

***Jacoburbirostrum*, a new middle Famennian rhynchonellid (brachiopod) genus from southwestern New York State**

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Jacoburbirostrum gen. nov., type species *Atrypa duplicata* Hall, 1843, is described from the middle Famennian (II-G) of southwestern New York State, and a lectotype is formally designated. New family Jacoburbirostridae is established.
• Key words: *Jacoburbirostrum*, Jacoburbirostridae, rhynchonellid, brachiopod, middle Famennian, New York State.

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The conjunction of various favourable circumstances makes it easy to identify *duplicatum*. It is small, abundant, has a simple ornament that makes it distinct from other rhynchonellids encountered in the same beds, and it is present in a limited area of southwestern New York State during the middle Famennian (II-G). However, none of the successive generic assignments of *duplicatum*, including *Pugnoides* that is currently favoured, is satisfactory. Therefore, it is proposed in the present paper to include the species in a new genus.

Specimens studied are deposited in the collections of the American Museum of Natural History (New York), the New York State Museum (Albany), and the Royal Belgian Institute of Natural Sciences (Brussels) with registration numbers prefixed AMNH, NYSM, IRScNBa, respectively.

Systematic paleontology

Family Jacoburbirostridae fam. nov.

Type genus. – *Jacoburbirostrum* gen. nov.

Etymology. – See etymology for the type genus.

Diagnosis. – Size small. Outline subquadratic to subrounded, sometimes triangular. Few simple and regular costae. Median costae, sulcus and fold starting close to the beaks; when more than two costae make up the fold, the intercalated

middle one is depressed in its posterior part. Anterior commissure deeply serrate. Sulcus deep and wide. Fold high. Apical angle small. Short dental plates separated from the wall of the shell by narrow umbonal cavities. Hinge plate divided. Septum thin. Septalium small and uncovered.

The small size of the shell and the characteristic costation (few regular, and simple costae) combined with a divided hinge plate supported by a thin septum, and narrow umbonal cavities, allow to separate the new family from all known families.

Genus *Jacoburbirostrum* gen. nov.

Type and only species. – *Atrypa duplicata* Hall, 1843.

Etymology. – *Jacobus*, *i* (Latin, masculine) = James; *urbs*, *is* (Latin, feminine) = town; *rostrum*, *i* (Latin, neuter) = beak. The name derives from East Jamestown from where most of the collections of the species come.

Diagnosis. – Small size and pattern of costae are the main external characters of the genus. The few simple and regular costae are angular with rounded top, and produce a deeply serrate commissure; median costae start close to the beaks, the middle dorsal one being, when more than two costae are present, significantly lower in its posterior part and starting slightly more anteriorly than the others; parietal costae absent. Other features are: subquadratic to subrounded,

sometimes subtriangular outline; wide and deep sulcus, high fold and tongue; small apical angle; short hinge line, short dental plates; narrow umbonal cavities; thick and divided hinge plate; thin septum; small uncovered septalium; and narrow elongated dorsal muscle field.

Remarks. – The middle Famennian genus *Rugaltarostrum* Sartenaer, 1961, as originally defined by its type species, *R. madisonense* (Haynes, 1916), can easily be separated from *Jacoburbirostrum* gen. nov. by its considerably larger size, subelliptical to suboval outline, anterior commissure seldom deeply serrate, considerably larger apical angle, generally shallower sulcus, outline of tongue sometimes rectangular, width by far the greatest dimension, maximum width only slightly anterior to mid-length, larger number of median and lateral costae, generally lower and rounded median costae showing some irregularity due to the occasional presence of divided or intercalated or parietal costae, presence of costellae, slender internal structures, wide umbonal cavities separating the dental plates from the wall of the shell, lamellar septum, well developed denticula, deeper and wider septalium, and thinner hinge plate.

Hall (1867, p. 350) notes in his description of *Rhynchonella* (*Stenocisma*) *duplicata* that “should the entire interior characters become fully known, this will probably be proven to belong to a distinct genus”.

Initially included in the genus *Atrypa* Dalman, 1828 by Hall (1843), and then occasionally in the genus *Stenocisma* Conrad, 1839 (also spelled *Stenoschisma*) (1867 to 1905), the species has been widely and successively assigned to the three following genera: *Rhynchonella* Fischer de Waldheim, 1809 (1867–1950), *Camarotoechia* Hall & Clarke, 1893 (or *Camarotoechia*? or “*Camarotoechia*”) (1893–1978), and to *Pugnoides* Weller, 1910 (or “*Pugnoides*”) (from 1944 on).

Occurrence. – Chadakoin Formation, southwestern New York State, middle Famennian.

***Jacoburbirostrum duplicatum* (Hall, 1843)**

Figures 1, 2, Table 1

Material. – Although abundant in certain layers, the species is mostly represented by isolated valves imbedded in the rock (Fig. 2G, J). The rare complete specimens are generally exfoliated.

Lithographs of the specimens illustrated by Hall (1843, organic remains of the Chemung group in Tables of organic remains, pp. 59, 60, No. 67, figs 2, 2a, b as *Atrypa duplicata*) are not of high quality. Still, they constitute the type series that the author considers as being composed of ten specimens (three isolated specimens + a slab carrying seven specimens); figs 2, 2a show specimens of various sizes (width of the specimens are obviously different), and

must, therefore, be counted as three specimens. All specimens come from Dexterville, Chautauqua County. The author did not locate a single specimen in the type material that could match any of the specimens of the type series. A lectotype is formally designated in the present paper.

Lectotype, AMNH FI-30617 (formerly ⁶⁰³⁶₁). Organic remains of the Chemung group in Tables of organic remains, p. 60, No. 67, fig. 2a (left) in Hall 1843 as *Atrypa duplicata*, duplicated by Lesley [1890, p. 1057 as *Stenoschisma duplicatum* (*Rhynchonella duplicata*; *Atrypa duplicata*)]. “Chautauque county”, New York.

Paralectotypes A, AMNH FI-30617a (formerly ⁶⁰³⁶₁), and B, AMNH FI-30617b (formerly ⁶⁰³⁶₁). Organic remains of the Chemung group in Tables of organic remains, p. 60, No. 67, figs 2, and 2a (right), respectively, in Hall (1843) as *Atrypa duplicata*, duplicated by Lesley [1890, p. 1057 as *Stenoschisma duplicatum* (*Rhynchonella duplicata*; *Atrypa duplicata*)]. “Chautauque county”, New York. Paralectotypes C–I, AMNH FI-30617c (formerly ⁶⁰³⁶₁). Organic remains of the Chemung group in Tables of organic remains, p. 60, No. 67, fig. 2b in Hall (1843) as *Atrypa duplicata*, duplicated by Lesley [1890, p. 1057 as *Stenoschisma duplicatum* (*Rhynchonella duplicata*; *Atrypa duplicata*)]. “Chautauque county”, New York.

Hypotype A, AMNH FI-30618 (formerly ⁶⁰³⁶₁). Fig. 1A–E = pl. 55, figs 17–20 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata* = pl. LVII, figs 36–38 in Hall & Clarke (1893) as *Camarotoechia* (?) *duplicata*. Chemung group; Cattaraugus County, New York. Figures have been duplicated several times in the literature, e.g. by Cooper in Shimer & Shrock (1944, pl. 120, figs 18, 19, 21 as *Pugnoides duplicatus*, and in later editions), Metzger *et al.* (1974, pl. II = p. B-23, figs 10, 11 as *Pugnoides duplicatus*), and Linsley (1994, pl. 124 = p. 230, figs 20, 25–27 as “*Pugnoides*” *duplicatus*). The specimen is considered a “characteristic specimen of ordinary size” by Hall (1867, explanation of figures). If figures were “views of the original example” as stated by Hall & Clarke (1893, explanation of fig. 36–38), then the locality would not be Cattaraugus County, but “Chautauque county” as indicated by Hall (1843, p. 59). It is highly probable that Hall & Clarke, in using the word “original”, wanted to indicate that the specimen they figured was originally figured by Hall (1867). Hypotypes B–E, AMNH FI-83798–83801 (formerly ⁶⁰³⁶₁), Fig. 1F–Y. Probably the same locality, because the specimens are in the same box as the hypotype A. Hypotype G, NYSM 1185 (formerly ⁷²¹⁴₁). Fig. 2J, K = probably pl. 55, fig. 21 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata*, duplicated by Linsley (1994, pl. 124 = p. 230, fig. 21 as “*Pugnoides*” *duplicatus*). Chemung beds; Conewango, Cattaraugus County, New York. Collected by C. Van Deloo, 1863 according to Clarke & Ruedemann (1903, p. 204). Hypotypes H and I, Chemung beds; New Albion, Cattaraugus County, New

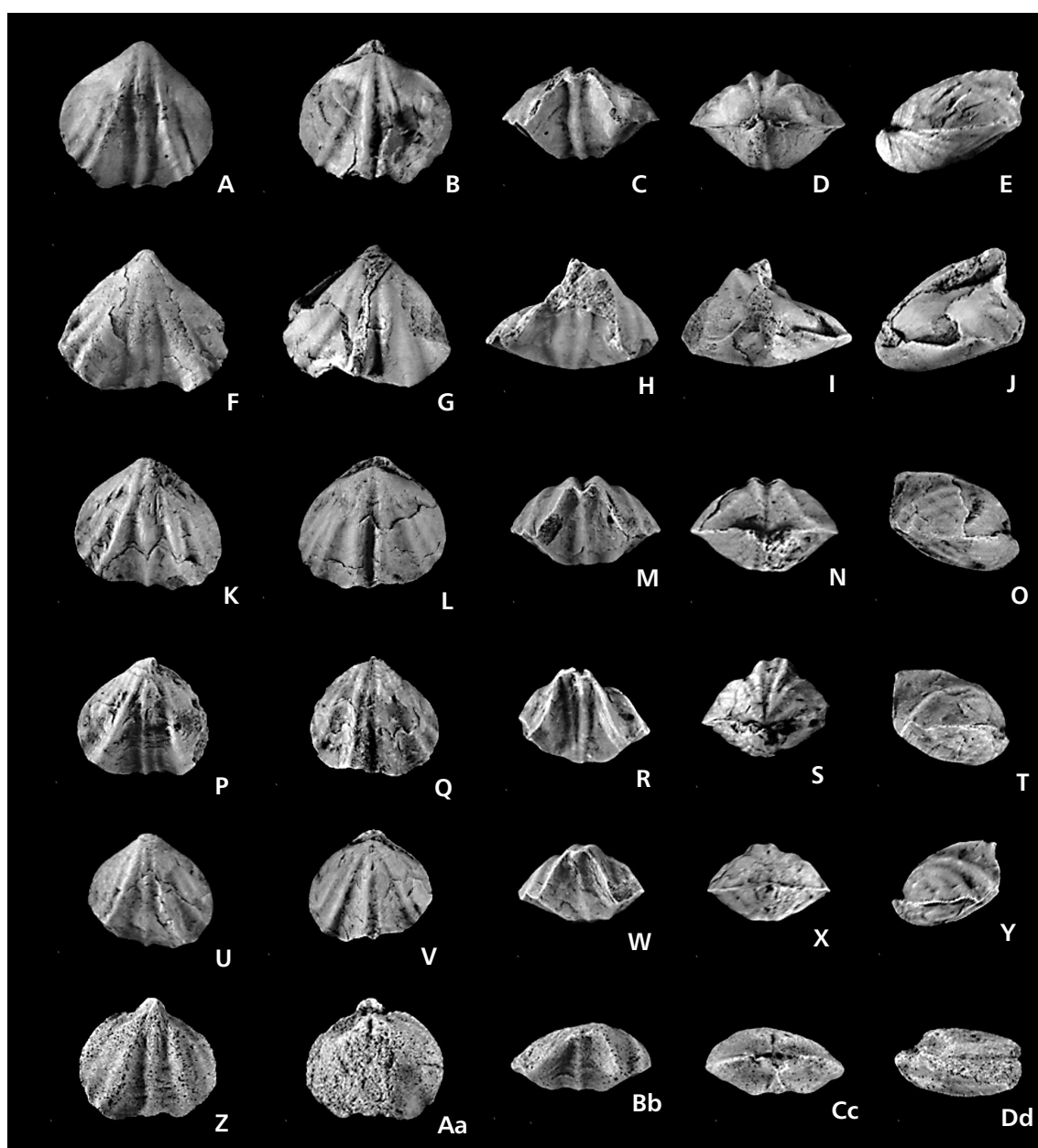


Figure 1. *Jacoburbirostrum duplicatum* (Hall 1843). Ventral, dorsal, anterior, posterior, and lateral views. • A–E – hypotype A, AMNH FI-30618 (formerly $\frac{6036}{1}$) [= pl. 55, figs 17–20 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata*; pl. LVII, figs 36–38 in Hall & Clarke (1893) as *Camarotoechia* (?) *duplicata*], Chemung group, Cattaraugus County, New York; costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. • F–Y – hypotypes B–E, probably the same locality as the hypotype A; F–J – hypotype B, AMNH FI-83798 (formerly $\frac{6036}{1}$); costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. K–O – hypotype C, AMNH FI-83799 (formerly $\frac{6036}{1}$); costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. P–T – hypotype D, AMNH FI-83800 (formerly $\frac{6036}{1}$); costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. U–Y – hypotype E, AMNH FI-83801 (formerly $\frac{6036}{1}$); costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. • Z–Dd – hypotype F, IRScNBa12833, Dexterville Siltstone Member, Chadakoin Formation, Dexterville brick shale quarries, Chautauqua County, New York; costal formula: $\frac{2}{1}$; 0; $\frac{1}{2}$. All $\times 1.7$.

York. Collected by C. Van Deloo, 1863 according to Clarke & Ruedemann (1903, p. 204). Hypotype H, NYSM 1186 (formerly $\frac{7214}{2}$), Fig. 2G, H = pl. 55, figs 22, 24 in Hall, 1867 as *Rhynchonella* (*Stenocisma*) *duplicata* = pl. LVII, fig. 39 in Hall & Clarke (1893) as *Camarotoechia* (?) *duplicata*; refigured by Cooper in Shimer & Shrock (1944, pl. 120, fig. 20 as *Pugnoides duplicatus*; and in later edi-

tions), and by Linsley (1994, pl. 124 = p. 230, figs 22, 28 as “*Pugnoides*” *duplicatus*). Hypotype I, NYSM 1187 (formerly $\frac{7214}{3}$), Fig. 2G, I = pl. 55, figs 23, 25 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata*, duplicated by Linsley (1994, pl. 124 = p. 230, figs 33, 34 as “*Pugnoides*” *duplicatus*). Hypotype F, IRScNBa12833, Fig. 1Z–Dd. Dexterville Siltstone Member, Chadakoin Formation;

Table 1. Number of median and lateral costae of *Jacoburbirostrum duplicatum* (Hall, 1843).

Median costae			Lateral costae		
Number of costae	Number of specimens	%	Number of costae	Number of specimens	%
$\frac{2}{1}$	88	53	$\frac{0}{1}$	6	6.5
$\frac{3}{2}$	69	41.5	$\frac{1}{2}$	26	28
$\frac{4}{3}$	9	5.5	$\frac{2}{3}$	41	44
	166	100	$\frac{3}{4}$	18	19.5
			$\frac{4}{5}$	1	1
			$\frac{5}{6}$	1	1
				93	100

Dexterville brick shale quarries, district of East Jamestown, Jamestown 7½' Quadrangle, Chautauqua County, New York. Collected by Irving H. Tesmer and Paul Sartenaer, 1972. Hypotype J, IRSnBa12834, Fig. 2A–E. Chadakoin Formation; 3400 feet southwest of Pine Hill Road along Bowen Road, Randolph Quadrangle, East Randolph, Cattaraugus County, New York. Collected by James J. Setlock & R. Dorsay (1974).

Description. – The original description of the species by Hall (1843, Organic remains of the Chemung group in Tables of organic remains, p. 59) is as follows: “Shell with two ribs elevated in front and two on each side of the mesial fold.” It explains the name given to the species, although the percentage of specimens with $\frac{2}{1}$ median costae is 53 per cent (see above). Although unsatisfactory and accompanied by very poor lithographs, the description draws attention to two notable external characters of the species: the very low number of median costae and the elevation of the dorsal median costae in front. A full description and adequate figures were provided by Hall later (1867, pp. 350, 351, pl. LV, figs 17–25).

Shell of small size. Strongly dorsibiconvex (dorsal valve about one and a half to two times the thickness of ventral valve). Flanks of ventral valve sloping gently from the umbonal region to the commissures, flanks of dorsal valve sloping strongly. Outline subquadrate to subrounded, sometimes subtriangular. Maximum thickness slightly posterior to front margin. Maximum width slightly anterior to mid-length in specimens with subtriangular outline, at mid-length in specimens with subrounded or subquadratic outline. Hinge line very short. Commissure sharp; anterior commissure (crest of tongue) moderately to deeply serrate; antero-lateral commissures slightly to moderately serrate; posterior commissure sticking out due to the postero-lateral margins of the valves being concave near the commissure. Apical angle generally between 90° and 100°, exceptionally larger. Ventral beak suberect to slightly incurved. Ventral interarea short. Deep sulcus and high

fold well marked, start close to the beaks. Sulcus wide (50–72% of shell width), well delineated; bottom flat to slightly convex, extended dorsally as a high tongue with trapezoidal outline, curving strongly but never tending to become vertical in its uppermost part. Top of tongue generally flat, sometimes slightly convex, located slightly lower than maximum shell thickness. Costae in very small number, regular, simple, and angular with rounded top, exceptionally rounded; median and internal lateral costae start very close to the beaks; median costae moderately high to high (ventral costae often lower than the dorsal ones); when there are more than two costae on the fold, the middle one is intercalated, lower, and starts at a slightly greater distance from the beak. The general costal formula in median, parietal, and lateral categories derived from at least 75% of the available specimens in each category is: $\frac{2 \text{ to } 3}{1 \text{ to } 2}$; 0; $\frac{1 \text{ to } 3}{2 \text{ to } 4}$. Width generally larger than length. Thickness is considerably smaller than width and length. Shell thick in the cardinal area. Dental plates very short, separated from the wall of shell by narrow, even residual, umbonal cavities. Teeth small and short. Septum thin, slightly lens-shaped posteriorly, reach half shell length, supports a small uncovered septalium. Hinge plate thick, divided. Dental sockets very short and shallow. Dorsal muscle field very narrow, longitudinally elliptical (width: 15–20% shell width; length: about half shell-length).

Remarks. – The *stratum typicum* of *duplicatum* according to Hall (1843, organic remains of the Chemung group in Tables of organic remains, p. 59) is “Dexterville, Chatauque county” in southwestern New York State. According to Caster (1934, p. 64 as *Camarotoechia duplicata*), the type locality of *duplicatus*, is “the section north side and at the foot of ‘Swan Hill’, Dexterville brick quarries, south of Chadakoin River in East Jamestown”.

Occurrence. – Chadakoin Formation, southwestern New York State, middle Famennian.

Discussion on stratigraphic range and distribution of *Jacoburbirostrum duplicatum*

Figure 3

“Chemung group” is the only information provided by Hall (1843, Tables of organic remains, p. 59). Chemung is no longer a valid stratigraphic name, just a facies name; it is devoid of formal meaning.

Chadwick (1934, p. 349) recognized four groups or stages “once lumped indiscriminately as Chemung” (from base to top): true Chemung, Canadaway group, Chagrin fauna with *Camarotoechia? duplicata*, and Conewango formation. Chadwick (1934, p. 349, Chadwick in Caster, 1934, p. 136, Chadwick 1935a, pp. 326, 327) stated that the

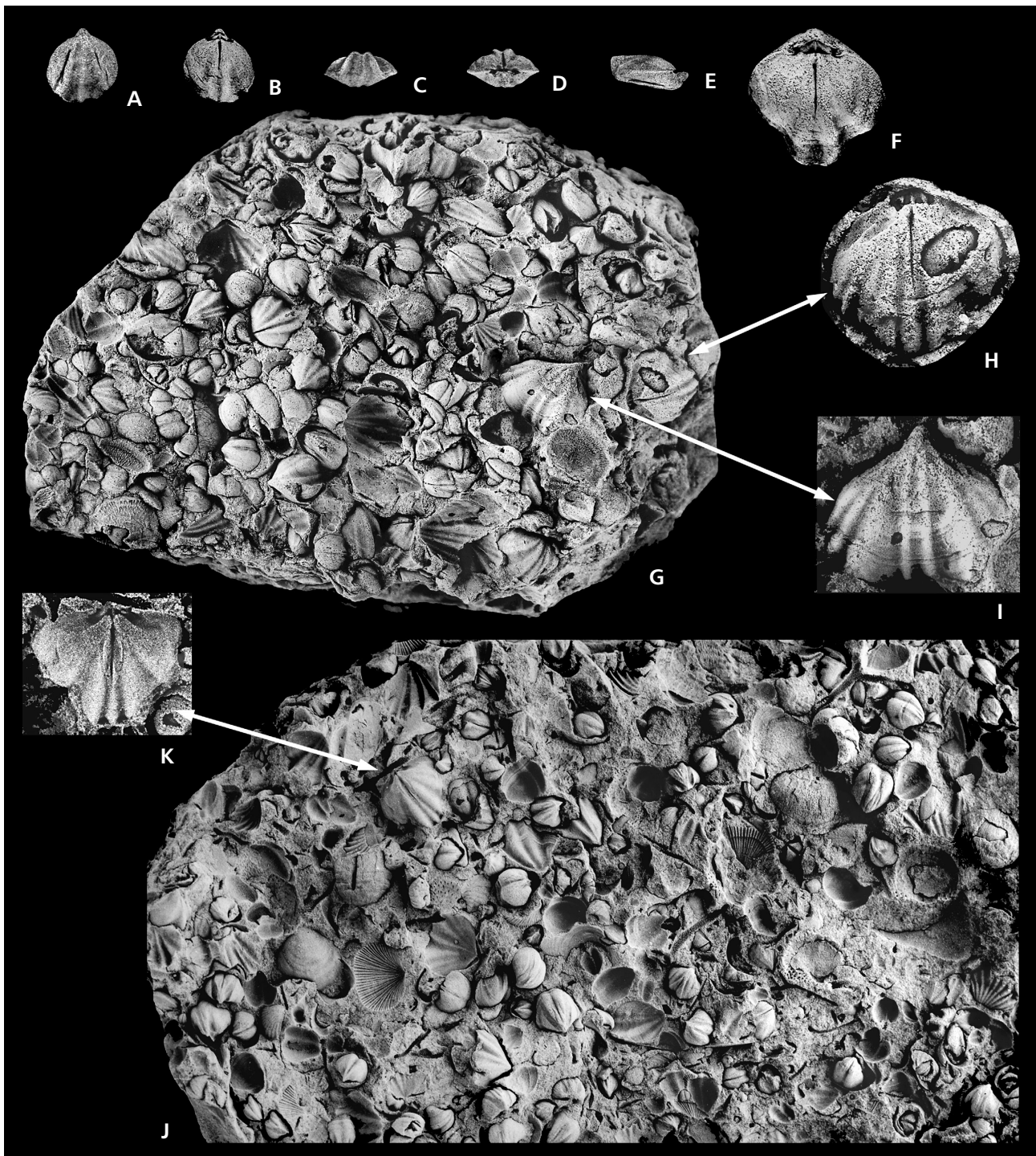


Figure 2. *Jacoburbirostrum duplicatum* (Hall, 1843). • A–F – hypotype J, IRScNBa12834, Chadakoin Formation, East Randolph, Cattaraugus County, New York; A–E – ventral, dorsal, anterior, posterior, and lateral views ($\times 1$); F – dorsal view ($\times 2$); costal formula: $\frac{2}{1}$; 0; $\frac{2}{3}$. • G – slab containing hypotypes H and I, Chemung beds, New Albion, Cattaraugus County, New York ($\times 1$). • H – hypotype H, NYSM 1186 (formerly $\frac{7214}{2}$), dorsal view [= pl. 55, figs 22, 24 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata* = pl. LVII, fig. 39 in Hall & Clarke (1893) as *Camarotoechia* (?) *duplicata*] ($\times 2$). • I – hypotype I, NYSM 1187 (formerly $\frac{7214}{3}$), ventral valve [= pl. 55, figs 23, 25 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata*] ($\times 2$). • J – slab containing hypotype G, Chemung beds, Conewango, Cattaraugus County, New York ($\times 1$). • K – hypotype G, NYSM 1185 (formerly $\frac{7214}{1}$), dorsal view [probably pl. 55, fig. 21 in Hall (1867) as *Rhynchonella* (*Stenocisma*) *duplicata*] ($\times 2$).

CHADWICK, G.H.			CASTER, K.E.	COOPER, G.A. <i>et al.</i>	TESMER, I.H.	KIRCH- GASSER, W.T. (2000)	HOUSE, M.R. & KIRCHGASSER W.T. (2008)			
(1923, 1924)	(1934)	(1935b)								
CHAUTAUQUAN Series			VENANGO stage	PANAMA conglomerate				Palmatolepis marginifera Zone		
		WOLF CREEK conglomerate								
	CHADAKOIN unit	Chagrin fauna with <i>Camarotoechia?</i> <i>duplicata</i>	CONNEAUT group	CHADAKOIN stage	TANNERS HILL red band (PA)	CHADAKOIN Formation	HAYMAKER beds		CHADAKOIN Formation	ELLICOTT Member
					ELLICOTT shale member		ELLICOTT shale			
			CUBA ss.	GIRARD stage	DEXTERVILLE shale member	CONNEAUT group	DEXTERVILLE (LILLIBRIDGE) shale and siltstone	DEXTERVILLE Siltstone Member		
					LILLIBRIDGE sandstone member					
			CANADAWAY group		GIRARD shale member	NORTHEAST shale	VETUSIA shale (GIRARD in NWPA)	CANADAWAY Formation	NORTHEAST Member	
					CUBA sandstone					
										Palmatolepis marginifera Zone
										Maeneceras aff. acutolaterale Zone

Figure 3. Middle Famennian (II-G) stratigraphic units of southwestern New York. Arrows indicate the range of *Jacoburbirostrum duplicatum* according to various authors.

C.? *duplicata* fauna started above the Candaway group, *i.e.* at the base of the Conneaut group (= base of the Chagrín fauna with *C.?* *duplicata*), the species being considered by Chadwick as confined to the Conneaut group of which it is the “diagnostic species”. Some authors followed suit: Cooper *in* Cooper *et al.* (1942, p. 1785, chart No. 4), who considered the species as the “chief index” or “index fossil” of the Conneaut group; Tesmer (1955, pp. 14, 19, 1964, pp. 6, 16, 37, 39, 1966, p. 49, 1974, p. B-4, 1975, pp. 33, 49, 56) and Metzger *et al.* (1974, p. B-20), who indicated clearly that *duplicatus* was the “index fossil” for the Dexterville or the “distinctive brachiopod” or the “index brachiopod” of that unit.

The Conneaut group, as defined by Chadwick (1931, manuscript, *fide* Caster, 1934, p. 136) includes strata from the base of the Cuba sandstone to the base of the Wolf Creek (Panama) conglomerate, in which the fauna has been modified by loss of *Delthyris mesacostalis* and the accession of *Camarotoechia (?) duplicata*. The Conneaut is the equivalent of the Chadakoin proposed by Chadwick (1923, p. 69; 1924, p. 154).

Dexterville, the stratum typicum of Jacoburbirostrum duplicatum. – The Dexterville shale member was proposed by Caster (1934, pp. 62–69, table between p. 62 and p. 63).

What Chadwick called Chadakoin unit, and Caster Chadakoin stage or Chadakoin monothem, *i.e.* the upper of the two stages of the Chautauquan series, was subdivided by Caster into four members. These are from base to top: Lillibridge sandstone member, Dexterville shale member, Ellicott shale member, and Tanners Hill red band. Of these, the three first members are new, and the Tanners Hill band outcropping only in Pennsylvania. The type section of the Dexterville shale member is “the section north side and at the foot of “Swan Hill”, Dexterville brick quarries, south of Chadakoin River in East Jamestown, New York”. The 139.75-foot outcropping at its type section represent, according to Caster (1934, p. 64) “only the upper part of the member ... where it is a blue shale and flag series carrying the Chadakoin phase of the ‘C’ (Chagrín) facies fauna”. Caster states that *Camarotoechia duplicata* is present from 60–134.75 feet below the top of the member with a *C. duplicata* zone between 129.75–134.75. It is highly probable that the 139.75 feet represent the full thickness of the Dexterville, because, according to Tesmer (1955, p. 14, 1964, p. 37, 1967, p. 266), its maximum thickness is about 120 feet in the Dunkirk and Jamestown quadrangles of Chautauqua County, and about 150 feet in the Cherry Creek quadrangle of Cattaraugus County.

Is the Dexterville clearly defined? The “Dexterville shale member” or “Dexterville shale monothem”, as proposed by Caster is composed of chocolate shales and greenish sandstones in its upper half (78.75 feet). Its lower half (61 feet) is composed of green and greenish shales, sandstones (greenish in the upper half), and occasional limy shales, sandy limestones and flags.

Dexterville as a lithostratigraphic unit. – The Dexterville Member of the Chadakoin Formation, which according to Tesmer (1955, pp. 14–16, 1964, pp. 31–35) includes the Volusia shale of Chadwick (1923, p. 69), and the Lillibridge sandstone of Caster (1934, p. 63) that “is not a distinct lithologic unit”. Defined as such the Dexterville “is composed of mostly light grey siltstone beds with some interbedded medium grey shale”, with “some siltstone layers (a foot in thickness), especially near the base of the member” (Tesmer 1967, p. 266), hence the name Dexterville Siltstone Member, introduced by Tesmer (1964, p. 31).

The base of the Dexterville “is usually marked by the introduction of grey siltstones” (Tesmer 1964, p. 14), the contact between the Northeast Shale Member and the Dexterville being either “sharp or transitional” or “placed where siltstones become abundant in the sequence” (Tesmer 1975, p. 42).

The top of the Dexterville, *i.e.* its contact with the Ellicott, is difficult to assess, because the lithological similarity of the two members, both represented by interbedded grey shales and siltstones (Tesmer 1966, p. 49, 1967, p. 266, 1975, p. 49). The Dexterville “usually contains a higher range of grey siltstones” than the Ellicott, “in which grey shales are more abundant”, but “the contrast between the two members is transitional at best” (Tesmer 1964, p. 35, 1975, p. 49).

The thickness of the Dexterville measured by Caster (1934, pp. 64–65) at the original Dexterville site is 139.75 feet, but “only the upper part of the member is shown”. Tesmer (1964, p. 38, 1967, p. 266, 1974, p. B-4) states that the Dexterville varies from about 40–120 feet, and that it is usually less than 100 feet in central and eastern Chautauqua County.

According to Tesmer (1966, p. 49, 1967, pp. 266, 267, 1974, p. B-4, 1975, p. 49), the Chadakoin Formation is not differentiated into members east of westernmost Cattaraugus County because it consists of interbedded light grey siltstones and medium grey shales that cannot be easily subdivided, either by fossils or by lithology.

Dexterville as a biostratigraphic unit. – Tesmer (1955, p. 14) included the Volusia shale in the Dexterville Member, because it contained *duplicatum*, and suggested confining the Dexterville Member to “those beds bearing the species”. In other words, *duplicatum* was limited to the Dexterville, and made it the “most easily recognized unit” in central and eastern Chautauqua County (Tesmer 1955,

pp. 14, 19, 1964, pp. 6, 35, 37, 1966, p. 49, 1967, p. 266, 1974, p. B-4) or the “index fossil of that unit” (Metzger *et al.* 1974, p. B-20). This has been recorded in the Devonian chart of the Geological Survey of the New York State Museum and Science Service by Rickard (1964, “ranges of selected species” as “*Pugnoides duplicatus*”), but, surprisingly, the species was dropped in the new edition of the chart by Rickard (1975, plate 3).

Tesmer (1955, pp. 9, 12, 15, 19, 1964, p. 14) defines the base and the top of the Dexterville by the first and last appearance of *duplicatus*. This is essentially valid for the Chautauqua County and the westernmost Cattaraugus County, because (see above) the two members of the Chadakoin Formation are not distinguished eastward of westernmost Cattaraugus County. This is also the *Pugnoides* range zone of Manspeizer (1963, fig. 1, p. 261) that covers the Volusia Shale, the Lillibridge Sandstone (both incorporated in the Dexterville by Tesmer; see above), and the Dexterville Formation. Tesmer’s (1964, pp. 35, 37) statements that “*P. duplicatus* appears confined to the Dexterville”, and that the “zone of *P. duplicatus* is approximately equivalent to the Dexterville” attenuates his 1955 position. It is important, because when precise data are available, *e.g.* Caster (1934, pp. 64–65 at Dexterville as *Camarotoechia duplicata*), and Barrier (1977 *vide* Baird & Lash, 1990 on Chautauqua Creek as “*Pugnoides duplicatus*?”), the species is mentioned only in the lower half of the Dexterville. This zone is of course not the zone of Caster (1934, p. 65), which is not used as a biostratigraphic unit. The last appearance of *Tylothyris mesacostalis* (Hall, 1843) has also been used by Tesmer (1955, p. 9, fig. 2, p. 11, p. 12, 1975, p. 42) for placing the base of the Dexterville in Chautauqua County and in westernmost Cattaraugus County. In the rest of Cattaraugus County, where *duplicatus* is absent, the base of the Dexterville is indicated by the last appearance of this species.

Rickard (1964, chart) put the Dexterville in the lower *Sporadoceras pompeckji* Zone (doIIß) in terms of House’s (1962) ammonoid zonation. *Sporadoceras pompeckji* is now called *Maeneceras aff. acutolaterale* (see House & Kirchgasser 2008, p. 86).

In terms of the conodont zonation the Dexterville lies in the *marginifera* Zone.

Distribution of Jacoburbirostrum duplicatum. – According to Tesmer (1955, p. 9, fig. 2, p. 11, 1964, pp. 6–7, 1966, p. 49, 1967, pp. 266, 267, 1974, p. B-4, 1975, pp. 33, 49, 50), *duplicatus* occurs, often in abundance, in many localities of central and eastern Chautauqua County. It is nearly completely absent in westernmost Cattaraugus County, where it is present only in a few localities, and is absent in the rest of that county. Localities are indicated by dots on a map drawn by Tesmer (1955, fig. 2, p. 11), and mentioned in several of his publications.

Caster (1934, p. 65) and Tesmer (1967, p. 267), who examined Butts's collection, gave a list of the species included in it, ignored Butts's (1903, pp. 992–993) mention of *duplicatus* in central (Salamanca) and southeastern Cattaraugus County (Olean), and in western Allegany County.

Williams (1887, pp. 58, 65, 69, 84, 96) was the first to mention specimens showing a vague resemblance to *duplicatus* in southwestern Cattaraugus County (“some varieties [of *Rhynchonella contracta*, var. *saxatilis*] approach the form called *R. duplicata* between Olean and Rock City”), and western Allegany County (“a variety of *R. contracta* very similar to fig. 23, pl. 55 [in Hall 1867], but not belonging to the species *R. duplicata*” in the Genesee section; *R. duplicata*? in Smith Quarry, Cuba; a “variety of *R. duplicata* often abundant in the Allegany County section”; and “*R. contracta*, small var., and approaching the type *R. duplicata*” at Clarksville). It is evident that Williams did not accept the presence of *duplicatus* in these two counties.

Occurrence of Jacoburbirostrum duplicatum outside southwestern New York State. – Mentions of *duplicatus* outside southwestern New York State are not valid. This can be easily ascertained when figures have been published and/or when collections are available. Otherwise, mere mentions in the literature are synonym of incorrect identifications; some have already been corrected, others will have to be progressively ironed out. The following list is not exhaustive.

North America. – Alaska: Buddington & Chapin [1929, p. 108 as *Camarotoechia* (?) *duplicata*], Upper Devonian limestone, Port Refugio, Suemez Island, SE Alaska, collected by Chapin, identified by E. Kirk; Savage *et al.* (1978, p. 371 as *C. (?) duplicata*, referring to Kirk's identification), Port Refugio, middle to late Famennian.

California: McAllister (1952, p. 19, pl. 2 as “*C.*” aff. “*C.*” *duplicata* and “*C.*” cf. “*C.*” *duplicata*, uppermost 35 feet of the Lost Burro Formation at the lower end of Lost Burro Gap, northern Panamint Range, Three Forks fauna (Conneaut group), identified by G.A. Cooper; Hunt & Mabey (1966, p. 41, referring to McAllister), Quartz Spring area, northern Paramount Range, Death Valley, SE California.

Iowa: Stainbrook (1948, p. 782 as *C. cf. duplicata*, referring to Stevenson 1941 and 1945).

Montana: Cooper *et al.* (1942, p. 1785 as “brachiopod almost identical to ‘*C.*’ *duplicata*”, Three Forks shale, Conneaut group).

Nevada: Walcott (1884, pp. 155, 157, 276, pl. XIV, fig. 8 as *Rhynchonella duplicata*), Eureka and White Pine Districts, Upper Devonian.

New Mexico: Stevenson (1941, p. 65; 1945, p. 239 as *C. cf. duplicata*), Sly Gap formation; Stainbrook (1948, p. 782 as *C. cf. duplicata*, referring to various publications

of Stevenson) stated that *C. cf. duplicata* “could be conspecific with” an Independence form.

Northwest Territories: Hume (1922, pp. 71B–72B as *Rhynchonella duplicata*), North Nahanni and Root Rivers area, *Leiorhynchus* Zone, Lower Famennian; Merriam (1940, p. 76 as “*R. duplicata*”), referring to Hume; Warren & Stelck (1950, p. 64 as *R. duplicata*), referring to Hume and Merriam). The Canadian species was put by Sartenaer (1969, pp. 63, 71) into the synonymy of *Eoparaphorhynchus maclareni* Sartenaer, 1961.

Pennsylvania: Lesley (1889, p. 887 as *Rhynchonella duplicata*; 1890, pp. 1057–1058 as *Stenoschisma duplicatum*, *Rhynchonella duplicata*, and *Atrypa duplicata*) in the Chemung group of Perry and Columbia counties of central Pennsylvania, and in the McKean and Tioga counties of northern Pennsylvania; cannot be assessed on account of the disappearance of the collections. Willard [1939, pp. 252, 287, 291 as *Camarotoechia duplicata* and *C. (?) duplicata*], although accepting the presence of the species in the Conneaut group and Honesdale sandstone of northern Pennsylvania, reported that he did not find it in rocks likely to contain them in Tioga County.

Murphy (1973, p. 3408) confirmed this observation when he wrote that the “Dexterville has not yielded this characteristic species [“*Pugnoides*” *duplicatus*] anywhere in Pennsylvania”, and so did Baird & Lash (1990, p. Sat. A19).

Virginia: Williams & Kindle (1905, p. 33, chart between p. 54 and p. 55 as *Camarotoechia duplicata*), about ½ mile north of Hicksville, Brushy Mountain, Kimberling shale (Chemung fauna). Bush & Brame (2010, table 1, p. 581, pp. 585, 587 as *Pugnoides duplicatus*), Allegheny Front (Appalachian foreland basin), Blizzard Member (late Frasnian) of the Foreknobs Formation.

Outside of North America. – Belgium: Destinez [1900 as *Rhynchonella* (*Stenocisma*) *duplicata* in the collection of Liège University], La Hesse (Tohogne, eastern border of the Dinant Synclinorium), middle Famennian (Fa2a), and Destinez [1905, p. M127 as *R. (S.) duplicata*], Aywaille (eastern border of the Dinant Synclinorium, no stratigraphic information given).

Conclusions

Jacoburbirostrum duplicatum is an abundant species in a small area of southwestern New York State (central and eastern Chautauqua County, and westernmost Cattaraugus County). It occurs in a moderately thick lithostratigraphic unit (Dexterville Siltstone Member of the Chadakoin Formation) without clearly definable base and top. The range of *J. duplicatum* within this unit is still not clear, but the species is known to be abundant in the lower half of the unit. A regional *J. duplicatum* Zone is evident.

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