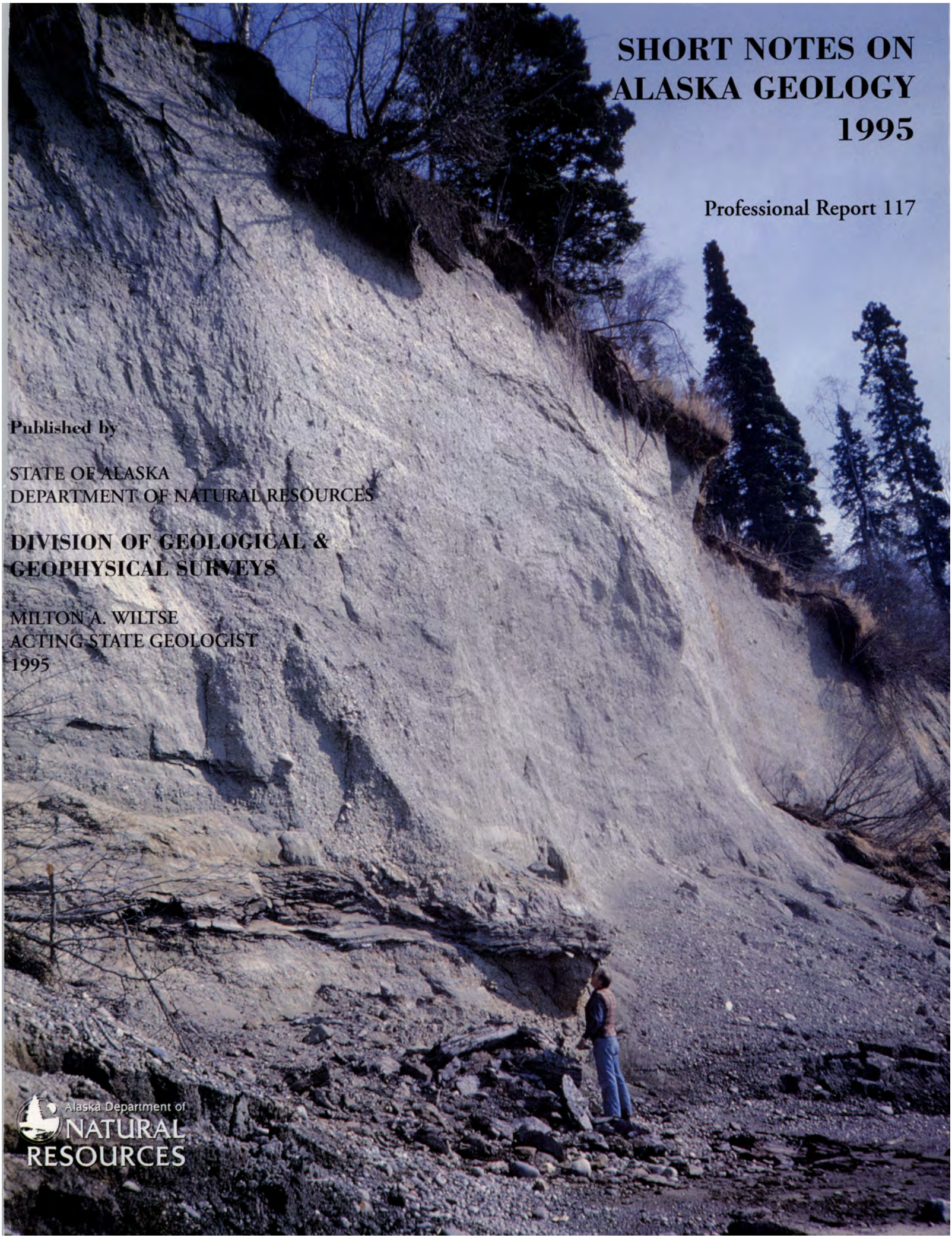
SHORT NOTES ON ALASKA GEOLOGY 1995

Professional Report 117



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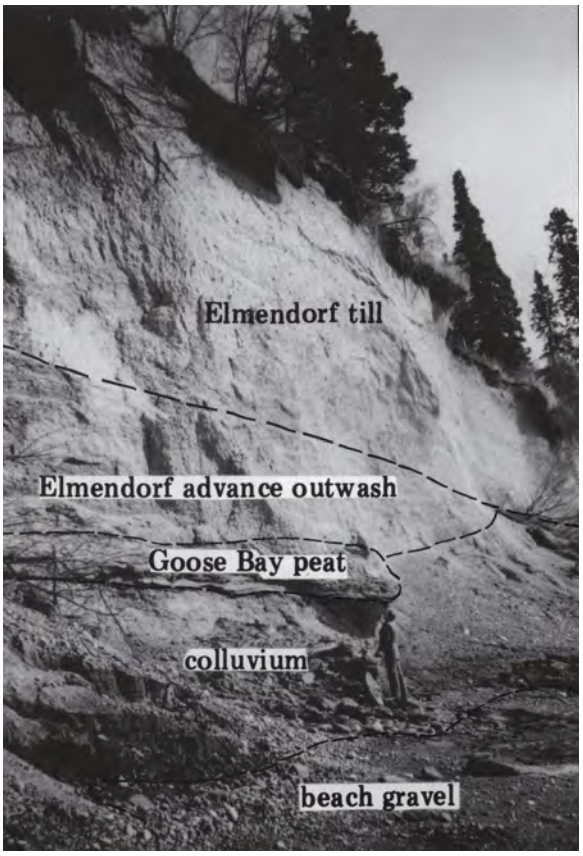

Front cover: *Exposure of till and outwash of the Elmendorf glacial advance at Goose Bay, west side of Knik Arm. (See paper by Reger and others, page 33.) Geologist Richard Reger examines Goose Bay peat of mid-Pleistocene age. Photograph by R.A. Combellick.*

Fairbanks, Alaska
1995

A NEW SPECIES OF THE CONODONT *AMYDROTAXIS* FROM THE EARLY DEVONIAN OF SOUTHWESTERN ALASKA

by
Norman M. Savage[1] and Robert B. Blodgett[2]

INTRODUCTION

During the summer of 1993 the authors worked with geologists from the Alaska Division of Geological & Geophysical Surveys in several areas of southwestern Alaska and had the benefit of helicopter and other support that permitted the collection of numerous paleontologic samples. Some of these samples have yielded conodonts and other fossils. Two of the samples that yielded conodonts are from Hill 2001 in the Lime Hills D-5 Quadrangle (figs. 1A–C) and are of interest because the specimens, although few in number, appear to represent the full apparatus of the youngest known species of the genus *Amydrotaxis*.

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OCCURRENCE AND AGE OF COLLECTIONS

The conodonts described here are from an unnamed lithologic unit consisting of Emsian-age (late Early Devonian) limestone exposed as scattered, isolated exposures in the SE¼SW¼ sec. 15, T. 20 N., R. 29 W. (Seward Meridian) of the Lime Hills D-5 Quadrangle. No detailed geologic map has yet been issued for this part of the Lime Hills D-5 Quadrangle. The strata have been strongly folded and hence no precise measurement has been made of their total thickness, but they are estimated to be no less than 50 m thick. Various types of lithologies are present, vary-

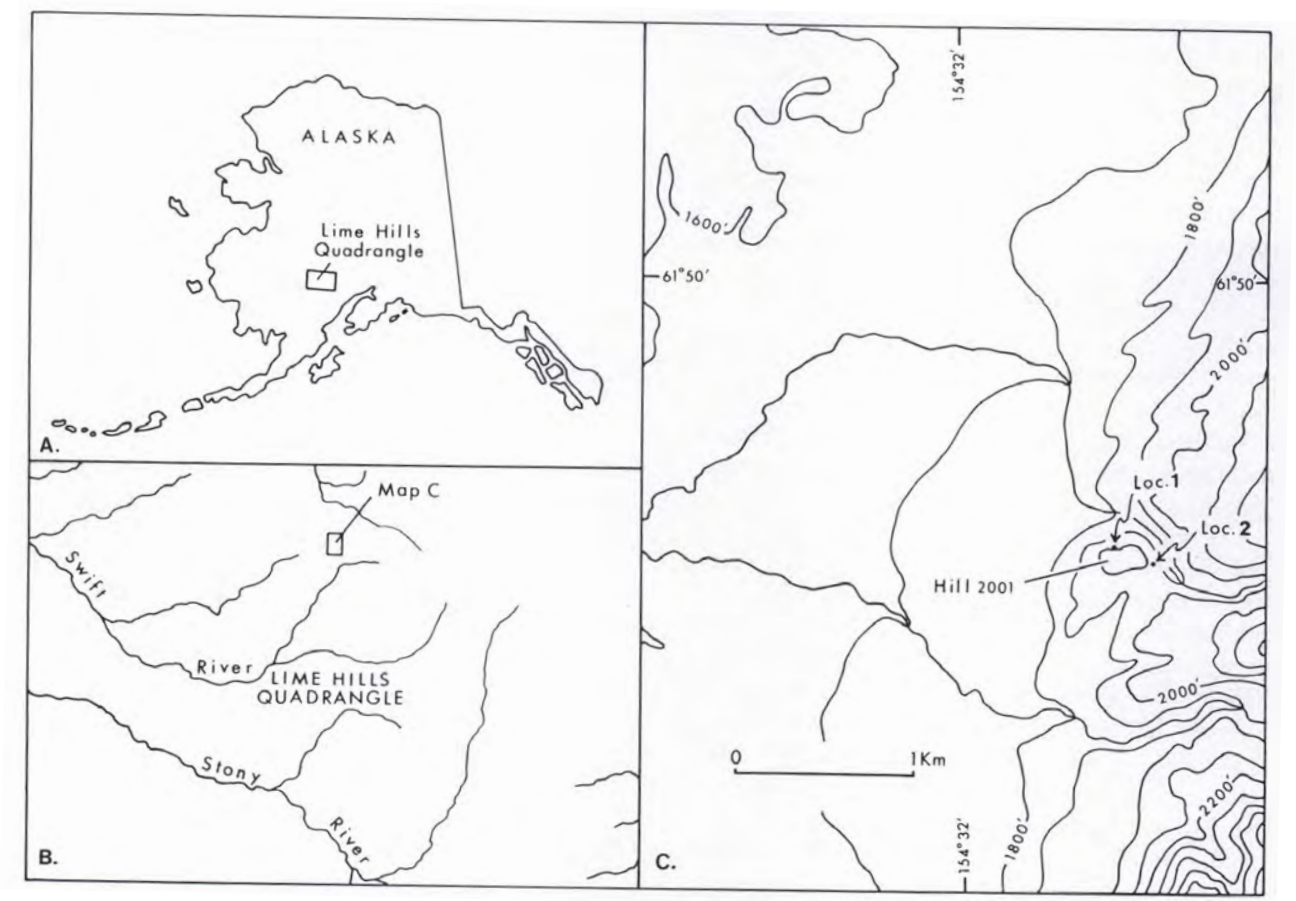

Figure 1. *Maps showing (A) Alaska and the position of the Lime Hills Quadrangle; (B) Lime Hills Quadrangle and the location of the sample area; (C) sample area in the D-15 15-minute quadrangle and the sites of localities 1 and 2.*

ing from lime mudstone to lime grainstone. The latter is composed of encrinite with abundant two-holed crinoid ossicles. The strata are typically medium to dark gray on fresh surfaces. Brachiopods, corals, the stick-like stromatoporoid *Amphipora* and large ostracodes are common. This unit locally forms the base of the Mystic sequence (Blodgett and Gilbert, 1992; Gilbert and Bundtzen, 1984), which overlies the Cambrian to Lower Devonian deep-water Dillinger sequence. The two localities from which the conodont-bearing samples were collected are described below.

Locality 1(93ABd42) (fig. 1C) is a small limestone exposure, approximately 5 m thick, on the north-facing slope just below the ridge crest and summit of Hill 2001, situated at lat 61°49'10"N., long 154°31'01"W. The rock is a dark-gray lime mudstone to wackestone and appears to be a continuous sequence of beds. Megafossils consist mostly of dendroid tabulate corals, stromatoporoids, and two-holed crinoid columnals. The conodont sample was taken from the middle of the outcrop in an argillaceous limestone that bears frequent athyrid brachiopods.

Locality 2 (93ABd44) (fig. 1C) is talus rubble at the base of a massive cliff at the southeast slope of Hill 2001. The cliff is composed of strata that dip steeply to the northeast. The talus appears to be derived from the exposure which is no more than 7 m thick. Locality 2 is in sec. 15, T. 20N., R. 29 W., Lime Hills D-5 Quadrangle. It is 250 m north of the border separating sections 15 and 22, and is on the border separating the SW¼ from the SE¼ sec. 15 at lat 61°49'08"N., long 154°30'46"W. Although the sample was collected from talus, the thickness of the unit, the lithologies, and the megafossils, including the two-holed crinoid columnals, are similar to those at locality 1. The cliff is exposed intermittently between the two localities, so there is good reason to consider that the two samples come from horizons within the same 5–7-m-thick unit.

The new species *Amydrotaxis murphyi*, described below, is represented by only a few specimens of the constituent elements, but is sufficiently distinctive and stratigraphically higher than other species that formal naming seems warranted. Its occurrence with *Polygnathus serotinus*, a conodont that is characteristic of the late Emsian *serotinus* Zone, and with megafossils considered to be of late Emsian to early Eifelian age, places it well above the early Lochkovian to late Pragian species of *Amydrotaxis* previously described from Devonian deposits. This small conodont fauna is therefore of interest to Alaskan bio-stratigraphers in that *Polygnathus serotinus* establishes the age of this horizon, and is of interest to conodont workers in greatly extending the range of *Amydrotaxis* and indicating the morphologic characteristics of this late form of the genus.

SYSTEMATIC PALEONTOLOGY

In this paper the multi-element notation and suprageneric classification used are those of Sweet (1988).

Family SPATHOGNATHODONTIDAE Hass, 1959
Genus AMYDROTAXIS Klapper and Murphy, 1980

Type species.—Amydrotaxis johnsoni Klapper, 1969.

Discussion

Seven species of Amydrotaxis have been described previously and appear to be particularly characteristic of the early Lower Devonian of western and northern North America and eastern Australia. The genus seems to have a seximembrate apparatus. The Pa element is carminate and typically has one or more high anterior denticles. The platform is usually asymmetrical and restricted to the posterior half of the unit, with one lobe often prominent and extending at a right angle of even slightly anterior of the axis of the blade. The Pb element is angulate, has a prominent reclined main cusp, a few smaller anterior denticles and just one or two much lower posterior denticles. The M element is digyrate and often has a slightly reclined main cusp with several closely placed denticles on the anterior process and about two on the posterior process. The Sa element is alate to palmate with three or four fused denticles situated symmetrically either side of a flattened main cusp. The Sb element is bipennate and generally has a large laterally compressed main cusp and subequal anterior and posterior processes, each bearing laterally compressed posteriorly reclined fused denticles. The Sc element is typically digyrate and curved, with a high reclined main cusp, two or three slender anterior denticles successively increasing in height toward the main cusp, and two or three posterior denticles that tend to increase in height toward the posterior tip of the element. It is the apparatus as a whole that characterizes *Amydrotaxis*, for in some cases the Pa element viewed in isolation might be confused with the Pa element of *Ozarkodina* or *Pandorinellina*. However, the Pa elements of the known species of the genus differ from each other sufficiently to be distinctive.

AMYDROTAXIS MURPHYI n. sp.
Figures 2.1–17

Material

A total of 20 specimens from locality 1, comprising 8 Pa elements, 3 Pb elements, 2 M elements, 4 Sa elements, 1 Sb element, and 2 Sc elements; and a total of 4 specimens from locality 2 comprising 3 Pa elements and 1 Sa element. Figured Pa element USNM 481676 from locality 1 is the holotype.

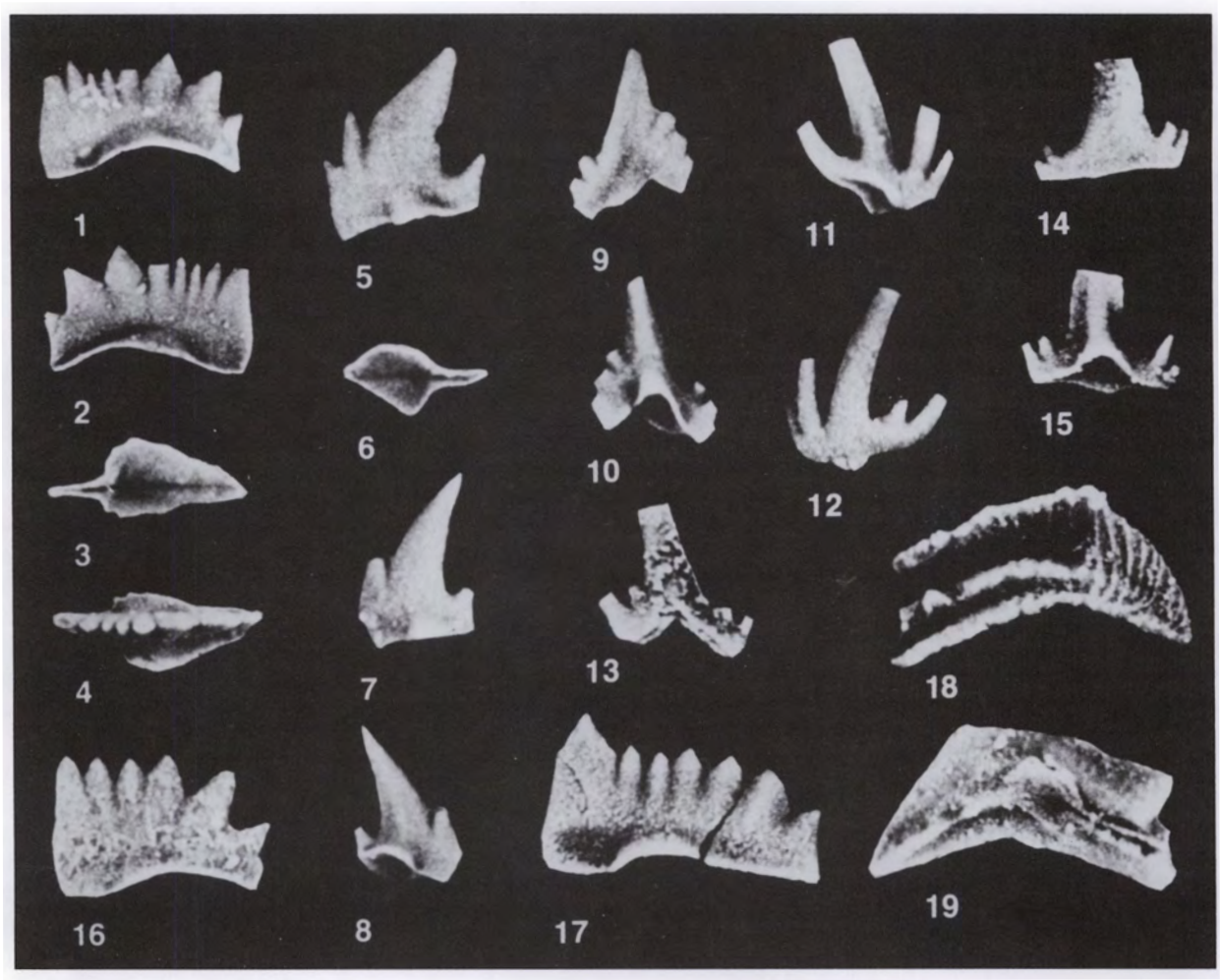

Figure 2. *(1-17)* Amydrotaxis murphyi *n. sp., (1-4) lateral, lower, and upper views of Pa element USNM 481676 (holotype) from locality 1; (5-6) lateral and lower views of Pb element USNM 481677 from locality 1; (7-8) lateral and lower-lateral views of Pb element USNM 481678 from locality 1; (9-10) inner and outer views of M element USNM 481679 from locality 1; (11-12) inner and outer views of Sc element USNM 481680 from locality 1; (13) inner view of Sb element USNM 481681 from locality 1; (14-15) anterior and posterior views of Sa element USNM 481682 from locality 1; (16) lateral view of Pa element USNM 481683 from locality 1; (17) lateral view of Pa element USNM 481684 from locality 2. (18-19)* Polygnathus serotinus *Telford, 1975. (18) upper view of broken Pa element USNM 481685 from locality 2, showing the platform margins, deep adcarinal trough, position of the carina, and shape of the geniculate tongue; (19) lower view of the same specimen showing the distinctive inverted basal cavity and projecting outer lip of the basal pit. All figures x 50.*

Diagnosis

A species of *Amydrotaxis* with a Pa element that is short for the genus and has three large posterior denticles that are progressively reclined. The platform lobes are flared from about one third the unit length and taper to the posterior tip.

Description

The Pa element is short and bears six to eight denticles. The anterior denticle is large and erect and is succeeded by two or three smaller denticles and then three denticles that are stout and progressively reclined. Viewed from above, the blade is straight and the platform lobes are asymmetrically flared from about one third the unit length and taper to the posterior tip. In lateral view the margin of the basal cavity is concave downward.

The Pb element has a large reclined cusp, with one or two small anterior denticles and a single small reclined posterior denticle. The basal margin is asymmetrically flared, with the narrower but more laterally pronounced flare on the outer margin.

The M element has a prominent cusp with two small anterior denticles and three posterior denticles on a short

posterior process. The basal cavity is widest under the cusp, most expanded inward, and tapers posteriorly.

The Sa element is known from only two specimens. The figured one is better preserved but has relatively short lateral processes, each bearing only two small denticles. The main cusp is large and has carinate lateral edges. A symmetrical basal cavity tapers laterally. The unfigured specimen is more palmate and has three larger denticles on the lateral processes.

The Sb element is known only from a single broken specimen. It appears to be somewhat intermediate between the M and the Sc elements, with a high, reclined main cusp, an anterior process bearing two well-separated denticles, and a rather shorter posterior process bearing two denticles, of which the posterior one is the larger. The basal cavity is narrow but extends up the inside of the main cusp.

The Sc element is markedly curved, with the inward curvature of the anterior process greater than that of the posterior process. A high main cusp is reclined both inward and backward, a short anterior process bears two slender denticles, with the anterior one the shorter, and a rather longer posterior process has two reclined denticles of which the posterior one is the longer and more reclined. The basal cavity is long, widest below the main cusp, and tapers posteriorly.

Discussion

Amydrotaxis murphyi differs from the other species in having an unusually short Pa element that has large reclined posterior denticles. In its relatively symmetrical, posteriorly tapering outline, the platform of the new species, when viewed from above, differs considerably from the platforms of *A. sexidentata* Murphy and Matti, 1983, *A. praejohnsoni* Murphy and Springer, 1989, *A. johnsoni* (Klapper, 1969), *A.* sp. n. of Savage 1984, and *A. druceana* (Pickett, 1980). Each of these species has a platform that is variable but usually highly asymmetrical, with one platform lobe projecting laterally from a point about half the unit length. The only other known species of *Amydrotaxis* with a platform similar to that of the Alaska species is *A. corniculans* Mawson, 1986, from eastern Australia, but the Pa element of that species differs from *A. murphyi* in length and lateral profile, as discussed above. *A. chattertoni* Uyeno, 1990, from the Canadian Arctic Archipelago, has a Pa element that differs from the Alaska species in possessing very high, stout, anterior and posterior cusps, and a platform that is relatively symmetrical and reminiscent of that of *Ozarkodina*.

It is premature to compare the other elements of *A. murphyi* with homologous elements of the other species of the genus because the collection is so small and the elements thus too poorly known to be confident of their typical form. This is particularly the case with the Sb, Sc, and M elements, which are represented by only one or two specimens, and hardly better with the Sa and Pb elements. The element described above as the Sa element may instead be the M element, and that described as the M element may be an unusually asymmetrical Sa element. Only the Pa element is represented by enough specimens to give some idea of its range of form, and even this element is inadequately represented and hardly worth formal description were it not for the stratigraphic interest of this occurrence.

The earliest known species of *Amydrotaxis* are *A. sexidentata* Murphy and Matti, 1983, from the early Lochkovian of Nevada (Murphy and Matti, 1983) and eastern Canadian Cordillera (Uyeno, 1991), and *A. chattertoni* from the early Lochkovian of the Canadian Arctic Archipelago (Uyeno, 1990). The next occurrences stratigraphically appear to be *A. corniculans* Mawson, 1986, from the early to late Lochkovian of eastern Australia (Mawson, 1986), *A. praejohnsoni* Murphy and Springer, 1989, from *delta* Zone beds of early to middle Lochkovian age in Nevada, east-central Alaska, eastern Australia, and Yukon Territory, Canada (Klapper, 1969; Lane and Ormiston, 1979; Murphy and Matti, 1983; Mawson, 1986; Murphy and Springer, 1989; Wilson, 1989). *A. johnsoni* (Klapper, 1969) occurs in the *delta* and *pesavis* Zones in Yukon Territory (Klapper, 1969) and Nevada (Murphi and Matti, 1983) but is not known in eastern Australia. The very poorly known species *Amydrotaxis* n. sp. of Savage (1984), from a small exposure on Jones Island, northwest Washington (Savage, 1984), occurs with *Ozarkodina remscheidensis* (Ziegler, 1960) and is thus of poorly constrained Early Devonian age. *A. druceana* (Pickett, 1980) is from the mid Lochkovian of central New South Wales in eastern Australia. Mawson and others (1992) show in their table 6 the occurrence of a few elements of *Amydrotaxis* sp. that they conclude, from the associated conodonts, to be of latest Pragian age.

The occurrence of *Amydrotaxis murphyi* in the late Emsian of Alaska makes the absence of a record of *Amydrotaxis* in beds of the early to middle Emsian age all the more interesting. Although the number of specimens comprising the present collection are insufficient for adequate description, they clearly represent the genus *Amydrotaxis*, and may be all the specimens we are going to get unless a further helicopter visit to the locality becomes possible.

Etymology

Named in honor of M. A. Murphy in recognition of his contributions to the study of Silurian and Devonian conodonts.

Genus POLYGNATHUS Hinde, 1879

Type species.—Polygnathus dubius Hinde, 1879

POLYGNATHUS SEROTINUS Telford, 1975

Figure 2.18–19

Discussion

Only two broken Pa elements of the species from locality 2 can be identified with confidence, although there are two other broken Pa elements and one M element. No specimens have been recovered from locality 1.

ACKNOWLEDGMENTS

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