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Journal of Geosciences, Osaka City University
Vol. 27, Art. 4, p. 119–141
March, 1984

Early Triassic Conodonts from Kashmir, India
Part 4: *Gondolella* and *Platyvillosus*

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(with 6 Tables and 6 Plates)

Introduction

In Part 4 of this work five species belonging to *Gondolella* and *Platyvillosus* are described. They are *Gondolella carinata* CLARK, *G. mosheri* KOZUR & MOSTLER, *G. milleri* MUELLER, *G. elongata* (SWEET), *G. jubata* (SWEET) and *Platyvillosus costatus* (STAESCHE). Stratigraphic ranges of these six species as well as the species described in Parts 1–3 will be given in a separate paper, in which Lower Triassic conodont zonation in Kashmir and Salt Range will be fully discussed.

Systematic Paleontology

Order CONODONTOPHORIDA EICHENBERG, 1930

Genus *GONDOLELLA* STAUFFER & PLUMMER, 1932

Gondolella carinata CLARK, 1959

Pl. 1, Figs. 1–11; Pl. 2, Figs. 1,3–5

1959 *Gondolella nevadensis* CLARK, p. 308, pl. 44, figs. 11–14.
1959 *Gondolella carinata* CLARK, p. 308–309, pl. 44, figs. 15–19.
1959 *Gondolella planata* CLARK, p. 309, pl. 44, figs. 8–10.
1966 *Gondolella carinata* CLARK — CLARK & MOSHER, p. 390, pl. 47, figs. 21–23.
1966 *Gondolella nevadensis* CLARK — CLARK & MOSHER, p. 391–392, pl. 47, figs. 28, 29.
1966 *Gondolella planata* CLARK — CLARK & MOSHER, p. 392, pl. 47, figs. 26, 27.
1970a *Neogondolella carinata* (CLARK) — SWEET, pl. 1, figs. 20, 23.
1970b *Neogondolella carinata* (CLARK) — SWEET, p. 240–241, pl. 3, figs. 1–17, 24, 26, 27.
1971 *Neogondolella carinata* (CLARK) — SWEET, MOSHER, CLARK, COLLINSON & HASENMUELLER, pl. 1, figs. 1, 6, 7.
1973 *Neogondolella carinata* (CLARK) — MOSHER, p. 165, pl. 19, figs. 1–3, 9.
1973 *Neogondolella nevadensis* (CLARK) — MOSHER, p. 169, pl. 19, figs. 17, 18, 24.
1973 *Neogondolella planata* (CLARK) — MOSHER, p. 169, pl. 19, figs. 15, 20.
1973 *Neogondolella carinata* (CLARK) — MCTAVISH, p. 288–289, pl. 2, fig. 13.
1973 *Neogondolella planata* (CLARK) — MCTAVISH, p. 290, pl. 2, figs. 15, 16, 18, 19.

For abbreviation of letters in the tables of measurement in the following description see Part 2.

1976 *Neogondolella carinata* (CLARK) — SWEET, pl. 16, figs. 14, 15.
1977 *Neogondolella carinata* (CLARK) — GOEL, p. 1098, pl. 3, figs. 10, 11.
1980 *Gondolella carinata* CLARK — NAKAZAWA, BANDO & MATSUDA, pl. 4, figs. 5, 6a, b.
1980 *Gondolella orientalis* BARSKOV & KOROLEVA — BANDO, BHATT, GUPTA, HAYASHI, KOZUR, NAKAZAWA & WANG, pl. 9, figs. 9, 14.
1981a *Gondolella carinata* CLARK — BHATI, JOSHI & AROFA, pl. 1, figs. 1–3, 7, pl. 2, figs. 7, 8, 13.
1981a *Gondolella orientalis* BARSKOV & KOROLEVA — BHATI, JOSHI & ARORA, pl. 1, figs. 4, 5, 14–17, pl. 2, figs. 1, 4, 11, 12, 19.
1981 *Neogondolella subcarinata* SWEET — MURATA, pl. 21, figs. 4, 5.
1981 *Neogondolella carinata* (CLARK) — MURATA, pl. 21, figs. 6, 7.
non 1973 *Neogondolella carinata carinata* (CLARK) — SWEET in TEICHERT, KUMMEL & SWEET, p. 435–436, pl. 11, figs. 1–4, text-figs. 16I-L.
non 1973 *Neogondolella carinata subcarinata* SWEET n. subsp. — SWEET in TEICHERT, KUMMEL & SWEET, p. 436, pl. 13, figs. 12–17, text-figs. 16E-H.
non 1973 *Neogondolella carinata subcarinata* SWEET n. subsp.? — SWEET in TEICHERT, KUMMEL & SWEET, p. 436–438, pl. 13, figs. 1–3.
non 1975 *Gondolella carinata subcarinata* (SWEET) — KOZUR, p. 19, pl. 2, figs. 9, 10.
non 1981 *Neogondolella carinata* SWEET — ZHAG, SHENG, YAO, LIANG, CHEN, RUI & LIAO, pl. 6, figs. 10, 11, pl. 7, figs. 9, 10.

Diagnosis:—Species characterized by platform type (gondolellid) element with thick and wide platform, with denticles low and node-like at central and posterior part, slightly high and discrete at anterior part and with flat and wide keel.

Description:—In oral view, unit symmetrical or subsymmetrical. Carina straight or slightly bowed at central and anterior part. Posterior end of carina terminated at cusp in many specimens, continuing further posterior to the cusp in other specimens. In the latter type, posterior part of carina deflected laterally at an angle of about 135° at cusp in some specimens (Pl. 1, Fig. 2, Pl. 2, Fig. 5), bifurcated at cusp in some other specimens (Pl. 1, Fig. 1) and straight in remaining specimens. Platform margin of posterior part symmetrical to subsymmetrical in the latter two forms and asymmetrical in the former form. Posterior margin of platform subangular in the specimens with bifurcated carina posterior to the cusp, distorted with deflected carina, rounded with straight carina or without denticles posterior to the cusp. Widest part of platform situated slightly anterior to the center in many specimens, about central or slightly posterior to the center in other specimens. In the former specimens platform gradually tapering anteriorly and faintly tapering posteriorly with straight platform margin in general. In the latter specimens platform margin arched in general. In a few specimens of both types, platform margin slightly undulated. In some specimens of both types, platform margin slightly concaved at anterior part and anterior end of carina free from platform.

In lateral view, aboral surface gently to moderately arched at central and anterior part, fairly bowed aborally around pit, protruded aborally at just posterior to the pit, nearly straight from the protruded part to posterior end of platform except for swelling of posterior margin of keel, rounded at posterior end. Platform gently arched. Summit line of denticles nearly flat or slightly arched. Cusp largest among denticles at posterior part, protruded posteriorly from platform in most specimens. Denticles of posterior and

central part low and not observable in some specimens and slightly protruded in other specimens. Denticles of anterior part, high comparing with that of central and posterior part, fused at base, fairly wide and triangular in shape.

In aboral view, keel widest at posterior part, gradually tapering anteriorly, in some specimens, faintly tapering anteriorly at anterior part in many specimens, widest at anterior to the center in a few specimens. Posterior part of keel, nearly similar in outline to posterior margin of platform. Keel slightly swelling at margin.

In transverse section, both sides of platform forming an angle of 170–180°. Platform bulged and arched in oral surface; the ratio of thickness to width about 0.23 around thickest part.

Measurement: (Based on 18 specimens, Table 1)—Length 0.39–1.03 mm; width 0.14–0.36 mm; height at central part 0.07–019 mm; height at anterior part 0.07–0.30 mm; ratio of length to width 2.1–3.2; number of denticles posterior to the cusp 7–17.

Table 1. Measurement of *G. carinata* CLARK.
Hc: Height at central part.
Ha: Height at anterior part.
Na: Number of denticles from cusp to anterior end.
Np: Number of denticles posterior to the cusp.

Specimen (OCU)	Bed no.	Pl.	Fig.	L	W	Hc	Ha	L/W	Na	Np
3006–11	57	1	1	0.97	0.35	—	0.20	2.8	—	—
3009–2	63	1	2	1.03	0.44	0.19	0.30	2.3	14	2
–3	63			0.88	0.36	0.16	0.20	2.4	—	1
–4	63	1	3	1.03	0.36	0.15	0.25	2.9	17	0
–5	63	1	4	0.80	0.30	0.15	0.18+	2.7	11	0
3010–1	64	2	4	0.72	0.33	0.15	0.18	2.2	13	1
–2	64	2	5	0.69+	0.34	0.15	—	2.0+	11+	1
–3	64	2	3	0.86	0.34	0.15	0.18	2.5	12	0
–4	64			0.62	0.30	0.11	0.18	2.1	11	0
–5	64	1	10	0.58	0.22	0.11	0.12	2.6	11	0
–6	64	1	8	0.44	0.16	0.08	0.10	2.8	7	0
–7	64	1	9	0.39	0.14	0.07	0.07	2.8	8	0
–8	64	1	6	0.72	0.27	0.13	0.16	2.7	—	—
–9	64			0.60+	0.25	0.11	0.15	2.4+	12+	0
–10	64	1	11	0.55	0.17	0.11	0.11	3.2	13	0
–11	64	1	7	0.49+	0.19	0.09	0.10	2.6+	11+	0
–12	64			0.84	0.36	0.15	0.21	2.3	—	—
–13	64	1	5	0.79	0.29	0.11	0.17	2.9	12	0

Remarks:—CLARK (1959) reported three forms of Early Triassic *Gondolella*. They are *G. carinata, G. planata* and *G. nevadensis*. The author agrees with SWEET (1970b, p. 241) in that these three forms of *Gondolella* represent a single species.

SWEET (1973) reported three types of *Neogondolella* (=*Gondolella*) from Permian strata in Julfa, Iran. They are *Neogondolella carinata carinata, N. c. subcarinata* and *N.*

orientalis. The author assigns these three forms of *Gondolella* to *G. subcarinata* group, which is distinct from *G. carinata,* as will be discussed below. SWEET (1973) regarded the former two forms as subspecies of *G. carinata*. However, they are quite different from *G. carinata* of Nevada, Kashmir and Salt Range in certain feature based on the author's observation of Permian specimens of Julfa and Abadeh, Iran, namely: in transverse section, platform of the *G. subcarinata* group in Iran is thin and forms open V-shape (Pl. 2, Fig. 2), while platform of Early Triassic *G. carinata* in Kashmir, Salt Range and Himalaya is thick and nearly flat (Pl. 2, Fig. 1).

KOZUR in BANDO and others (1980) stated that Late Permian conodonts of Iran and Transcaucasia are correlative with that of the *Otoceras* Bed. According to BANDO and others (1980), *G. subcarinata* and *G. orientalis* are found in the *Otocersa woodwardi* Zone in Spiti Himalaya (fig. 4; pl. 9, fig. 9). The author observed the Spiti specimens collected and studied by BHATT and JOSHI, but he has not found *G. subcarinata* group with thin and open V-shaped platform among specimens from the *Otoceras—Ophiceras* beds. All of these *Gondolella* specimens are assignalbe to *G. carinata.*

Late Permian *G. orientalis* has the above-mentioned essential feature of *G. subcarinata* group and is furthermore characterized by carina which does not extend to the posterior end of platform, as stated in original description by BARSKOV & KOROLEVA (1970). KOZUR (1975) ignored this important feature of *G. orientalis*. *G. orientalis* is not found at all among specimens from the *Otoceras* Zone and younger strata in Kashmir, Salt Range and Spiti. On the other hand, a specimen figured in BANDO and others (1980, pl. 9, figs. 2a, 2b) from Longtan Formation, Changxing, Zhejiang, South China, originally referred to as *G.* cf. *planata*, was later assigned to *G. orientalis* correctly by ZHAO and others (1981, pl. 5, figs. 13, 14). Late Permian strata of South China and Iran are abundant in *G. subcarinata* group but lack *G. carinata*. However, it is remarked additionally that in the Upper Permian of Kashmir both thin and thick platform types of *Gondolella* are found by the author.

Occurrence:—Bed nos. 57, 59, 61, 63, 64, 65, 66, 68, 70.

Gondolella mosheri KOZUR & MOSTLER, 1976

Pl. 2, Figs. 6–8

1976 *Gondolella mosheri* KOZUR & MOSTLER, p. 8, pl. 1, figs. 9–12.
1978 *Neogondolella planata* (CLARK) — WEITSCHAT & LEHMANN, p. 97, pl. 14, figs. 1–5.
1978 *Neogondolella nevadensis* (CLARK) — WEITSCHAT & LEHMANN, p. 97–98, pl. 14, figs. 6–10.

Description:—In oral view, unit symmetrical to subsymmetrical. Carina straight or slightly bowed. Platform fairly wide comparing with the length of unit, widest near posterior end, tapering anteriorly, not continuing to the anterior end and forming a teardrop shape. Cusp laterally compressed and strongly protruded posteriorly from posterior margin of platform.

In lateral view, unit fairly arched. Posterior end of aboral surface protruded posteriorly. Cusp large, situated at posterior end of carina and strongly inclined posteriorly

Denticles 6 to 11 in number, laterally compressed, pointed at top, triangle shaped, low at central part, increasing height posteriorly and anteriorly, but becoming lower again at anterior end, about vertical at anterior end, increasing reclined angle posteriorly, fused at base. Platform fairly upturned.

In aboral view, keel wide, terminated at pit with surrounding loop, continuing anteriorly with central groove, but gradually decreasing width anteriorly. Posterior end of loop protruded posteriorly from platform.

Measurement: (Based on 3 specimens, Table 2)—Length 0.30–0.70 mm; width 0.15–0.29 mm; height at central part 0.12–0.17 mm; ratio of length to width 2.0–2.4; number of denticles 11.

Table 2. Measurement of *G. mosheri* KOZUR & MOSTLER.
Hc: Height at central part.
All specimens are from Bed no. 90c.

Specimen (OCU)	Pl.	Fig.	L	W	Hc	L/W	N
3041–1	2	6	0.70	0.29	0.17	2.4	11
–2	2	7	0.60	0.25	0.17	2.4	11
–3	2	8	0.30	0.15	0.12	2.0	11

Remarks:—This species is found in the upper Smithian (*Wasatchites tardus* Zone and its correlatives) of Kashmir, Dolpo area (Nepal) and Spitsbergen. Specimens of each locality reveal some morphological individuality, but they are classified into a single species in view of the following common features, namely: platform is wide and teardrop shape in oral view and is upturned in general; posterior and anterior denticles are high, reclined and strongly protruded posteriorly.

In Kashmir specimens, denticles at the central part of carina are fairly high, discrete and pointed. In Nepal specimens (KOZUR & MOSTLER, 1976), platform is widest at posterior end and is concaved at posterior side. In Spitsbergen specimens (WEITSCHAT & LEHMANN, 1978), platform is not so wide in some specimens, and denticles at the central part of carina are low and fused. So these specimens look similar to *G. elongata*, but they are distinguished from *G. elongata* by teardrop shape.

This species is distinguished from *G. carinata* by thin and upturned platform and high denticles.

According to the author's biostratigraphic studies both in Salt Range and Kashmir, the occurrence of this species is limited to a short interval in the upper Smithian of the two areas.

Occurrence:—Bed no. 90c.

Gondolella milleri MUELLER, 1956

Pl. 3, Figs. 1–4

1956 *Gondolella milleri* MUELLER, p. 823, pl. 95, figs. 1–9.

1956 *Gondolella eotriassica* MUELLER, p. 823–824, pl. 95, figs. 10, 11.
1966 *Gondolella milleri* MUELLER — CLARK & MOSHER, p. 390, pl. 47, figs. 30–35.
?1968 *Gondolella* cf. *milleri* MUELLER — HAYASHI, p. 70, pl. 2, figs. 4a-c.
1971 *Neogondolella milleri* (MUELLER) — SWEET, MOSHER, CLARK, COLLINSON & HASENMUELLER, pl. 1, fig. 37.
1973 *Neogondolella milleri* (MUELLER) — MOSHER, p. 167, pl. 19, figs. 22, 23, 25.
1976 *Gondolella milleri parva* KOZUR & MOSTLER, p. 7–8, pl. 1, fig. 7.
1979 *Neogondolella milleri* (MUELLER) — BURYI, p. 64–65, pl. 11, figs. 1–8; pl. 15; pl. 16.
1979 *Neogondolella milleri* (MUELLER) — SOLIEN, p. 302, pl. 2, figs. 19–26.

Measurement: (Based on 4 specimens, Table 3)—Length 0.61–0.81 mm; width 0.25–0.34 mm; height at central part 0.19–0.26 mm; ratio of length to width 2.4–2.7; number of denticles 11–13.

Table 3. Measurement of *G. milleri* MUELLER.
Hc: Height at central part.
All specimens are from Bed no. 90d.

Specimen (OCU)	Pl.	Fig.	L	W	Hc	L/W	N
3042–1	3	1	0.72	0.29	0.19	2.5	11
–2	3	2	0.81	0.34	0.26	2.4	13
–3	3	3	0.61	0.25	0.24	2.4	12
–4	3	4	0.67	0.25	0.20	2.7	10?

Remarks:—Kashmir specimens agree well with specimens described in detail by MUELLER (1956). Carina is relatively higher than platform margin in large specimen. Grooves which are parallel to the central groove are observable on keel in large specimens but are not found in small specimens. Some large specimens are similar to the specimen described as "*G. eotriassica*" by MUELLER (1956).

G. milleri is found in a very short interval in Kashmir, Salt Range and Nevada. This species is found associated with Late Smithian ammonites of *Wasatchites tardus* Zone by TOZER (1967) and its correlatives in many areas of the world (e.g. SOLIEN, 1979; WEITSCHAT & LEHMANN, 1978).

Occurrence:—Bed no. 90d.

Gondolella elongata (SWEET), 1970

Pl. 3, Figs. 5–8, Pl. 4, Figs. 1–10

1970b *Neogondolella elongata* SWEET, p. 141–143, pl. 2, figs. 4, 5, 6–8: pl. 3, figs. 18, 23, 25.
1973 *Neogondolella jubata* SWEET — MOSHER, p. 167, pl. 19, fig. 27.
1977 *Neogondolella polygnathiformis* (BUDUROV & STEFANOV) — GOEL, p. 1099, pl. 3, figs. 20, ? 23. (non figs. 21, ? 22)
1979 *Neogondolella jubata* SWEET — BURYI, p. 63–64, pl. 10, figs. 1–6.
1981a *Neogondolella jubata* SWEET — CHHABRA, pl. 1, figs. 1, 4.
1981a *Neogondolella elongata* SWEET — CHHABRA, pl. 1, figs. 2, 3.
1981b *Neogondolella jubata* SWEET — CHHABRA & SAHNI, pl. 2, figs. 3, 4, 8, 10, 13.
1981b *Neogondolella elongata* SWEET — CHHABRA & SAHNI, pl. 2, figs. 1, 2, 5.

Description:—In oral view, unit elongated and subsymmetrical. Carina straight or slightly bowed, terminated at cusp posteriorly. Discrete one or two conical denticles generally situated at posterior margin of platform posterior to the cusp. Widest part of platform at just anterior to the center or continuing from that level to posterior part in many specimens (Pl. 4, Fig. 1) and at just posterior to the center in some specimens (Pl. 3, Fig. 7). Platform generally rounded at posterior end, gradually tapering anteriorly in many specimens (Pl. 3, Fig. 7) and rapidly tapering anteriorly into mid-lateral rib of free blade in some specimens (Pl. 4, Fig. 3, 4). Lateral margin of platform smoothly arched in many specimens (Pl. 3, Fig. 7) and irregularly undulated in some specimens (Pl. 4, Fig. 2).

In lateral view, unit gently arched in many specimen, fairly arched just posterior to the center in some specimens. Aboral surface slightly protruded around basal pit, slightly swelling at posterior margin of keel. Aboral surface and anterior side of unit forming an angle of about 70°. Anterior 4 to 6 denticles prominent, higher than posterior denticles fused at lower half in many specimens (Pl. 4, Fig. 3) and fused at base to nearly top in some specimens (Pl. 4, Fig. 4). In the latter specimens, anterior part of carina forming plate with undulated oral surface. Middle part of carina low, strongly fused and forming ridge in many specimens (Pl. 3, Figs. 5–7) and faintly denticulated in some specimens (Pl. 4, Fig. 1), slightly swelling from platform or hidden by upturned platform margin. Except for conical denticle on posterior margin of platform, posterior 1 to 3 denticles prominent in some specimens and prominent denticle absent in other specimens. Conical denticle on posterior margin of platform smaller than other denticles in some specimens

Table 4. Measurement of *G. elongata* (SWEET).
Hc: Height at central part.
Ha: Height at anterior part.

Specimen (OCU)	Bed no.	Pl.	Fig.	L	W	Hc	Ha	L/W	N
3045–1	91c	3	5	1.14	0.30	0.14	0.33	3.8	—
–2	91c	3	8	1.05	0.30	0.16	0.28	3.5	—
–3	91c			1.24	0.36	0.21	0.37	3.4	14
–4	91c	3	7	1.09	0.34	0.17	0.26	3.2	—
3047–2	91g	3	6	1.12	0.49	0.11	0.31+	2.3	—
–3	91g			1.03+	0.40	0.14	0.30	2.6+	—
–4	91g	4	2	0.88+	0.35	0.13	0.22	2.5+	—
–5	91g	4	3	0.74+	0.33	0.13	0.25	2.2+	13
–6	91g	4	5	0.63	0.26	0.11	0.17	2.4	—
–7	91g	4	6	0.66	0.21	0.13	0.20	3.1	12
–8	91g	4	8	0.67+	0.26	0.12	0.18	2.6	14
–16	91g	4	1	0.86	0.29	0.13	0.27	3.0	14
–17	91g	4	7	0.82	0.24	0.11	—	3.4	—
3049–2	92a	4	9	0.70	0.20	0.12	0.17+	3.5	—
3056–3	K95	4	4	0.93	0.36	0.15	0.29	2.6	—

(Pl. 3, Fig. 8) and larger than posterior denticles in many specimens (Pl. 3, Fig. 1).

In aboral view, keel widest near posterior end, gradually tapering anteriorly and terminated posteriorly at pit with surrounding loop in many specimens (Pl. 3, Figs. 5, 6), widest around center in a few specimens (Pl. 4, Fig. 3). Basal pit and central groove observable but faint.

Measurement: (Based on 15 specimens, Table 4)—Length 0.63–1.24 mm; width 0.20–0.49 mm; height at central part 0.11–0.21 mm; height at anterior part 0.17–0.37 mm; ratio of length to width 2.3–3.8.

Remarks:—Some specimens referable to *G. elongata* have been assigned to other speices in several papers (see synonym list). *G. jubata* is easily distinguishable from *G. elongata* by its carina with many highly fused denticles of nearly equal height. As mentioned already (p. 122–123), *G. mosheri* is characterized by high denticles, teardrop shaped platform in oral view and carina free from platform anteriorly, and is distinct from *G. elongata* in these respects.

Some specimens of *G. carinata* which is quite variable in morphology look similar to *G. elongata*, but in the former, platform is wider and thicker, and the central part of carina is less strongly fused than in the latter.

Middle to Late Triassic species *G. navicula navicula* and especially *G. n. steinbergensis* (MOSHER, 1968) resemble *G. elongata*, but these subspecies differs from *G. elongata* in that the unit is larger and more elongated and that carina is lower and highly fused except for conical denticle on the posterior margin of platform.

Specimens of this speciès, found from some horizons of Spathian age (i.e. Bed no. K95) looks similar to *G. polygnathiformis*. GOEL (1977, pl. 3, fig. 20) assigned this type of *G. elongata* to *G. polygnathiformis*, but platform of *G. polygnathiformis* is thicker and is not upturned.

Occurrence:—Bed nos. 91a, 91b, 91c, 91d, 91e, 91f, 92a, K95.

Gondolella jubata (SWEET), 1970

Pl. 5, Figs. 1–8; Pl. 6, Figs. 1–5

1970b *Neogondolella jubata* SWEET, p. 243–244, pl. 2, figs. 1–3, 9–6, 16.
1970 *Neogondolella eagaea* BENDER, p. 516–517, pl. 4, fig. 1. (non pl. 3, figs. 21–26)
1971 *Neogondolella jubata* SWEET — SWEET, MOSHER, CLARK, COLLINSON & HASENMUELLER, pl. 1, figs. 17, 20.
1973 *Neogondolella jubata* SWEET — MCTAVISH, p. 289, pl. 2, figs. 1, 4, 5, 8, 9, 12.
1973 *Neogondolella regale* MOSHER — MOSHER, p. 169, pl. 19, figs. 28, 32. (non pl. 19, figs. 21, 29)
1976 *Neogondolella jubata* SWEET — WANG & WANG, p. 408–409, pl. 5, figs. 10–12, 14–16.
1977 *Neogondolella polygnathiformis* (BUDUROV & STEFANOV) — GOEL, p. 1099, pl. 3, figs. 21, ?22. (non pl. 3, figs. 20, ?23)
?1979 *Neogondolella jubata* SWEET — SOLIEN, p. 301–302, pl. 2, figs. 1, 6, 8, 11, 15.

Measurement: (Based on 14 specimens, Table 5)—Length 0.39–1.23 mm; width

Table 5. Measurement of *G. jubata* (SWEET).
Hc: Height at central part.
Ha: Height at anterior part.

Specimen (OCU)	Bed no.	Pl.	Fig.	L	W	Hc	Ha	L/W	N
3047–9	91g	5	4	1.23+	0.31	0.26	0.32+	4.0	16+
–10	91g	5	5	0.88	0.20	0.20	0.23+	4.4	—
–11	91g	5	3	0.89	0.35	0.18	0.26+	2.5	16?
–12	91g	5	7	0.82	0.24	0.20	0.31	3.4	—
–13	91g	5	2	0.87	0.32	0.19	0.26	2.7	19
–14	91g			1.05	0.28	—	0.37+	3.8	—
–15	91g	5	1	1.00	0.31	0.19	0.29	3.2	—
3048–5	91h	6	2	0.39	0.13	0.13	0.12	3.0	11
3056–1	K95	5	8	0.85	0.30	0.17	0.33	2.8	—
–2	K95	5	6	0.75	0.30	0.13	0.30	2.5	—
3057–3	K96b	6	1	0.91+	0.24	0.14	0.25	3.8+	—
–4	K96b	6	4	0.61	0.15	0.14	0.18	4.1	19
–5	K96b	6	5	0.50	0.15	0.15	0.16	3.3	18
–6	K96b	6	3	0.77	0.24	0.14	0.23	3.2	—

0.13–0.35 mm; Height at central part 0.13–0.26 mm; height at anterior part 0.12–0.37 mm; ratio of length to width 2.5–4.4.

Remarks:—Kashmir specimens at hand agree well with specimens described by SWEET (1970b) but some change in morphological features is noticed according to stratigraphic horizons.

In the middle part of Spathian strata (basal part of thin red limestone bed=Bed no. K95), characteristic specimens of this species are found. In these specimens, carina is free from platform in anterior one-third and is high and highly fused at free part. Specimens similar to this type are assigned to *G. polygnathiformis* by GOEL (1977, pl. 3, figs. 21, ?23) but are distinguished from *G. polygnathiformis* by upturned thin platform.

In the lower part of Spathian strata, platform is slightly undulated irregularly in oral view and oral surface of carina is irregularly undulated in lateral view in many specimens. Denticles are highly fused and each denticle is not distinguishable each other at central part in many specimens.

Above the Bed no. K95, platform margin become smooth and oral surface of carina is regularly denticulated in many specimens. Denticles of carina are highly fused but each denticles are distinguishable by discrete apical part and visible faint groove between two denticles on the lateral surface of carina in many specimens. Anterior part of carina is free from platform in some specimens.

Some specimens figured as "*Neogondolella*" *aegaea* (BENDER, 1970, pl. 4, fig. 1) are identifiable with *G. jubata*, although holotype of "*N.*" *aegaea* (BENDER, 1970, pl. 3, fig. 25) may be assigned to *N. timorensis*.

Occurrence:—Bed nos. 91e, 91f, 91h, 92a, K95, K96b.

Genus *PLATYVILLOSUS* CLARK, SINCAVAGE & STONE, 1964

Platyvillosus costatus (STAESCHE), 1964

Pl. 6, Figs. 6–10

1964 *Eurygnathodus costatus* STAESCHE, p. 269–271, pl. 28, figs. 1–6.
1971 *Platyvillosus costatus* (STAESCHE) — SWEET, MOSHER, CLARK, COLLINSON & HASENMUELLER, pl. 1, fig. 32.
1973 *Eurygnathodus costatus* STAESCHE — BUDUROV & PANTIC, p. 51–52, pl. 1, figs. 1–15.
1977 *Platyvillosus costatus* (STAESCHE) — GOEL, p. 1098, pl. 2, figs. 15–21.

Measurement: (Based on 5 specimens, Table 6)—Length 0.21–0.27 mm; width 0.09–0.12 mm; Height 0.10–0.14 mm; ratio of length to width 1.9–2.7.

Table 6. Measurement of *P. costatus* (STAESCHE). All samples from Bed no. 82.

Specimen (OCU)	Pl.	Fig.	L	W	H	L/W
3030–4	6	8	0.23	0.12	0.14	1.9
–5	6	6	0.23	0.09	0.13	2.6
–6	6	7	0.21	0.09	0.11	2.3
–7	6	10	0.24+	0.12	0.10	2.0
–8	6	9	0.27?	0.10	0.10	2.7

Remarks:—In Kashmir specimens, a form similar to the juvenile form described by STAESCHE (1964, Abb. 38) is included (Pl. 6, Figs. 6, 9, 10 in this paper), but other matured forms by STAESCHE (1964, Abb. 36, 37, 39) are not found. In Kashmir specimens, transverse ridges on platform are 5 to 7 in number and are discrete.

Among Kashmir specimens a form with many nodes on platform (Pl. 6, Fig. 8) is found, which has not been reported by previous worker. This form is assigned to *P. costatus*, because a transitional form between the juvenile form with transverse ridge (STAESCHE, 1964) and the newly found form with many nodes is also found among Kashmir specimens (Pl. 6, Fig. 7). These forms are regarded as variable morphotypes within a single species.

Platyvillosus costatus and *P. asperatus* are regarded as diagnostic species of early Spathian age (Zone 10, *Platyvillosus* Zone) by SWEET and others (1971). In Kashmir and Spiti (GOEL, 1977), however, *P. costatus* is found together with *Neospathodus nepalensis* and *N. pakistanensis*, so that specimens of *P. costatus* from Kashmir and Spiti are regarded as late Dienerian to early Smithian in age (Zone 6, *N. pakistanensis* Zone by SWEET *et al.* 1971).

Occurrence:—Bed no. 82.

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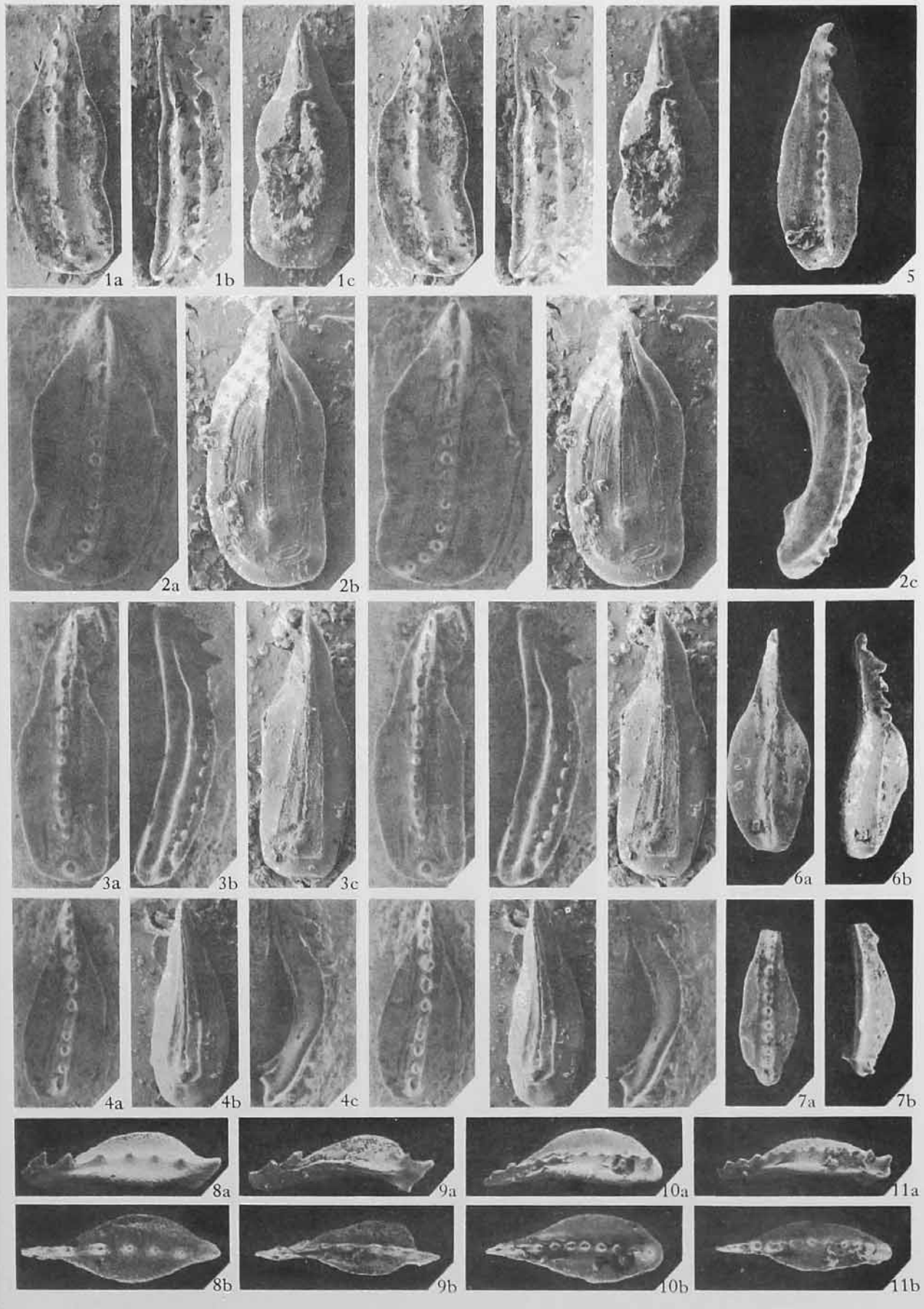
Explanation of Plate 1

Figures 1a, 1b, 1c, 2a, 2b, 3a, 3b, 3c, 4a, 4b, 4c
in stereoscopic pairs.

Figs. 1–11. *Gondolella carinata* CLARK .....Page 119

1. OCU 3006–11, Bed no. 57, ×46. Oral (a), lateral oral (b) and aboral (c) views.
2. OCU 3009–2, Bed no. 63, ×46. Oral (a), aboral (b) and lateral (c) views.
3. OCU 3009–4, Bed no. 63, ×46. Oral (a), lateral (b) and aboral (c) views.
4. OCU 3009–5, Bed no. 63, ×46. Oral (a), aboral (b) and lateral (c) views.
5. OCU 3010–13, Bed no. 64, ×46. Oral view.
6. OCU 3010–8, Bed on. 64, ×46. Oral (a) and lateral oral (b) views.
7. OCU 3010–11, Bed no. 64, ×46. Oral (a) and lateral oral (b) views.
8. OCU 3010–6, Bed no. 64, ×68. Lateral oral (a) and oral (b) views.
9. OCU 3010–7, Bed no. 64, ×68. Lateral oral (a) and oral (b) views.
10. OCU 3010–5, Bed no. 64, ×46. Lateral oral (a) and oral (b) views.
11. OCU 3010–10, Bed no. 64, ×46. Lateral oral (a) and oral (b) views.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Explanation of Plate 2

Figures 6a, 6b, 6c, 7a, 7b, 7c, 8a, 8b in stereoscopic pairs.

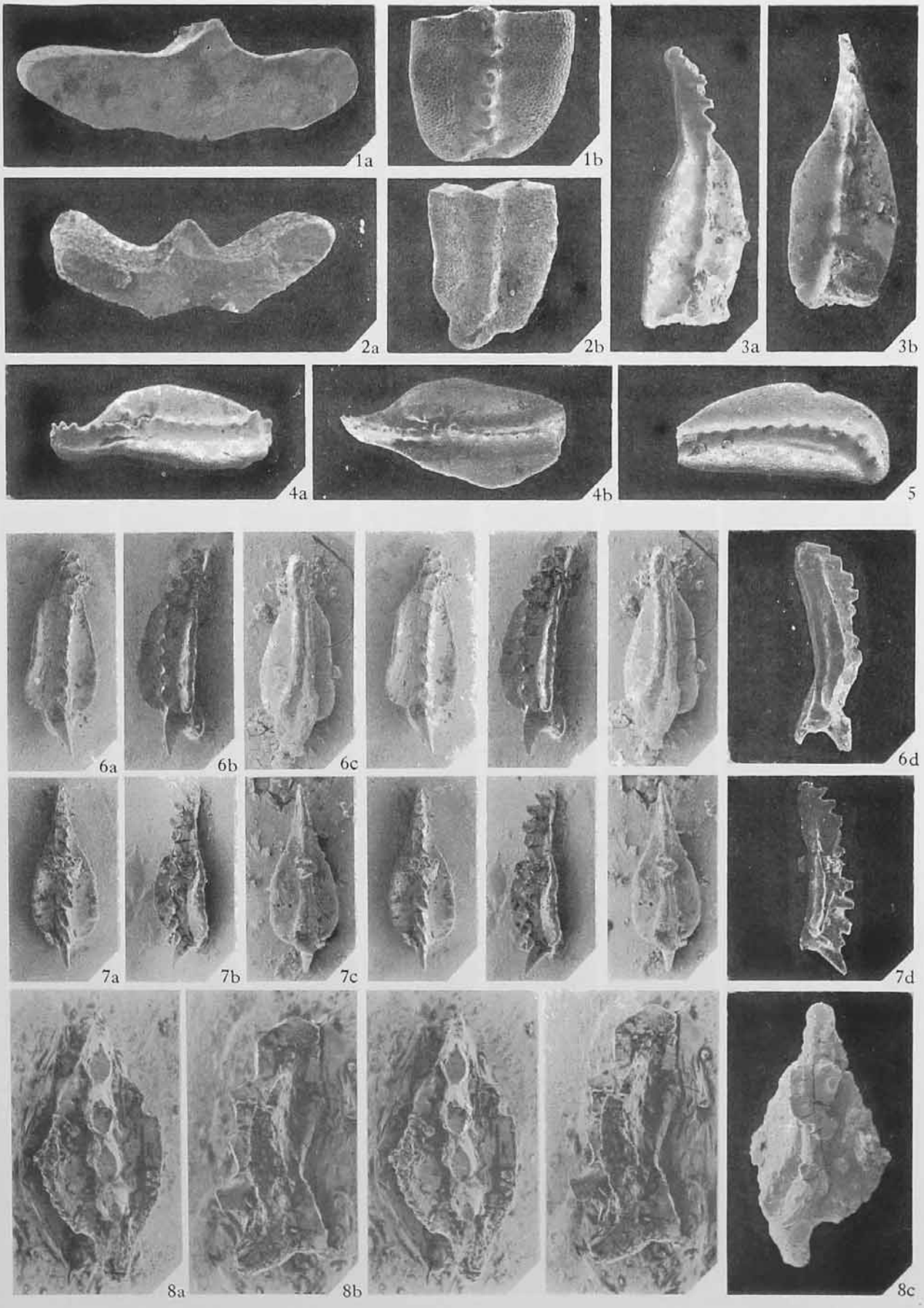
Figs. 1,3–5. *Gondolella carinata* CLARK .....Page 119

1. Bed no. 57, Transverse section (a, ×136) and oral view (b, ×68).
3. OCU 3010–3, Bed no. 64, ×46. Lateral oral (a) and oral (b) views.
4. OCU 3010–1, Bed no. 64, ×46. Lateral oral (a) and oral (b) views.
5. OCU 3010–2, Bed no. 64, ×46. Oral view.

Fig. 2. "*Gondolella carinata*" of *Paratirolites* bed (uppermost Permian) in Adabeh, Iran (collected by BANDO). Transverse section (a, ×136) and oral view (b, ×68).

Figs. 6–8. *Gondolella mosheri* KOZUR & MOSTLER .....Page 122

6. OCU 3041–1, Bed no. 90c, ×46. Oral (a), lateral oral (b) and aboral (c) views.
7. OCU 3041–2, Bed no. 90c, ×46. Oral (a), lateral oral (b) and aboral (c) views.
8. OCU 3041–3, Bed no. 90c, ×130. Oral (a), lateral (b) and aboral (c) views.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Explanation of Plate 3

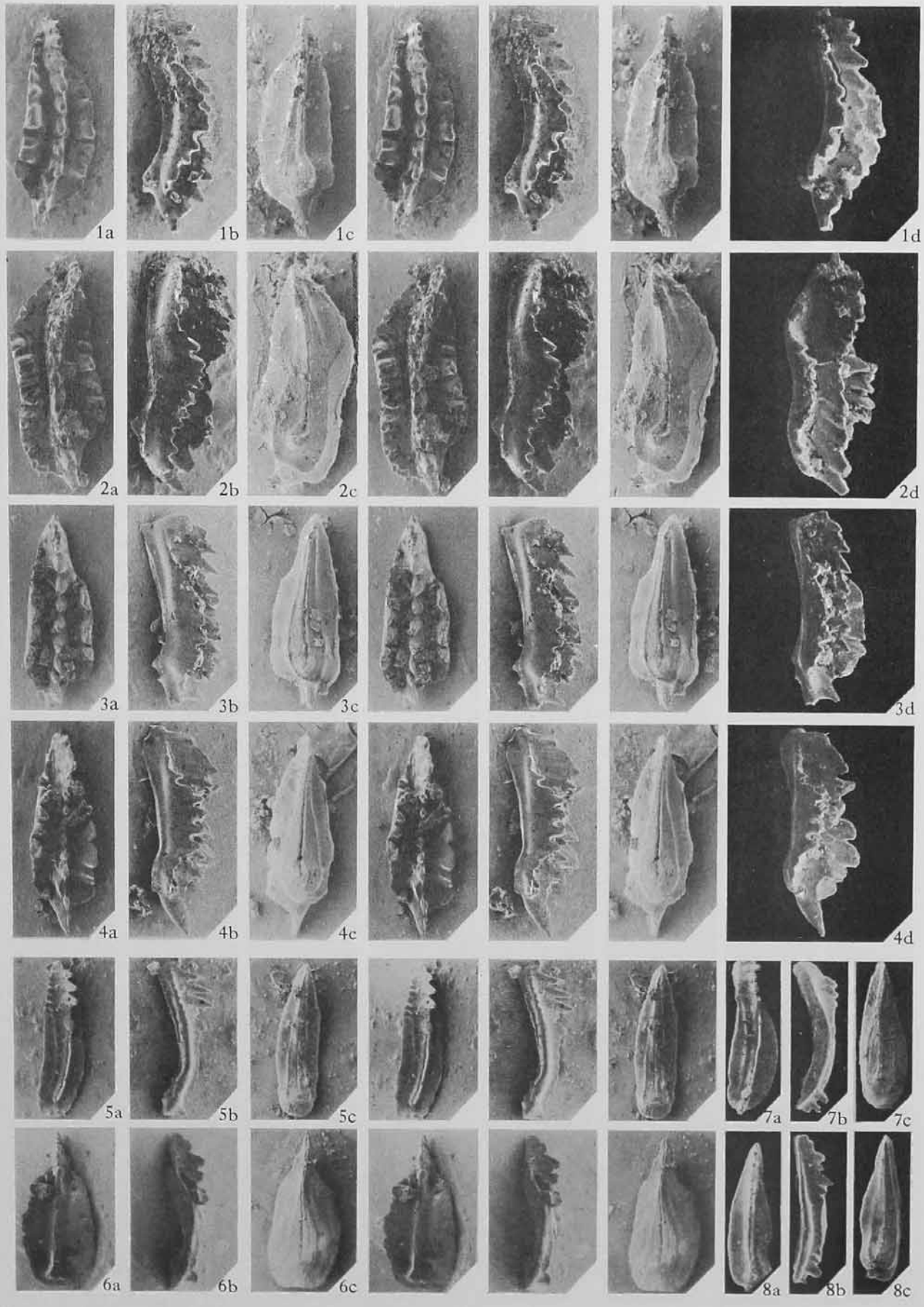
Figures 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, 6c in stereoscopic pairs.

Figs. 1–4. *Gondolella milleri* MUELLER .....Page 123

1. OCU 3042–1, Bed no. 90d, ×46. Oral (a), lateral (b), aboral (c) and lateral oral (d) views.
2. OCU 3042–2, Bed no. 90d, ×46. Oral (a), lateral (b), aboral (c) and lateral oral (d) views.
3. OCU 3042–3, Bed no. 90d, ×46. Oral (a), lateral (b), aboral (c) and lateral oral (d) views.
4. OCU 3042–4, Bed no. 90d, ×46. Oral (a), lateral (b), aboral (c) and lateral oral (d) views.

Figs. 5–8. *Gondolella elongata* (SWEET) .....Page 124

5. OCU 3045–1, Bed no. 91c, ×23. Lateral oral (a), lateral (b) and aboral views.
6. OCU 3047–2, Bed no. 91g, ×23. Oral (a), lateral (b) and aboral views.
7. OCU 3045–4, Bed no. 91c, ×23. Lateral oral (a), lateral (b) and aboral (c) views.
8. OCU 3045–2, Bed no. 91c, ×23. Oral (a), lateral (b) and aboral (c) views.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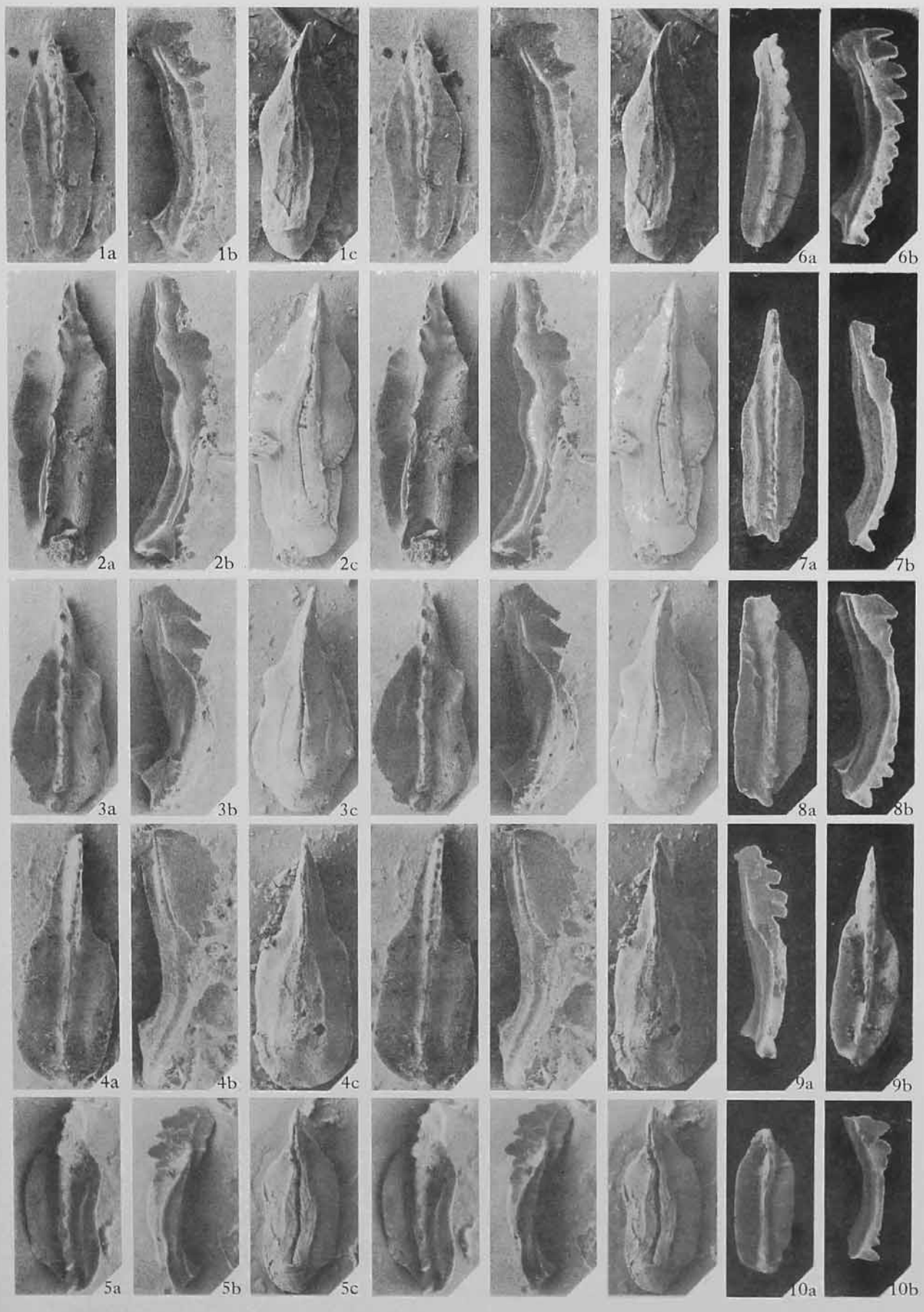
Explanation of Plate 4

Figures 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 5a, 5b, 5c,
in stereoscopic pairs.

Figs. 1–10. *Gondolella elongata* (SWEET) ..... Page 124

1. OCU 3047–16, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
2. OCU 3047–4, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
3. OCU 3047–5, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
4. OCU 3056–3, Bed no. K95, ×46. Oral (a), lateral (b) and aboral (c) views.
5. OCU 3047–6, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
6. OCU 3047–7, Bed no. 91g, ×46. Lateral oral (a) and lateral (b) views.
7. OCU 3047–17, Bed no. 91g, ×46. Oral (a) and lateral (b) views.
8. OCU 3047–8, Bed no. 91g, ×46. Oral (a) and lateral (b) views.
9. OCU 3049–2, Bed no. 92a, ×46. Lateral (a) and oral (b) views.
10. OCU 3047–5, Bed no. 91g, ×46. Oral (a) and lateral (b) views.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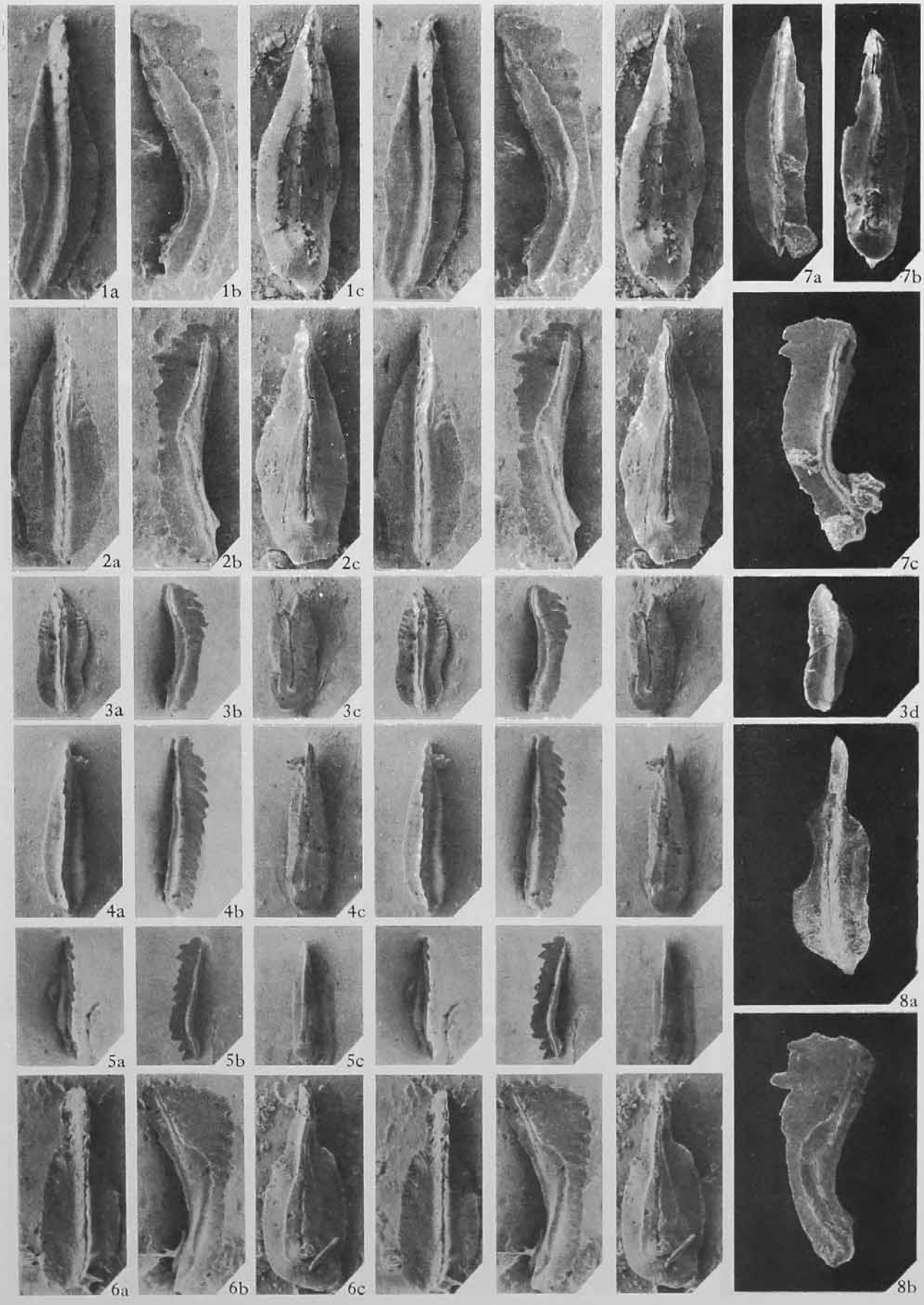
Explanation of Plate 5

Figures 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 5a, 5b, 5c, 6a, 6b, 6c in stereoscopic pairs.

Figs. 1–8. *Gondolella jubata* (SWEET) .....Page 126

1. OCU 3047–15, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
2. OCU 3047–13, Bed no. 91g, ×46. Oral (a), lateral (b) and aboral (c) views.
3. OCU 3047–11, Bed no. 91g, ×23. Oral (a), lateral (b) aboral (c) and lateral oral (d) views.
4. OCU 3047–9, Bed no. 91g, ×23. Oral (a), lateral oral (b) and aboral (c) views.
5. OCU 3047–10, Bed no. 91g, ×23. Oral (a), lateral (b) and aboral (c) views.
6. OCU 3056–2, Bed no. K95, ×46. Oral (a), lateral (b) and aboral (c) views.
7. OCU 3047–12, Bed no. 91g, ×46. Oral (a), aboral (b) and lateral (c) views.
8. OCU 3056–1, Bed no. K95, ×46. Oral (a) and lateral (b) views.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Explanation of Plate 16

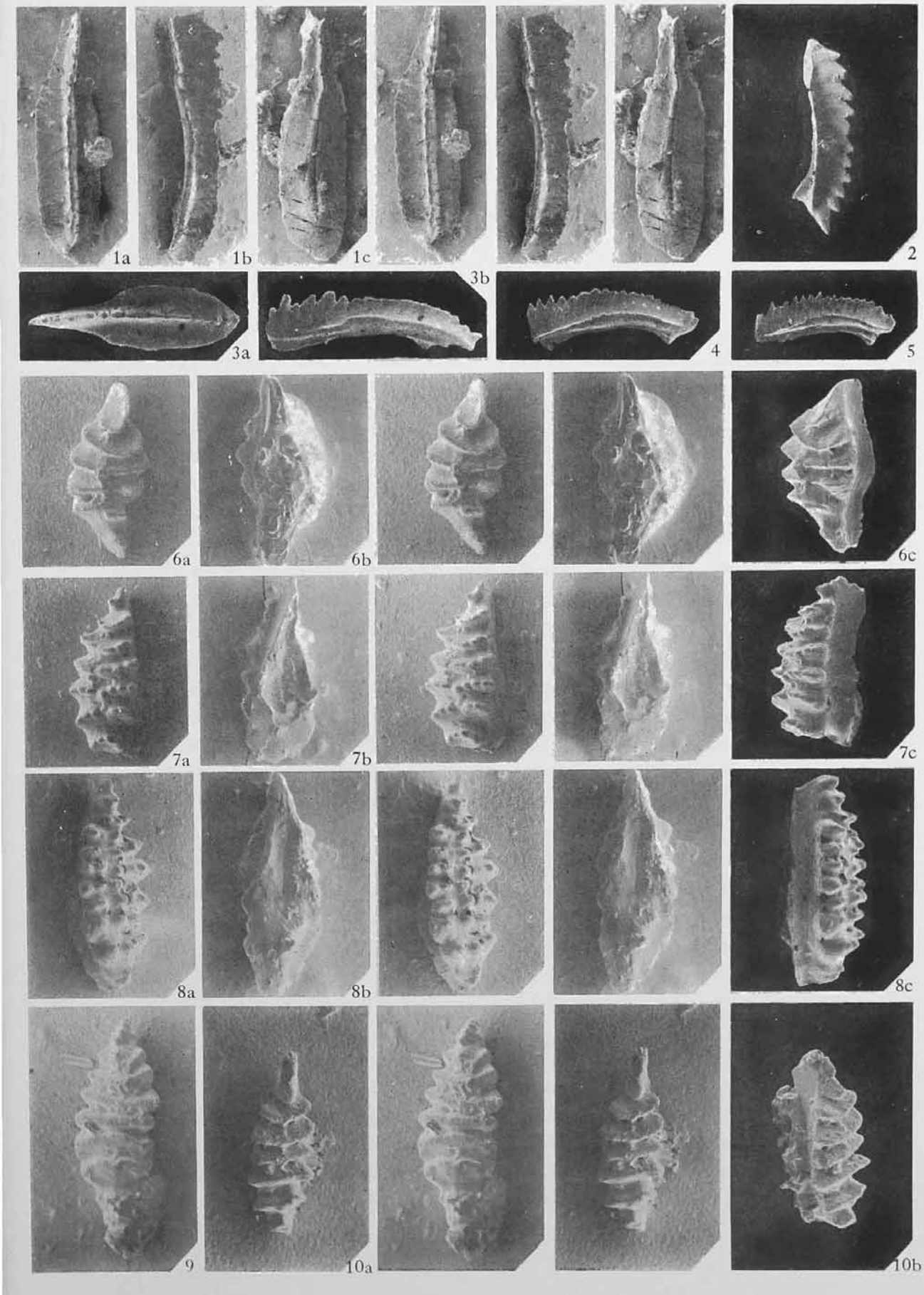
Figures 1a, 1b, 1c, 6a, 6b, 7a, 7b, 8a, 8b, 9, 10a in stereoscopic pairs.

Figs. 1–5. *Gondolella juabta* (SWEET) ..... Page 126

1. OCU 3057–3, Bed no. 96b, ×46. Oral (a), lateral (b) and aboral (c) views.
2. OCU 3048–5, Bed no. 91h, ×68. Lateral view.
3. OCU 3057–6, Bed no. 96b, ×46. Oral (a) and lateral (b) views.
4. OCU 3057–4, Bed no. 96b, ×46. Lateral view.
5. OCU 3057–5, Bed no. 96b, ×46. Lateral view.

Figs. 6–10. *Platyvillosus costatus* (STAESCHE) ..... Page 128

6. OCU 3030–5, Bed no. 82, ×120. Oral (a), aboral (b) and lateral oral views.
7. OCU 3030–6, Bed no. 82, ×120. Oral (a), aboral (b) and lateral oral views.
8. OCU 3030–4, Bed no. 82, ×120. Oral (a), aboral (b) and lateral oral views.
9. OCU 3030–8, Bed no. 82, ×120. Oral view.
10. OCU 3030–7, Bed no. 82, ×120. Oral (a) and lateral oral (b) views.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