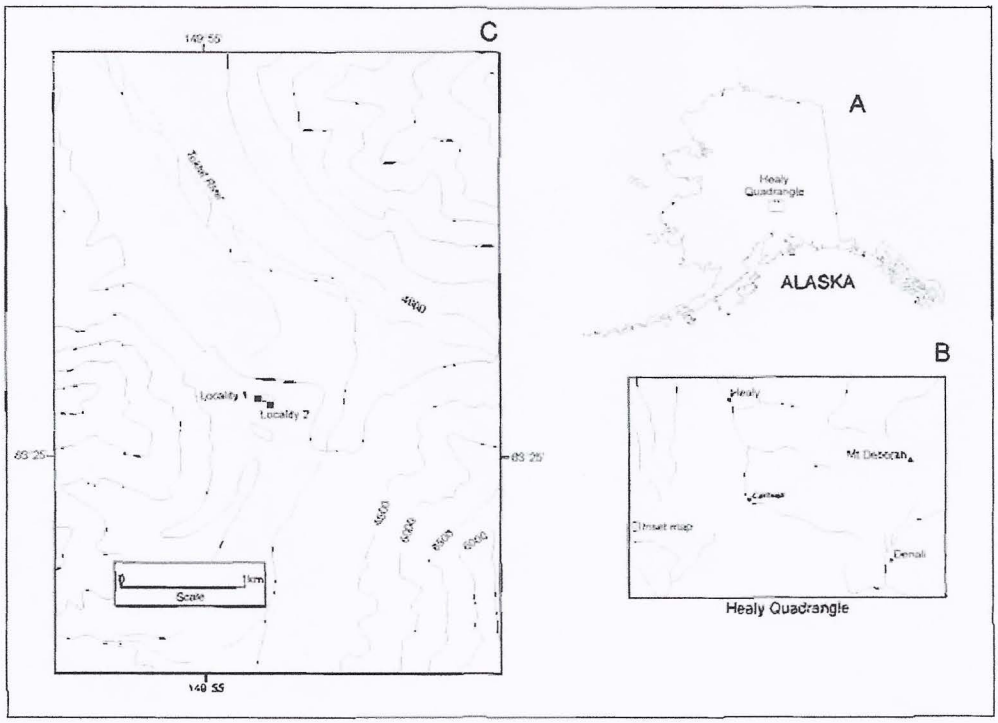

Figure 1. *Locality maps for the Toklat River conodont samples. (A) Location of Healy 1:250,000-scale quadrangle in southcentral Alaska. (B) Location of part of Healy B-6 15-minute quadrangle. (C) Location of sites 1 and 2 near Toklat River.*

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(1990), and an early Frasnian age. Brachiopods include *Hypothyridina* sp., *Variatrypa (Radiatrypa)* sp., *Spinatrypa (Exatrypa)* sp., and *Eleutherokomma* sp. Rugose corals are also common, and include both colonial forms (notably phillipsastreids and undetermined fasciculate types), as well as solitary rugosans. Conodonts from locality 2 were recovered from nodular, argillaceous limestone beds in the uppermost part of the underlying thick unnamed shale unit. These limestone beds represent a thin transitional interval with the overlying unit. Conodonts from these beds include those listed above from the upper unit. Brachiopods from these same beds include *Schizophoria* sp. *Eleutherokomma* sp. and *Ladogioides pax*.

The massive limestone unit and underlying shale unit are widespread in the area and share strong lithologic similarities with similar Frasnian sections recognized near the base of the Mystic sequence of west-central Alaska, notably in the Shellabarger Pass area, Talkeetna C-6 Quadrangle, and in the Lime Hills D-4 Quadrangle (Blodgett and Gilbert, 1992). These close lithologic and faunal ties suggest that the rocks described here form an eastward extension of the Farewell terrane of Decker and others (1994). The areal extent of the Farewell terrane is shown in Blodgett (1998, fig. 2), showing the component subterranes of the Farewell terrane as well as the location of Shellabarger Pass.

The Devonian fossils reported here are of significance in providing badly needed timelines within the weakly metamorphosed sediments exposed along the north side of the central Alaska Range within Denali National Park. Very few Paleozoic age fossil localities were known in this area previously. It is of further interest in terms of biotic diversity, since all Devonian collections from this part of the Park before the 1990s consisted of poorly preserved corals. In addition, the fossils reported here provide important evidence for more correct determination of the stratigraphic framework for this region. The Frasnian age determination and associated brachiopod fauna provide evidence for correlation of these beds with the Mystic sequence (or "subterrane") exposed further to the southwest in the McGrath, Talkeetna, and Lime Hills quadrangles. Prior to this study, rocks from this part of the Park had been assigned to the Dillinger terrane by Jones and others (1981) and later to the Nixon Fork terrane by Mullen and Csejtey (1986) and Csejtey and others (1992). On the basis of our recently acquired fossil data and regional field studies conducted in 1994, we now think the assignment of Dillinger "terrane" is incorrect (it is present and underlies the Mystic strata reported here), and that the assignment of Nixon Fork terrane affinities is also incorrect (no shallow-water carbonate platform equivalent strata of Ordovician–early Middle Devonian age are recognized in the region).

The Mystic subterrane was originally defined by Jones and others (1981) as a separate tectonostratigraphic entity of full terrane rank. More recently, Decker and others (1994) recognized that the Mystic, as well as the Nixon Fork and Dillinger terranes, were genetically related and all were reduced in rank to subterranes of a larger terrane, termed the Farewell terrane. Gilbert and Bundtzen (1984) considered the Dillinger and Mystic terranes, each of whose type sections were close to one another, to represent a single stratigraphic succession of Paleozoic to Triassic age, preferring to apply the term "sequence" to each. They considered the underlying Dillinger sequence to be a Cambrian to Lower Devonian deep-water succession that is followed depositionally by the Mystic sequence, which consists of laterally variable Devonian to Triassic (?) shallow-water to nonmarine sedimentary rocks and intrusive and extrusive mafic and ultramafic rocks. The close stratigraphic relationship between the Dillinger and Mystic sequences (or subterranes) was supported by stratigraphic studies by Blodgett and Gilbert (1992) to the southwest in the Lime Hills quadrangle.

SYSTEMATIC PALEONTOLOGY

Genus *ANCYRODELLA* Ulrich and Bassler, 1926

ANCYRODELLA PRISTINA Khalymbadzha and Chernysheva, 1970

Figure 2.7

Discussion. The single specimen recovered has an asymmetrical platform outline and few but large nodes.

Material. 1 Pa element from locality 1.

Genus *MEHLINA* Youngquist, 1945

MEHLINA sp.

Figure 2.9

Discussion. These Pa specimens have the lateral profile of *Ozarkodina* but lack the characteristic expanded platform margins and are assigned to *Mehlina*.

Material. 2 Pa elements from locality 2.

Genus *POLYGNATHUS* Hinde, 1879

POLYGNATHUS cf. *P. ROBUSTUS* Klapper and Lane, 1985

Figures 2.5–2.6

Discussion. This specimen differs from typical Pa elements of *P. robustus* in having a convex inner platform margin and smaller anterior denticles on the free blade. It bears some resemblance to *P. ljaschenkoi* Kuzmin, 1995, but has a more convex inner platform margin than that species also.

Material. 1 Pa element from locality 1.

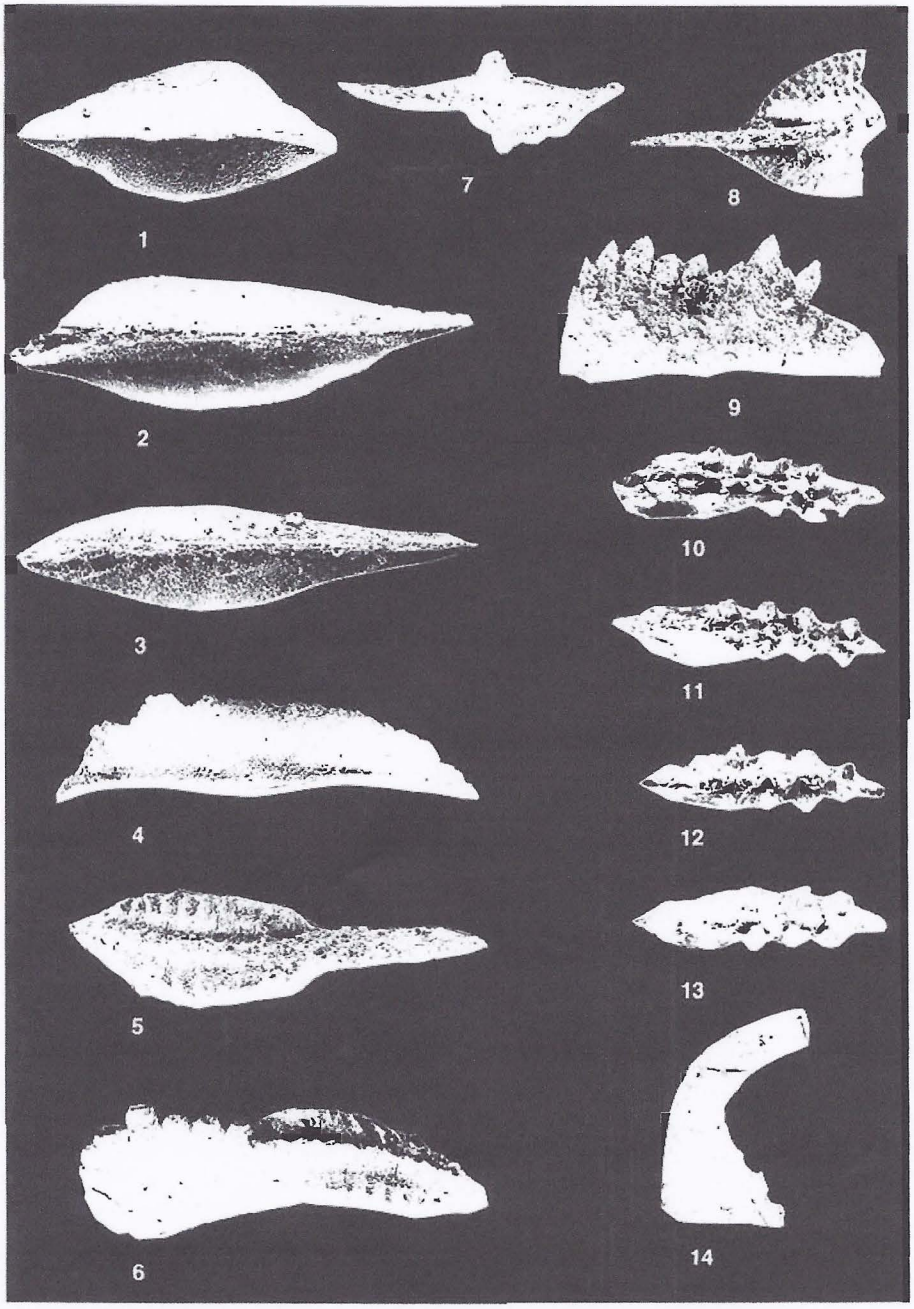

Figure 2. *(1–4).* Playfordia *aff.* P. primitiva *(Bischoff and Ziegler, 1957). (1) Upper view of USNM 481705 from locality 1. (2) Upper view of USNM 481706 from locality 2. (3) Upper view of USNM 481707 from locality 2. (4) Lateral view of USNM 481708 from locality 1, all x 70. (5–6)* Polygnathus *aff.* P. robustus *Klapper and Lane, 1985. Upper and oblique-lateral views of Pa element USNM 471709 from locality 1, x 70. (7)* Ancyrodella pristina *Khalymbadzha and Chernysheva, 1970. Upper view of Pa element USNM 471710 from locality 1, x 70. (8)* Mesotaxis *cf.* M. falsiovalis *Sandberg, Ziegler and Bultynck, 1989. Upper view of broken Pa element USNM 471711 from locality 2, x 70. (9)* Mehlina *sp. lateral view of Pa element USNM 471712 from locality 2, x 70. (10–11)* Icriodus symmetricus *Branson and Mehl, 1934. Upper views of Pa elements USNM 471713-471714, both from locality 1, x 70. (12–13) Possibly juveniles of* Icriodus symmetricus *Branson and Mehl, 1934, or mature specimens of* I. praealternatus *Sandberg, Ziegler, and Dreesen, 1992, both from locality 1, x 70. (14)* Belodella *sp. USNM 471717 from locality 1, x 70*

Genus *ICRIODUS* Branson and Mehl, 1938
ICRIODUS SYMMETRICUS Branson and Mehl, 1934
Figures 2.10–2.13

Discussion. These Denali specimens are more slender than characteristic specimens of *I. subterminus* Youngquist, 1945, and also differ in having a less expanded posterior platform. They are unlike typical specimens of *I. symmetricus* in having lateral denticles that almost alternate laterally with the median denticles, although Dr. Charles Sandberg (written commun., April 1999), believes that the specimens in Figs 2.10–11 are unquestionably *I. symmetricus*, and those in Figs.2.12–13 look like juveniles of *I. symmetricus* or mature specimens of *I. praealternatus* Sandberg, Ziegler and Dreesen, 1992.

Material. 8 Pa elements; 5 from locality 1, and 3 from locality 2.

Genus *MESOTAXIS* Klapper and Philip, 1972
MESOTAXIS cf. *M. FALSIOVALIS* Sandberg, Ziegler and Bultynck, 1989
Figure 2.8

Discussion. The only specimen is broken but enough is present to suggest the species *Mesotaxis falsiovalis*.

Material. 1 Pa element from locality 2.

Genus *PLAYFORDIA* Glenister and Klapper, 1966
PLAYFORDIA aff. *P. PRIMITIVA* (Bischoff and Ziegler, 1957)
Figures 2.1–2.4

Discussion. The specimens of *Playfordia* aff *P. primitiva* differ from typical members of the species in having less projecting denticles at the posterior end, as pointed out by Dr. Charles Sandberg (written commun., April 1999). The presence of this species, even in its somewhat different form, helps considerably in determining the age of the collections because it is known elsewhere only from the Late *falsiovalis* to *transitans* Zones of Ziegler and Sandberg (1990). Dr. Sandberg has commented (written commun., April 1999) that it has never been reported from the *falsiovalis* Zones. However, the interpretation by the senior author of ongoing work in the Timan Basin, Russia, is that *Playfordia primitiva* occurs there in the Late *falsiovalis* Zone about 2 m (6.5 ft) below the first occurrence of *Palmatolepis transitans*.

Material. 23 Pa elements; 9 from locality 1, and 14 from locality 2.

Genus *BELODELLA* Ethington, 1959
BELODELLA sp.
Figure 2.14

Discussion. The single specimen appears to belong to a *Belodella* apparatus. Devonian species of *Belodella* usually include apparatus elements that bear numerous fine denticles but our small collections do not include any of these elements.

Material. 1 element from locality 1.

ACKNOWLEDGMENTS

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