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On *Enteletes gibbosus* CHRONIC

(An Upper Palaeozoic Fauna from Miharanoro,
Hiroshima Prefecture, Japan 3rd Note)

by

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(with 2 Text Figures and 2 Plates)

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Enteletes gibbosus CHRONIC, 1949

pl. 34, figs. 1-4: pl. 35, figs. 1-4

Text-figs. 1a-h,i; 2a-q,r.

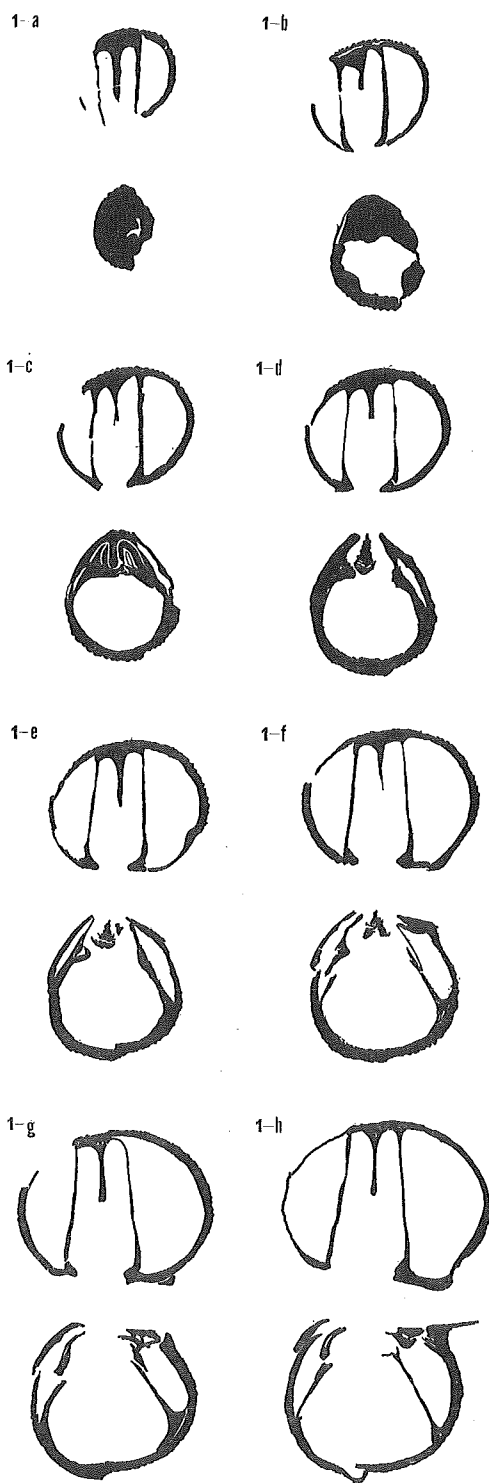
1953. *Enteletes gibbosus* CHRONIC. NORMAN D. NEWELL, JOHN CHRONIC, and THOMAS G. ROBERTS:-Upper Paleozoic of Peru (The Geol. Soc. America Memoir 58), pp. 92-93, pl. 16, figs. 9a-14.

Description*

Shell strongly biconvex and globose, with brachial valve larger, deeper and more convex than the opposite: hinge-line short, about half the maximum width of shell. Beak of brachial valve curved inwards, more or less overhanging hinge-line; that of pedicle valve also curved inwards slightly, and apparently beneath that of the brachial valve. Cardinal area is small, and not distinctly recognized because of the unfavourable state of fossilization.

Umbonal region of both valves are free of radial ribs and furrows. In pedicle valve median fold begins at a distance about half the length from beak to median sinus of the anterior commissure; other folds on either side of the median one, usually 3 on each side, begin slightly later. Brachial median fold is about 3 times as wide as the first lateral pairs; the further lateral ones decrease in width and height toward lateral margin; intercostal furrows are much wider than lateral ribs, and flatly concave. The median furrow of pedicle valve, corresponding to the median fold of the opposite valve, is wide and long, bounded on both sides by a pair of prominent radial ribs: smaller ribs, usually 3, follow toward both sides. Median furrow is recognized as such where the bounding pair of radial ribs start

* All specimens herein dealt with were collected from loc. 2045, Miharanoro.

**Fig. 1a~h**

Enteleles gibbosus CHRONIC. Serial replicas.
(\times Ca 5)

In each figure ventral side is placed on top.
UHR 18480 (See plate 35, figs. 1a-c)

at about midway from beak: it extends anteriorly, and intrudes into the anterior end of the pedicle valve so as to form an acute, tonguelike projection. In profile median furrow is wide V-shape, with a quite distinct groove lengthwise at the bottom. The radial folds and furrows on both valves meet at the anterior margin in the similar way of alternation, so that the anterior commissure draws a very acute zigzag line.

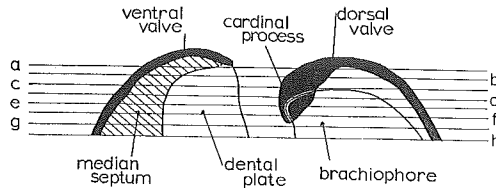


Fig. 1i

Enteleles gibbosus CHRONIC Median vertical section (restoration \times Ca 5) showing positions from which respective replica films have been taken.

UHR 18480 (See plate 35 figs. 1a-c)

The whole surface, with folds and furrows, is covered with very fine costellae in alternation with equally fine interspaces: about 5 of costellae are counted in a space of 1 mm.

Of the species from Miharano identified with CHRONIC's species there are about a dozen specimens including a few rather obscure ones. They are all of the similar size and of similar physiognomic features, very strongly suggesting their specific identity. The affinity of the Japanese specimens was first suggested with *Enteleles andrewsi* GRABAU from the upper Permian Jisu Honguer limestone of Mongolia. But, that the two forms can not be identified was found with respect to certain features. The most apparent distinction is recognized in the difference in the form of the shell: the Mongolian species has a roundly triangular outline of the umbonal region, when viewed either from ventral or dorsal side, while the Japanese specimens are characteristically globular in form, as is shown by the pictures given in this paper.

Among the many species of *Enteleles* with which the writers have been able to acquaint through literature, one which appears to be very closely allied to the present Japanese species is the Permian fossil *E. gibbosus*; in reality, the writers have been convinced that the two are identical.

As to the specific affinities, CHRONIC tried a detailed comparison with such allied forms as *E. andii* (d'ORBIGNY), *hemiplicatus* (HALL), *dumblei* (GIRTY) and *wolfcampensis* KING, and came to the conclusion that none of them is to be identified with *E. gibbosus*.* In one of the recent Chinese publications, *E. waageni*

* op. cit.

GEMMELLARO* from the Carboniferous of Kweichow Province is briefly referred to with a Chinese text, with four textfigures attached. In general aspect it does look quite like *E. gibbosus*, although the pictures are not very clear, and the descriptive text a little too brief. However, it is diagnosed that the dorsal valve develops 8 coarse angular ribs on the surface, and the ventral valve 9 similar ribs; this point at least, gives reason to distinguish it from *E. gibbosus*.

Dimensions

Specimens, as stated above, are globose, and virtually almost spherical, measuring almost equal in length, breadth and depth, being around 18 mm: the ratio in average is 1:1:1. The hinge is short, but the length varies from specimen to specimen: ranging from about 7 to 9 mm.: the ratio hinge length/maximum breadth of shell is 1/2, more or less. Apical angle as a whole is mostly over 90 degrees in the dorsal valves and around 100 degrees in the ventral. Lateral ribs on either side of the median fold of the dorsal valve are 3, and rarely 2 in number.

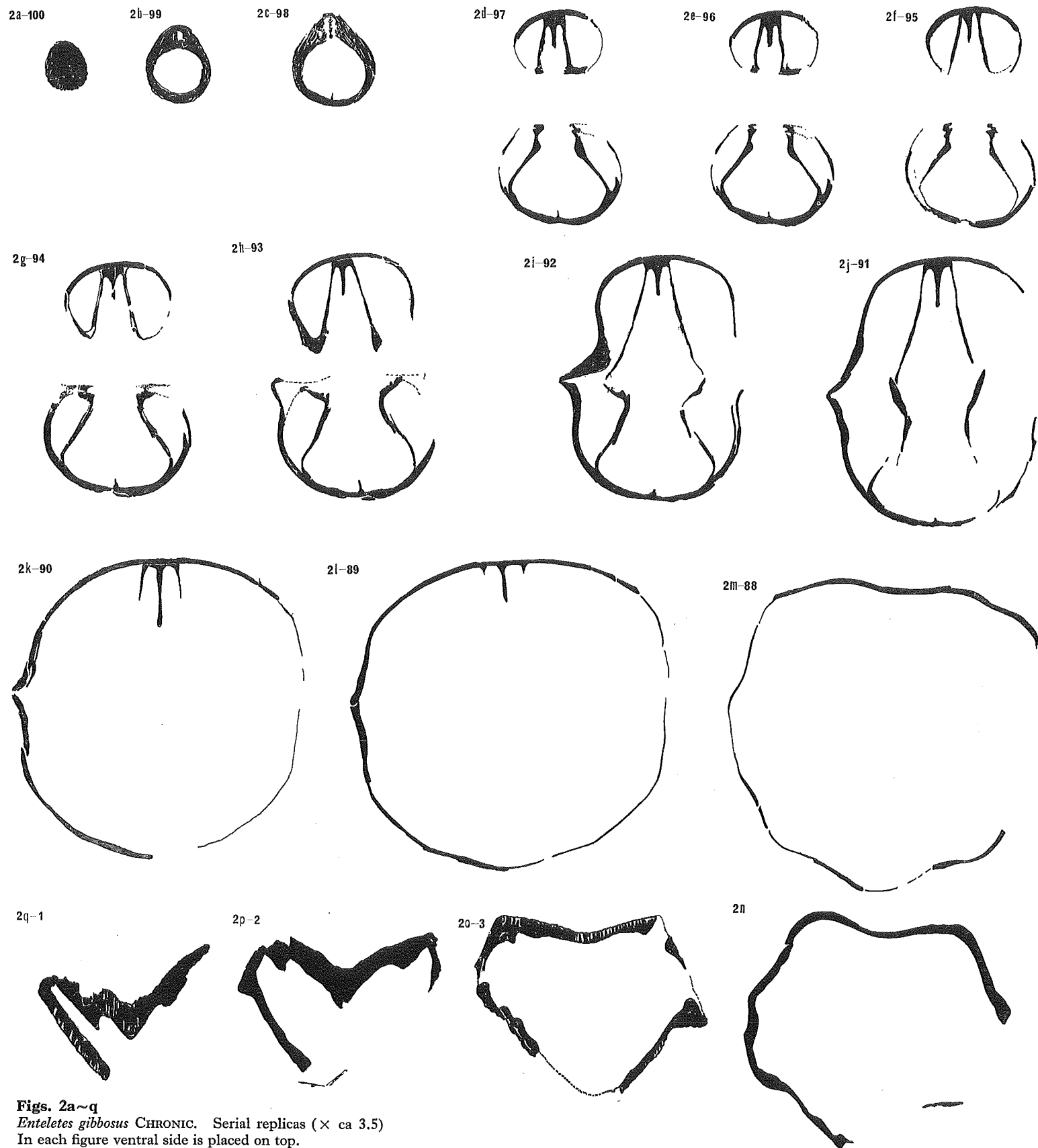
Beside these specimens of the average size and configuration, there are several more that occurred together. They belong, no doubt, to the same type as those described above in physiognomical features, except that they are somewhat smaller in size, and some of them of less depth, also. It is quite possible that they may represent different stages of growth. However, it is worthy of note that some among them appear to be more or less allied to certain known species of *Enteleles*, for instance, to *E. andii* D'ORB., *E. retardata* HUANG, among others, in point of the external aspects of the shells. Further, there are four incomplete specimens characteristically larger, and with coarse radial ribs on the surface, but either the median fold or furrow is not recognized to exist in these crushed and deformed specimens, so that it is very difficult to decide their affinities at present. Further material expected from Mihranoro in future, would be useful for solving the problem or problems lying here now.

Inner Structure**

In order to examine the internal structures of the shell, a series of replicas have been prepared of the polished surfaces parallel to the direction of the shell growth.

* 中国標準化石手冊 (Handbook of Chinese Index Fossils) edited by Lun Wen Wan, et al. 1953, pp. 385-6, 4 text figs.

** Professor M. MINATO prepared all of the carefully oriented serial replicas which are shown in text-figures 2a-q from a specimen UHR 18476. He also made a reconstruction figure out of these serial replicas so as to clarify the internal structure of the present form of *Enteleles*. Dr. S. HONJO of our department prepared another series of replica films from a specimen UHR 18480 (text-figs. 1a-h). We are very much indebted to Prof. MINATO and Dr. HONJO for their kind assistance in investigating the internal characteristics of the present species of *Enteleles*.



Figs. 2a~q
Enteleles gibbosus CHRONIC. Serial replicas (\times ca 3.5)
 In each figure ventral side is placed on top.
 UHR 18476 (See plate 34, figs. 3a-d)

These replicas are numbered from beak froward, the first being no. 100. The distances between consecutive replicas are measured (fig. 2r). The structures observed in consecutive replicas are seen in order (figs. 2a-q).

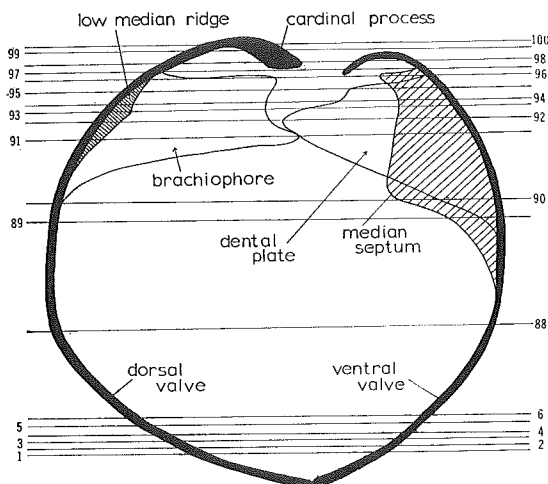


Fig. 2r

Enteleles gibbosus CHRONIC Median vertical section (restoration \times ca. 3.5) showing positions from which thin sections and replica films have been taken.

UHR 18476 (See plate 34, figs. 3a-d)

Replica no.		Dorsal valve	Ventral valve	mm
100	Shell			
99	„	Cardinal process		0.2
98	„	Cardinal process Brachiophore Brachiophore plates divergent Secondary area	Shell	0.5
97	„	Cardinal process Brachiophore Brachiophore plates	divergent dental plates Shell median septum	0.7
96	„	Brachiophore Brachiophore plates	„ „	0.5
95	„	Brachiophore Brachiophore	Shell divergent dental plates strong median septum	0.2

Replica no.		Dorsal valve	Ventral valve	mm
94		—Short, thin median septum	dental plates long	0.3
93		Area		0.3
92		Brachiophore Brachiophore plates		0.4
91	Shell	Brachiophore Brachiophore plates		0.7
90		no plates	dental plates short	2.5
89		no plates	dental plates short, median plate very short	0.6
88		no plates	no plates	4.3

The anterior portion of the shell also has been examined by the same procedure. The pair of dental plates and the median septum are present at about 1.8 mm below the beak, both being short, but the latter is longer than the former.

The characteristics of the species revealed by the internal structure are:

Cardinal process is small

Socket plates, dental plates and median septum of ventral valve are quite strong

Brachiophore thickened distally,

Brachiophore plates very long, divergent and then gradually converge along the anterior border of the valve

Median septum of the dorsal valve is low and short, representing the *Schizophoria* type of structure.

Localities:—2045

(Manuscript received February 20, 1966)

PLATE AND EXPLANATION 34

Explanation of Plate 34

(All figures twice natural size).

Figs. 1a-d. *Enteleles gibbosus* CHRONIC

1a-dorsal view ; 1b-anterior view ; 1c-ventral view ; 1d-posterior view : UHR18478 (MO 63)

Figs. 2a-d. *Enteleles gibbosus* CHRONIC

2a-anterior view ; 2b-dorsal view ; 2c-posterior view ; 2d-ventral view. UHR 18475 (MO 61)

Figs. 3a-d. *Enteleles gibbosus* CHRONIC

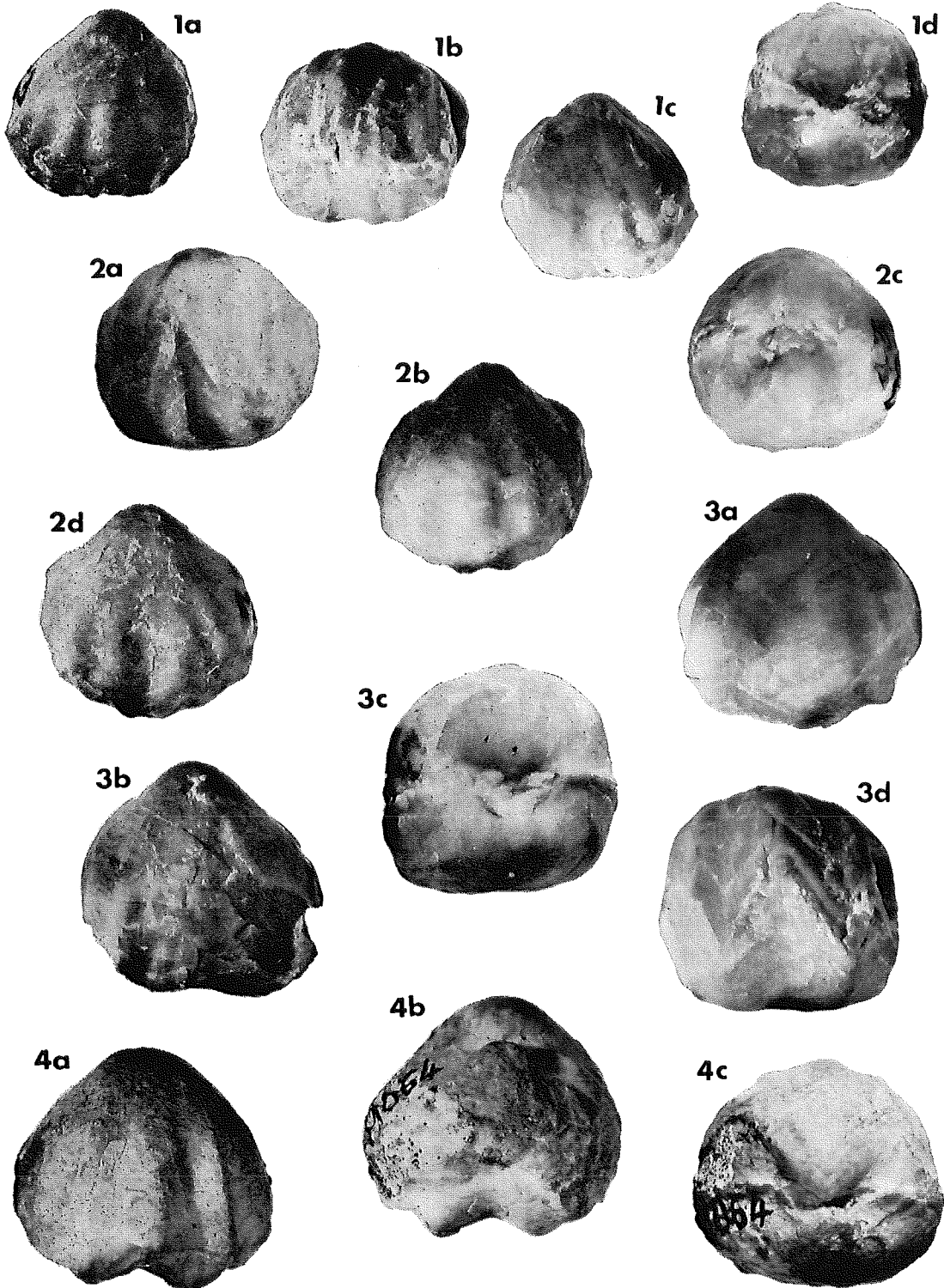
3a-ventral view ; 3b-dorsal view ; 3c-posterior view ; 3d-anterior view. UHR 18476 (MO 62)

The specimen has been successively ground down to take serial replica films shown in text-figs. 2a-q.

Figs. 4a-c. *Enteleles gibbosus* CHRONIC

4a-dorsal view ; 4b-ventral view ; 4c-posterior view. UHR 18479 (MO 64)

Plate 34



S. KUMANO photo.

PLATE AND EXPLANATION 35

Explanation of Plate 35

(All figures twice natural size).

Figs. 1a-c. *Enteleles gibbosus* CHRONIC

1a-dorsal view ; 1b-lateral view ; 1c-anterior view. UHR 18480 (MO 65) Several replicas shown in text-figs. 1a-h were taken from this specimen.

Figs. 2a-c. *Enteleles gibbosus* CHRONIC

2a-dorsal view ; 2b-lateral view ; 2c-anterior view. UHR 18483 (MO 68)

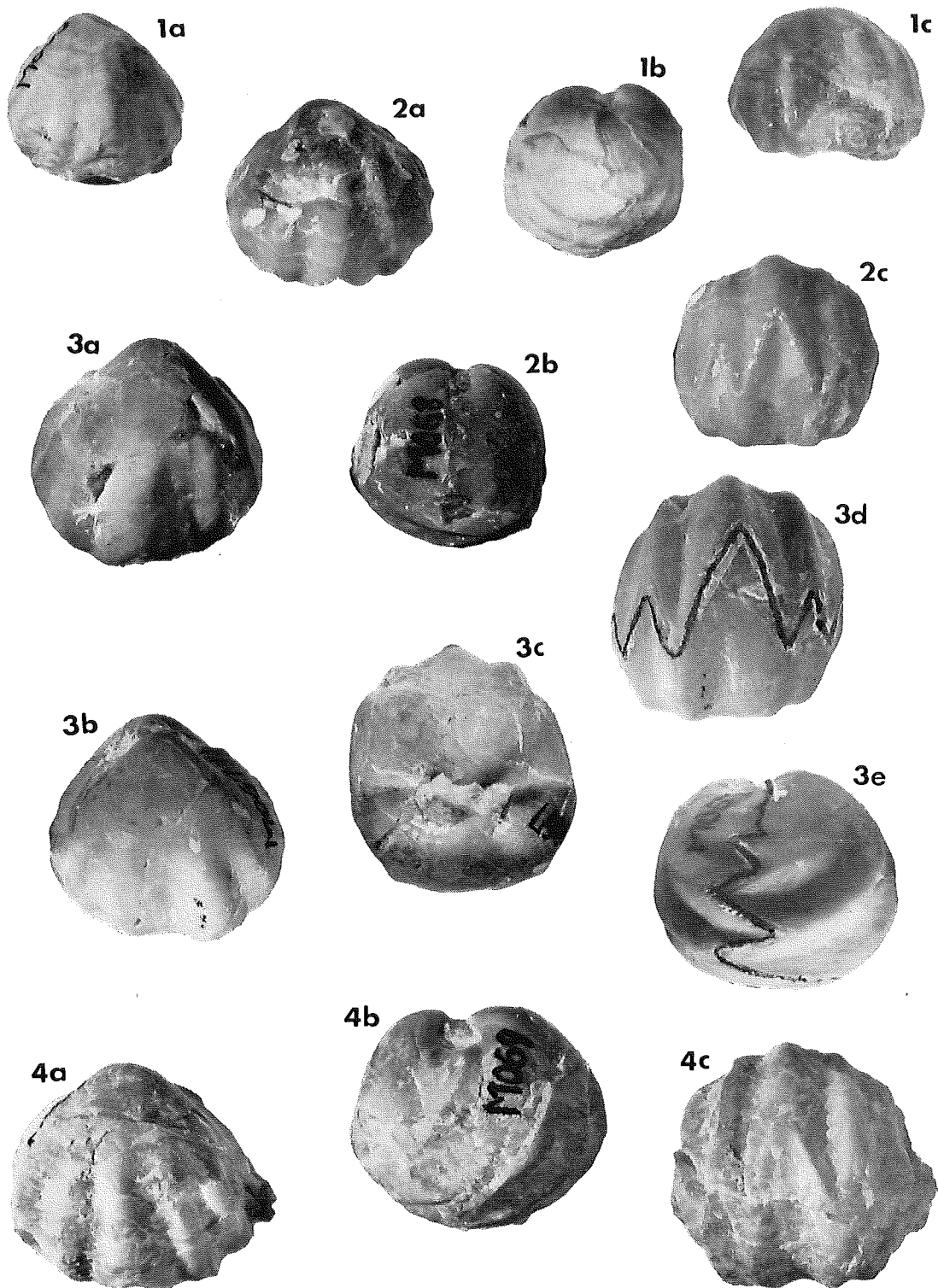
Figs. 3a-e. *Enteleles gibbosus* CHRONIC

3a-dorsal view ; 3b-ventral view ; 3c-posterior view ; 3d-anterior view ; 3e-lateral view. UHR 18482 (MO 67)

Figs. 4a-c. *Enteleles gibbosus* CHRONIC

4a-dorsal view ; 4b-lateral view ; 4c-anterior view. UHR 18484 (MO 69)

Plate 35



S. KUMANO photo.