Contributions

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DEVONIAN EURYPTERIDS FROM INDIANA AND PENNSYLVANIA

BY

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Abstract — The collection of the University of Michigan Museum of Paleontology contains specimens from two previously undescribed Devonian eurypterid localities. Specimens assigned to *Pterygotus* sp. come from the now flooded Northern Indiana Stone Quarry from Rensselaer, Jasper County, Indiana. The material is preserved as carbonaceous films in dolomites, probably from the Middle Devonian Muscatatuck Group. These are the youngest known specimens of pterygotid eurypterids. A single large body plate is described from the Famennian Oswayo Sandstone of Port Allegany, McKean Co., Pennsylvania and tentatively assigned to the huge stylonurid eurypterid *Hallipterus*. There are a number of fragmentary eurypterids described from the Upper Devonian of Pennsylvania, but no new material has been described since the 1930s.

INTRODUCTION

Although never common in the fossil record, eurypterid diversity, in terms of both species and genera, peaked during the late Silurian and declined throughout the Devonian (Lamsdell and Selden, 2017). One of major groups lost during the Devonian are pterygotids, which include the largest arthropods of all time (Plotnick and Baumiller, 1988; Braddy et al., 2007; Lamsdell and Braddy, 2010). Although most of the Silurian and Devonian eurypterid occurrences are in a variety of marine settings, especially shallow and marginal marine, non-marine occurrences become proportionally more common from the Early Devonian onwards (Plotnick, 1999). Many Late Devonian forms, such as *Hallipterus* Kjellesvig-Waering, 1963 are also quite large (Tetlie, 2008).

The collections of the University of Michigan contain specimens that document two previously undescribed Devonian eurypterid occurrences. The first of these are specimens of the genus *Pterygotus* Agassiz, 1844 from marginal marine deposits in the Middle Devonian of Indiana. This may represent the youngest occurrence of this once diverse family. The second is a large isolated tergite from non-

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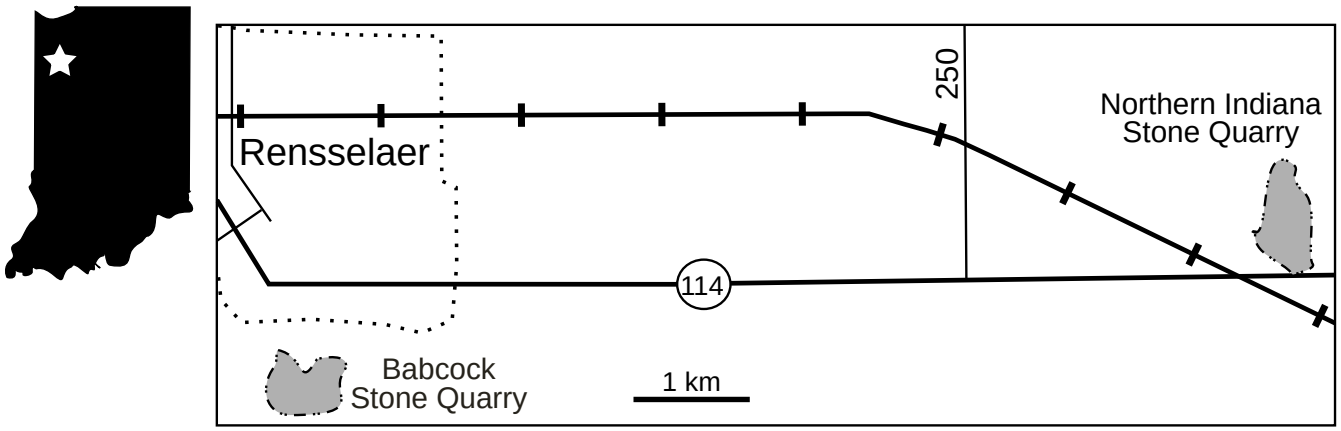

FIGURE 1 — Silhouette map of Indiana showing location of Rensselaer, Jasper Co. (star). Map at right shows locations of now flooded Northern Indiana Stone Quarry at Pleasant Ridge, east of Rensselaer, and the Babcock Stone Quarry, south of Rensselaer.

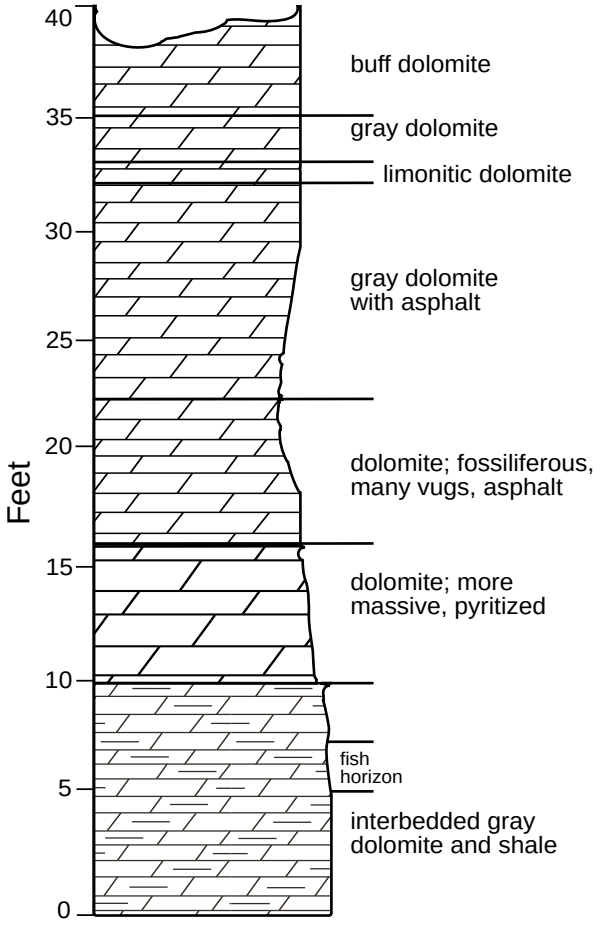

FIGURE 2 — Geologic section of the Northern Indiana Stone Quarry, based on the field notes and sketch of W. G. Melton Jr. on June 18, 1962.

marine sediments in the uppermost Devonian of Pennsylvania, possibly belonging to the genus *Hallipterus*.

As is common for eurypterids, the specimens are incomplete fragments. Nevertheless, they add important documentation to the history of this interesting clade. In addition, I summarize the eurypterid fossil record of the Upper Devonian of Pennsylvania.

A Middle Devonian Pterygotid from Indiana

William G. Melton Jr. collected the eurypterids on June 18, 1962. They came from the now flooded Northern Indiana Stone Quarry (*aka* Rensselaer Stone Company Quarry or A Metz. Inc.), 6.9 km E east of Rensselaer, Jasper County, Indiana, and just west of Pleasant Ridge on Indiana 114 (N 40.93349 W 87.07043; Fig. 1).

Figure 2 shows a redrawn section of the quarry produced by Melton during his visit. According to his field notes, he was accompanied by James Malick and Phillip Bjork; they found "bone through the dolomite as well as in the shale partings, especially in the upper 5 feet." It can be assumed that this is the "fish horizon" in the measured section. He also mentions the presence of 11' of Silurian below, "near the contractor's shack." Based on a note with the specimens, a dipnoan tooth identified by D. Dunkle (Sept. 6. 1963) supported a Devonian age. All the specimen labels indicate Devonian.

The quarry was visited by geologists from the Indiana Geological Survey (IGS) several times between 1963 and 1993, when it was flooded and abandoned (unpublished IGS reports). A 1963 visit by L.F. Rooney and R. R. French recorded a similar section to that drawn by Melton, with an upper 6.8' unit of buff dolomite, then 27' of dark gray dolomite very bituminous and vuggy, with pyrite and molds of corals, underlain by 5' of argillaceous light gray dolomite and shale. This lower unit appears to correspond to the "Fish horizon" identified by Melton, and they suggested it was Silurian. In a 1983 visit, C.A. Ault identified the entire sequence as Devonian, with the upper 33.8' being Traverse Formation

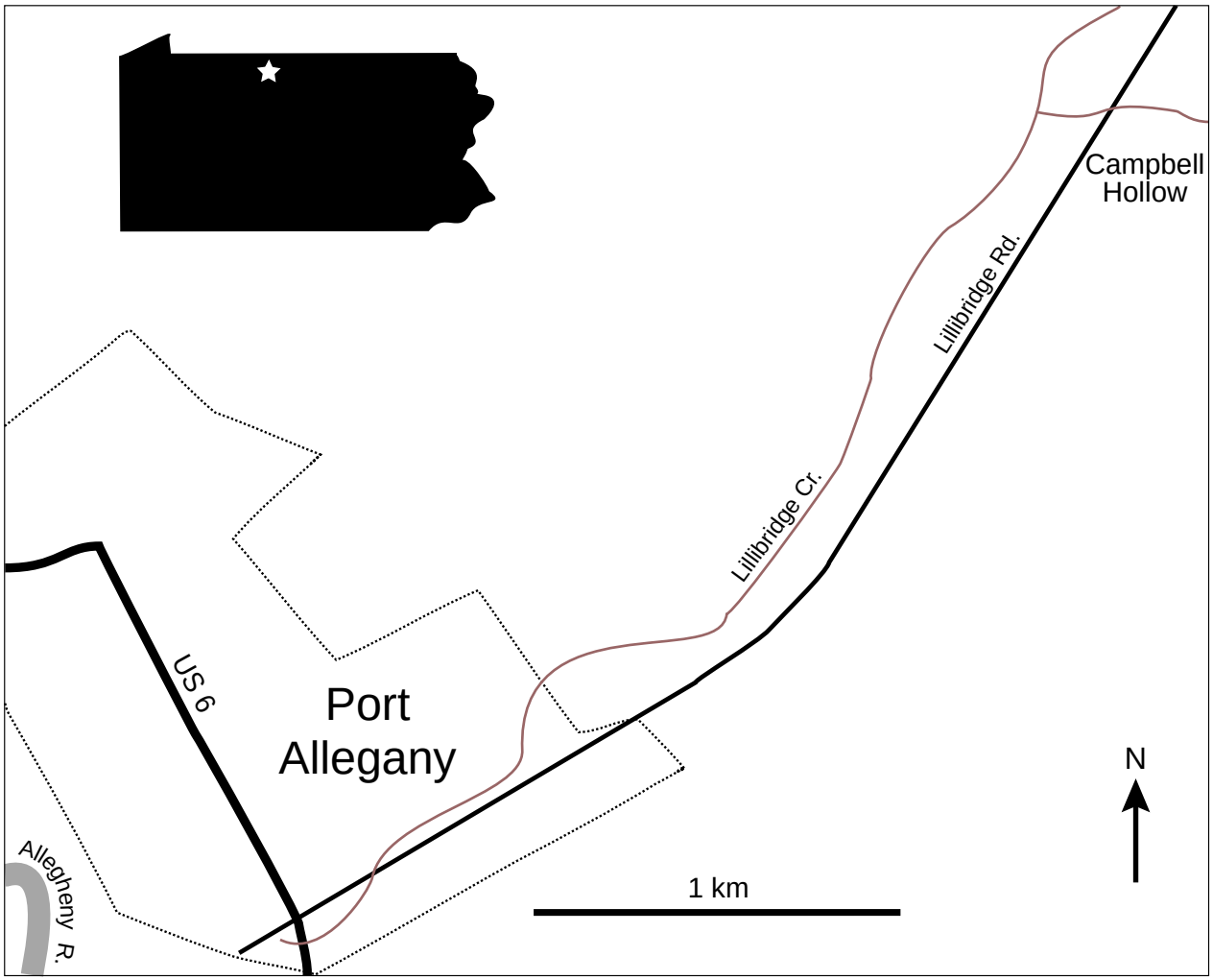

FIGURE 3 — Silhouette map of Pennsylvania showing location of Port Allegany (star). Larger map shows location of Campbell Hollow locality relative to Port Allegany, McKean County.

and the lower unit being Traverse or Detroit River Formation with a total thickness of 14.7'. The Devonian is underlain unconformably by the reefal Silurian Wabash Formation (Salina Group), with some 15' of relief on the unconformity in the quarry. A similar unconformity is described in the nearby Babcock Stone Quarry, where the Devonian is again described as vuggy and oily, with a lower shale marker bed.

The Traverse and Detroit River Formations are part of the Middle Devonian Muscatatuck Group (Doheny et al., 1975), with Detroit River Formation being latest Emsian–Eifelian and the Traverse Formation being Givetian (Shaver et al., 1986; Klapper and Oliver, 1995). Orr and Rebuck (1972) examined conodonts from Traverse Formation outcrops in the Rensselaer area, in the dark grey vuggy dolomite, and placed then in the Givetian *Polygnathus varcus* zone. The Traverse Formation is predominantly limestone with shale beds, and more fossiliferous whereas laminated dolostones are more characteristic of the Detroit River Formation, considered to have been deposited in penesaline to hypersaline environments. Unfortunately, there is insufficient evidence to confidentially determine which of the formations the eurypterids come from, so the age cannot be specified beyond probably Middle Devonian. The presence of shale beds supports a correlation with the Traverse Formation.

The quarry was well known for its sulfide group mineral specimens (Brock, 1986), including marcasite and pyrite. These are present in the vugs in the upper horizons in the quarry, greyish brown sparry dolostones, along with calcite and dolomite crystals. Most cavities are also oil-filled, making collection "indescribably filthy" (Brock, 1986).

The dolomites are also fossiliferous. The Yale Peabody Museum collections contain an unidentified stromatoporoid listed as coming from the middle part of the quarry. The collections of the Indiana State Museum (ISM) include

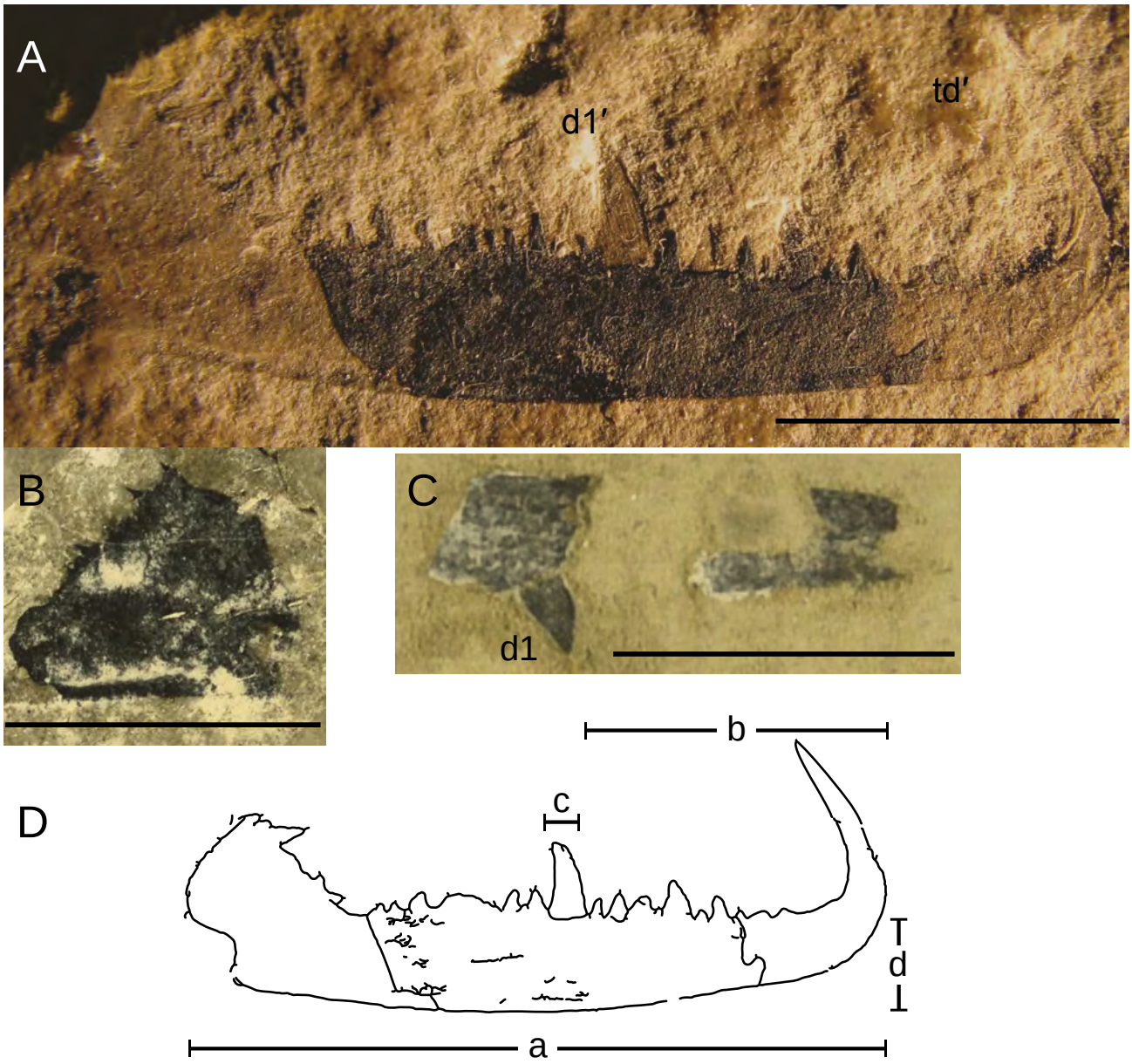

FIGURE 4 — Chelicerae of *Pterygotus* sp. **A**, free finger of UMMP 64135. **B**, base of free finger of UMMP 64137, which may be the counterpart of 64135. **C**, fragments of fixed finger of UMMP 64134. **D**, schematic showing measurements made on UMMP 64135 (Table 1). Dactyl designations and measurements from Miller (2007). All scales equal 1 cm. Abbreviations: *d1*, principal dactyl of fixed finger; *d1′*, principal dactyl of free finger; *td′*, terminal dactyl of free finger.

specimens of brachiopods (*Atrypa reticularis; Pseudoatrypa devoniana; Schizophoria* sp.) and corals, preserved as mineralized casts and molds. According to Peggy Fisherkeller (ISM), hundreds of fossil and mineral specimens from the quarry have had to be deaccessioned due to pyrite disease.

In addition to the eurypterids, specimen UMMP 64141 labelled as being collected by G.M. Ehlers, R.V. Kesling, and A. Boucot on the same date, appears to be a fragment of a placoderm. Based on a photo, L. Sallan and M. Brazeau identified this as likely an arthrodire placoderm, either *Coccosteus* or a close relative, based on size and the rounded ornament (pers. comm., 08/2020), although M. Friedman is not convinced the material is vertebrate. The ornamentation, however, is not consistent with that of eurypterids (agreed with by J. Lamsdell, pers. comm. to J. Bauer, 12/2020). The specimen clearly requires further study.

A Upper Devonian Stylonurid from Pennsylvania

A single specimen (UMMP 26196) was collected by J. C. Galloway, of Port Allegany, McKean Co., Pennsylvania and given to Chester A. Arnold in 1931. It came from a small quarry, known as the DeLong Quarry, 2 miles northeast of Port Allegany at Campbell Hollow (N 41.829, W 78.241) about 30 m above the local valley floor (Fig. 3).

Arnold (1933, 1939) described the lithology and paleobotany of the locality. The described section consists of 3 – 4 meters of massive sandstone, overlain by an approximately 0.5 meter bed of yellow mud and sand with associated pyrite. Plant remains include fronds of *Archaeopteris latifolia* Arnold, 1939 and pyritized wood (*Callixylon*) of *Archaeopteris*, a possible lycopod strobilus (tentatively assigned by Arnold to *Sigillaria*), and the lycopods *Prolepidodendron breviinternodium* Arnold, 1939 and *Lepidostrobus gallowayi* Arnold, 1935.

Stratigraphically, Arnold (1933, 1939) placed this locality in the Oswayo Sandstone. The Pennsylvania geological survey maps this area as "Shenango through Oswayo undivided" (Berg and Dodge, 1981). This puts the unit in the uppermost Famennian (Richardson and Ahmed, 1988).

Richardson and Ahmed (1988) assigned the Oswayo to the "Cattaraugus facies" of Rickard (1975). These are variable nearshore and alluvial sediments, including non-marine sandstones with abundant plants. This is compatible with Arnold (1939), who believed this deposit represented a deltaic environment.

INSTITUTIONAL ABBREVIATIONS

NYSM — New York State Museum
SMP — State Museum of Pennsylvania
UMMP — University of Michigan Museum of Paleontology
YPM — Yale Peabody Museum

SYSTEMATIC PALEONTOLOGY

EURYPTERIDA Burmeister, 1843
EURYPTERINA Burmeister, 1843
PTERYGOTOIDEA Clarke and Ruedemann, 1912
PTERYGOTIDAE Clarke and Ruedemann, 1912
PTERYGOTUS Agassiz, 1844
PTERYGOTUS sp.

Referred Specimens.— UMMP 64135 (moveable finger of chelicera), UMMP 64137 (probable counterpart of 64135); Paratype UMMP 64138 (telson, part and counterpart), UMMP 64134 (fragments of fixed finger of chelicera), UMMP 64136 (podomeres of swimming leg?); UMMP 64139 (fourteen pieces, unidentifiable fragments), UMMP 64140 (sixteen pieces, unidentifiable fragments).

Locality and Horizon.— Northern Indiana Stone Quarry 6.9 km E east of Rensselaer, Jasper County, Indiana. Probably Muscatatuck Group, Middle Devonian.

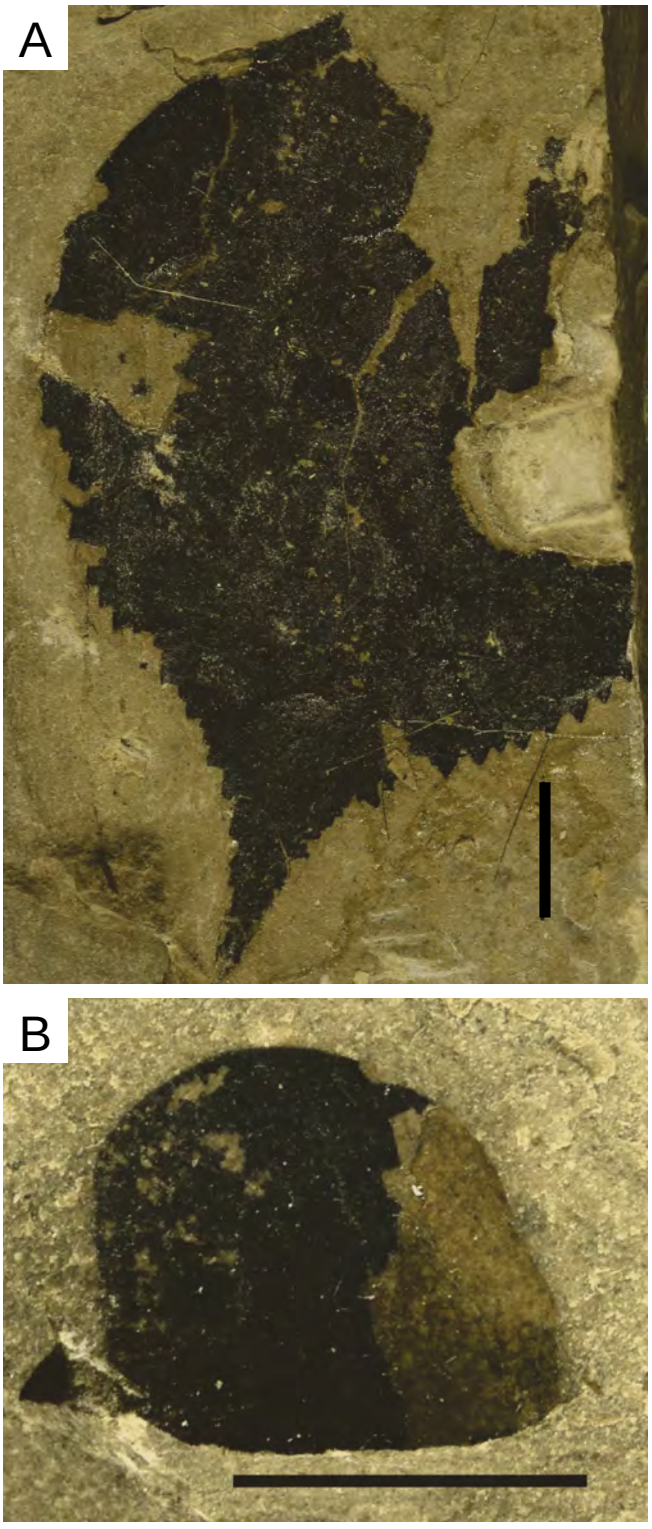

FIGURE 5 — **A**, telson of *Pterygotus* sp. (UMMP 64138). **B**, unidentified fragment; possibly podomeres 7 and 7a of swimming leg (UMMP 64136). Scales equal 1 cm.

FIGURE 6 — **A**, isolated tergite from the Upper Devonian of Pennsylvania. UMMP 29196. **B**, closeup showing the ornamentation. Scales equal 1 cm.

Description.— Specimen UMMP 64135 (Fig. 4A) is an isolated moveable finger of chelicerae, 32.4 mm in length, terminal dactyl recurved proximally. There is a single major sharp denticle, clearly striated, with a height of 3.6 mm and width of 1.76 mm, designated d1′, using the notation of (Miller, 2007: text-fig. 13). A second more distal denticle, corresponding in position to d3′, is 2.0 mm in height, Additional small denticles occur along the length of finger, including on the base. The denticles on the base are clearly shown in UMMP 64137 (Fig. 4B), which is almost certainly the counterpart of UMMP 64135.

Table 1 includes measurements of the free fingers of given in Miller (2007) plus those of the specimen discussed here (Fig. 4D). Although the specimen from Indiana is smaller, the proportions given as ratios in the table are indistinguishable.

UMMP 64134 (Fig. 4C) is a fragment of a finger, with a single large denticle, 1.7 mm in height, broad at the base and inclined distally. This specimen is interpreted as a fragment of the fixed finger and the denticle as d1. Poschmann and Tetlie (2006) noted an inclined denticle is characteristic of the fixed finger of the Silurian *Acutiramus macrophthalmus* (Hall, 1859).

Specimen UMMP 64138 (part and counterpart; Fig. 5A) is a laterally expanded telson diagnostic of pterygotid eurypterids (Plotnick and Baumiller, 1988). The posterior end is pointed, and the posterolateral margins are serrated. The anterolateral margins appear smooth. There is no evidence of a median keel, although we may be looking at the ventral surface. The telson length is >69.5 mm, with a width of ~47 mm. The approximate length-to-width ratio of 1.48 compares to 1.35 for a much larger specimen described by Miller (2007). A reduced major axis analysis of nine telsons of *Acutiramus* by Plotnick and Baumiller (1988) showed a strong positive allometry of width with size, with length/width ratios in small individuals being about 1.4 and large individuals close to 1.0. Poschmann and Tetlie (2006), based on 62 specimens of telsons of *A. macrophthalmus* (Hall, 1859), also noted an allometric decrease in the length to width proportion, from nearly 2.5 in very small individuals and about 1.0 in large ones. The length/ratio of UMMP 64138 is greater than what was observed in similar sized *A. macrophthalmus* but are what would be expected in a juvenile pterygotid.

There are numerous other small fragments, but no others are diagnostic. UMMP 64136 (Fig. 5B) may be a portion of the swimming paddle of the sixth prosomal appendage, possibly podomeres 7 and 7a.

A Note on Pterygotid Chelicerae.— At least as far back as Huxley and Salter (1859), pterygotid papers have termed the two components of the pterygotid chelicerae the "fixed ramus" and the "free ramus." This persists despite the usual usage of ramus in arthropod biology, to refer to separate, multiple podomere branches of appendages, such as the endopods and exopods of crustaceans. An examination of the literature of living chelicerates reveals a wide disparity of terminology among papers on *Limulus* and arachnids (Shultz, 2001; Carrera et al., 2009; Bird et al., 2015; Bicknell et al., 2018). As a result, I am using the terminology fixed finger and moveable finger, similar to that used for the cheliped of decapods Snodgrass (1965).

Discussion.— The material from Rensselaer, Indiana represents fragments of a small, possibly juvenile, pterygotid eurypterid. Although somewhat smaller, it is not readily distinguished from *Pterygotus anglicus* Agassiz, 1844 as described by Miller (2007) from the Emsian Campbellton Formation of New Brunswick. *P. anglicus* was originally identified by Agassiz (1844) and discussed in detail by Huxley and Salter (1859) and Woodward (1866–1878). One of the first eurypterids described, it is from "Lower Old Red Sandstone" of Scotland (Arbuthnott Group, Gedinnian). If these specimens are indeed conspecific, then *P. anglicus* has a wide stratigraphic and geographic range. However, following Lamsdell and Legg (2010), the modest amount of material neither justifies creating a new species nor allows certainty in the taxonomic assignment, beyond *Pterygotus* sp.

In addition, if the Middle Devonian date is correct, these specimens represent the last occurrence of the pterygotid eurypterids (Tetlie, 2007). Russell (1954) described *P. gaspesiensis* from the Devonian Battery Point Formation of Gaspé Bay, Quebec and gave it a Middle Devonian age (Russell, 1947). However, more recent work has assigned

TABLE 1 — Comparison of the four moveable fingers of *P. anglicus* given in Miller (2007) to UMMP 64135. Measurements in millimeters are a) total length of finger; b) distance from the distal base of the primary denticle (d1′) to outside terminal denticle (td′), c) width of base of primary denticle, d) width finger from base primary denticle. See Figure 4D. NBMG = New Brunswick Museum; GSC = Geological Survey of Canada.

Specimen	a. Total Length	b.Distance Primary to Terminal Denticle	c. Basal Width Primary Denticle	d. Width Finger at Primary Denticle	Ratio b/a	Ratio c/a	Ratio d/a
NBMG 10237	71	33	4	9+	0.46	0.06	0.13
NBMG 9774	135	52	7	18	0.39	0.05	0.13
NBMG 10000	101	54	4–5	15	0.53	0.04	0.15
GSC 3239	50.5	>18	3	6.5	0.36	0.06	0.13
UMMP 64135	32.4	13.8	1.76	4.04	0.43	0.05	0.12

TABLE 2 — Upper Devonian Eurypterids of Pennsylvania (see text).

Higher taxon	Species	Formation	Locality	Age
Hardieopteridae	*Hallipterus excelsior*	Catskill	Meshoppen	Late Frasnian-Famennian
Stylonurina	*Stylonurella (?) arnoldi*	Catskill	Port Allegany	Late Famennian
	Stylonurella (?) beecheri	Chadakoin	Warren	Famennian
	Stylonurus (?) shaffneri	Lock Haven	Galeton	Late Frasnian-Famennian
Adelophthalmidae	*Adelophthalmus approximatus*	Venango	Warren	Late Famennian
	Adelophthalmus		Burtville	Famennian

these strata to the Cap-aux-Os Member of that formation, which has an Emsian age based on spores (McGregor, 1979; Griffing et al., 2000). In an informal report, Giesen and Poschmann (2012) described an isolated pterygotid metastoma from Wuppertal-Elberfeld, Germany. It is likely from the upper Eifelian Brandenberg Formation, but may be lowermost Givetian (M. Poschmann, pers. comm., 1/2021).

The only other described Middle Devonian form is *P. bolivianus* Kjellesvig-Waering, 1964, described solely on a supposed fragment of the ramus of the chelicera. The locality is described as in the "*Metacryphaeus caffer* Zone of the upper part of the Sicasica Series… near the farm of Belen (Finca de Belen)…La Paz Department, Bolivia" (Kjellesvig-Waering 1964: 348). According to Farjat (2005) and a column supplied by A. Farjat (pers. comm., 7/2020), this unit would be Eifelian. However, the figured specimen does not resemble any other pterygotid. Based on photographs supplied by J. Lamsdell and P. Mayer, Phillipe Janvier identified the specimen as the lower jaw of the chondrichthyan *Pucapampella*, with superbly preserved teeth (pers. comm. 12/2020). This genus was described from the same locality by Janvier and Suarez Riglos (1986). A specimen from the Upper Devonian of Colombia (Olive et al., 2019) was misidentified as possibly being *P. bolivianus*; it is probably arthropod but is too fragmentary to identify further (J. Lamsdell, pers. comm. 1/2021).

STYLONURINA Diener, 1924
KOKOMOPTEROIDEA Kjellesvig-Waering, 1966
HARDIEOPTERIDAE Tollerton, 1989
Hallipterus? Kjellesvig-Waering, 1963
Hallipterus excelsior? Hall 1884

Referred material.— UMMP 29196.

Locality and Horizon.— DeLong Quarry at Campbell Hollow, 2 miles northeast of Port Allegany, Pennsylvania. Oswayo Sandstone, Late Devonian (Famennian).

Description.— The specimen is a large, probably incomplete isolated sclerite (Fig. 6A). The preserved portion is about 100 mm wide and 40 mm maximum length. The presence of cracks on the left side of the specimen (as oriented in the photo), the broken edge on the right side, and the lack of bilateral symmetry in length (longer on the right side), all suggest the original width was significantly greater.

One margin of the sclerite (lower edge in the figure) is serrate, with small pits on the surface. The opposite margin appears corrugate. The shapes of the margins resemble those shown for tergites of the Carboniferous eurypterids *Dunsopterus* Waterston, 1968 (see Waterston, 1957: pl. 3, fig. 1) and *Cyrtoctenus* Waterston, Oelofsen, and Oosthuizen 1985 (see their fig. 11e). As a result, this plate is interpreted as a tergite, with the corrugate margin being anterior.

The tergite is covered with broad lunules (Fig. 6B; Selden, 1981). In the central part of the plate, they appear to be oriented laterally from the upper left to the lower right. On the left side, they are oriented more longitudinally.

Discussion.— Although extremely rare, Upper Devonian

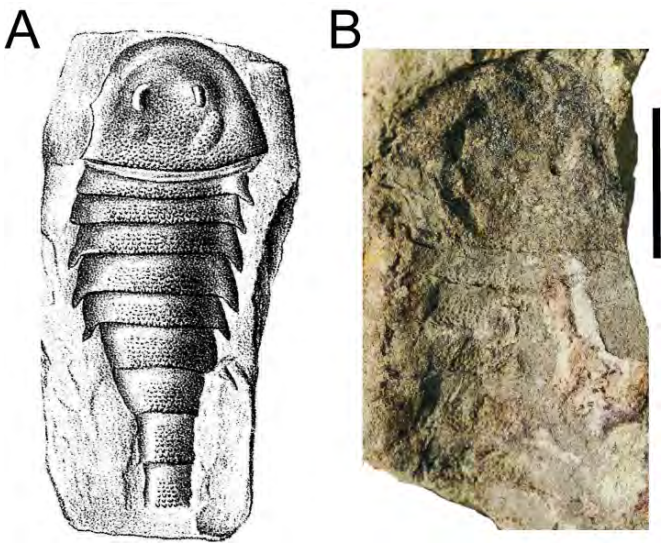

FIGURE 7 — *Adelophthalmus approximatus*. **A**, drawing of missing holotype from Hall and Clarke (1888). **B**, photograph of specimen SMP IP-12793 in State Museum of Pennsylvania, which is the probable counterpart of holotype. Scale equals 1 cm. Photo courtesy of Andrew Bush.

(Frasnian and Famennian) eurypterids have been known from Pennsylvania since the nineteenth century. Surprisingly, none have been described since 1935 (Ehlers, 1935), despite intensive paleontological work on these rocks since then (e.g., Broussard et al., 2018). Unfortunately, the original descriptions often use outdated stratigraphic nomenclature, and the locality data tends to be generalized. I have summarized these occurrences, including their currently used taxonomy (Table 2; Tetlie, 2007, 2008; Lamsdell et al., 2010) and a best estimate of their stratigraphy based primarily on publications and maps of the Pennsylvania Geological Survey (Berg and Dodge, 1981; Dodge, 1992; Berg et al., 1993; Harper, 1999).

Claypole (1883) described a large carapace from the "sandstone of the Catskill group at Meshoppen" Wyoming county. This specimen was very similar to a fossil collected at nearly the same time from New York, which led to a complex nomenclatural history, ably reviewed by Tetlie (2008). There were also competing inaccurate but spectacular reconstructions of a 1.5 m long animal. Tetlie (2008) places both specimens in the genus *Hallipteris excelsior,* a member of the stylonurid eurypterid Family Hardieopteridae (Lamsdell, et al., 2010). He also provides a new reconstruction showing an approximately 100 cm long eurypterid. The state geological map of the area shows Catskill formation as the sole Devonian unit, ranging in age this area from the Late Frasnian to the Famennian (Dodge, 1992; Harper, 1999).

Based on its geographic location, stratigraphy, environments and size, the specimen described here is tentatively assigned to *H. excelsior*. This is also supported by the similarity of the posterior margin of the tergite to that of the prosoma of *H. excelsior* (Tetlie, 2008: fig. 1A).

FIGURE 8 — Holotype of *Stylonurella* (?) *beecheri* (YPM 24347). Photograph of specimen in negative relief. Scale equals 1 cm. Photo by Susan Butts.

Other Late Devonian Eurypterids from Pennsylvania.— Hall and Clarke (1888) illustrated, as a drawing, a small eurypterid from "three miles south of Warren, Warren county, Pennsylvania" and named it *Eurypterus approximatus*. There was only a short description of the species in the caption. The species is now placed in the genus *Adelophthalmus*, a diverse and cosmopolitan taxon that survived until the Middle Permian (Tetlie, 2007; Tetlie and Poschmann, 2008). The original specimen seems to be lost, with the New York State Museum catalog listing only a "plastotype" (NYSM 4459). In 2012, however, Andrew Bush located in the collections of the State Museum of Pennsylvania a specimen collected by the 1800's by the Second Pennsylvania Geological Survey (Second Survey #9651, State Museum Pennsylvania #: SMP IP-12793). It appears to be the counterpart of the holotype (Fig. 7). This is supported by the locality data, which is given as "R2.Tanner's Hill Red Rock. Second Oil Sand? Grey SS. 3 miles S. W. of Warren, PA." The Tanners Hill Red beds are from the Venango Formation in Warren County, making this occurrence Upper Famennian (Dodge, 1993; S. Jasinski, pers. comm., 05/2021). Given the loss of the part, this specimen should be considered the holotype for *A. approximatus.*

In the same publication, Hall and Clarke (1888) illustrated *Eurypterus beecheri* from a sandstone in the "Chemung" (currently Chadakoin) beds of Warren, Warren County, originally described by (Hall, 1884). No other locality information is available. Since a photo of this specimen has not been previously published, I am including it here as Figure 8. The drawing in Hall (1884) is based on a plaster cast and is thus reversed and in positive relief. Tetlie (2008) lists this as an "enigmatic stylonurid" under the name *Stylonurella (?) beecheri*.

Willard (1933) published a new "Chemung eurypterid" from a locality "along the west side of State Highway number 144, three and one-fourth miles south of the town of Galeton in Potter County". The eurypterid, which he named *Stylonurus shaffneri*, is based solely on what is interpreted as a single appendage. Tetlie (2008) considered it doubtfully assigned to the genus *Stylonurus* and indicated it was an "enigmatic stylonurid." The specimen is apparently lost. Lithologically, the specimen is in soft greenish gray shale, associated with lingulids, small bivalves (*Leptodesma*, *Nucula*, and *Grammysia*) and fragments of a bothriolepid. The state survey maps this region as Catskill Formation, underlain by Lock Haven Formation, equal to the no longer used Chemung. Based on fossil content of the site, the eurypterid probably came from the Lock Haven (late Frasnian–Famennian; Broussard et al., 2020).

Another "enigmatic stylonurid" according to Tetlie (2007), despite being relatively complete, is *Stylonurella (?) arnoldi*, described as *Eurypterus arnoldi* by Ehlers (1935). This specimen is from a roadcut along U.S. 6 between Smethport and Port Allegany, McKean County, Pennsylvania, at a place locally known as Bush Hill, about six miles west of Port Allegany. The eurypterid was found in soft, clayey shale containing *Archaeopteris*, lingulid brachiopods, and

fragments of *Holoptychius*. Richardson and Ahmed (1988) placed this section in the upper part of the Cattaraugus Formation and assigned an age, based on miospores, of Late Famennian ("Strunian"). According to S. Jasinski (pers. comm., 05/2021) this is the Catskill Formation. It should be noted that this form has very large eyes relative to the size of the carapace, suggesting it may be juvenile, possibly of *H. excelsior* (Lamsdell et al., 2019).

An undescribed small *Adelophthalmus* in the collections of the New York State Museum (BU 320) was collected ca. 1969 by Ray Baschnagel, from an outcrop on Route 6, near Burtville, Potter County, 4.6 miles east of the junction with Route 155 at Port Allegany. The label gives the age as Famennian.

These specimens suggest that there are numerous additional eurypterid remains to be discovered in the Devonian rocks of northern Pennsylvania and adjacent areas. Future discoveries should help clarify taxonomic ambiguities, as well as improve our knowledge of biostratigraphy and paleoenvironments. These will be important for determining the impact of the Late Devonian extinctions on eurypterids (Lamsdell and Selden, 2017).

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