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POLYCHAETE JAW APPARATUS FROM THE DEVONIAN OF CENTRAL OHIO

Abstract. — The polychaete jaw apparatus *Sciotoprion klondikensis* gen. n., sp. n., family uncertain, was discovered among a number of apparatuses and isolated scolecodonts recovered from Eifelian limestone of the Columbus Formation in Delaware County, Ohio. No scolecodonts identifiable with the distinctive components of this apparatus have been previously described, suggesting that the new species either has a short geologic time-range, or is facies-dependent; it may prove of geologic value in either correlation or environmental reconstruction.

INTRODUCTION

Isolated polychaete jaws (scolecodonts) are relatively common microfossils, easily obtained by solution of carbonate rocks. Demonstration of their stratigraphic and biological significance has been delayed, however, by the scarcity of published information on natural assemblages, or apparatuses. As demonstrated by Kielan-Jaworowska (1966), these apparatuses are characteristic of particular polychaete species, and therefore constitute valid material for research into the evolutionary history of the group. A good understanding of polychaete evolution might then provide the basis for stratigraphic applications.

The earlier research on fossil polychaete jaw apparatuses was reviewed in the monograph of Kielan-Jaworowska (1966). Since then, additional apparatuses have been described or reported from Europe (Corradini & Serpagli, 1968; Gall & Grauvogel, 1967; Kozur, 1967, 1970, 1971; Mierzejewski & Mierzejewska, 1975; Szaniawski, 1968, 1970, 1974; Szaniawski & Wrona, 1973; and Zawidzka, 1971, 1975). Since 1966, only an abstract by Jansonius & Craig (1972) and a short paper by Taugourdeau (1968) treat of North American apparatuses.

In an effort to extend geographically the investigation of polychaete jaw apparatuses, the author visited a number of promising localities in Ohio during August 1974. During the ensuing months, large quantities of limestone were processed at the Earth Sciences Department of Fairleigh

Dickinson University. The samples were broken up into chunks 2 to 4 cm across, and these pieces were then dissolved in 20% hydrochloric acid, the residue being handled after the methods of Kozłowski described by Kielan-Jaworowska (1966, pp. 15—16). These residues accompanied the author to Warsaw, where they were examined and compared with the fine collections of the Paleozoological Institut of the Polish Academy of Sciences (Polska Akademia Nauk, Zakład Paleozoologii, abbreviated ZPAL). Drawings were prepared with the Leitz stereo-microscope equipped with a camera lucida, and the pictures were verified by comparison with scanning electron micrographs. Type specimens have been deposited at the U.S. National Museum in Washington (abbreviated USNM) and at ZPAL.

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LOCALITY AND STRATIGRAPHY

The material which forms the subject of this paper derives from the north part of the Klondike Quarry, about 6.5 km WSW of Delaware, and about 1.7 km ENE of White Sulphur, in Scioto Township, Delaware County, Ohio. The quarry is the property of the National Lime and Stone Company, formerly the Scioto Lime and Stone Company. Samples were collected from the Klondike Member of the Columbus Formation, at 9.4 and 9.0 m beneath the contact with the overlying Delaware Formation. The Klondike Member is here a thick-bedded, massive, light-colored limestone, well-illustrated by Westgate (1926, Pl. 1, Fig. A) when he first described it from this locality. According to the correlation of Oliver *et al.* (1967, Fig. 4, p. 1007), our material is in the upper part of the Onesquethaw Stage, upper Ulsterian Series, by the North American standard; this corresponds to the Eifelian Series of the European sequence, which is lowermost Middle Devonian.

PRESERVATION, BIOSTRATINOMY, AND ASSOCIATED FAUNA

The jaws in this collection are light-brown to black and of chitinoid appearance. There is little sign of flattening or compression of the specimens. A few bear incrustations of insoluble minerals which may act as the binding agent holding the apparatuses together (see Pl. XIX, Fig. 1). The delicate form of the most abundant isolated elements (first maxillae), their mostly unbroken condition, the relatively high proportion of partial apparatuses among the isolated scolecodonts, and the lack of any apparent concentration of the scolecodonts along particular bedding surfaces indicate that neither postmortem transportation nor winnowing can have been an important influence in the environment of deposition. Bioturbation (due perhaps to the activity of these polychaetes, as well as other organisms) was probably an important process, and has resulted in the massive bedding of the Klondike Member.

The associated rich fauna includes abundant brachiopods, and Westgate (1926, p. 21) reported several nautiloids. The insoluble residue contained pyritized ostracodes and tentaculitids, and several specimens of the spherical alga *Tasmanites*. In addition to the species described in this paper, other polychaete remains include abundant mochtyellid placognath elements and partial apparatuses, isolated polychaetaspid labidognath elements, and several other different maxillae. We choose to defer description of the latter material pending search for additional apparatuses.

TAXONOMIC PROBLEMS

The taxonomic difficulties of research on scolecodonts must be by now but little less discussed than the corresponding problems of research on conodonts. (For a review of this problem from contending viewpoints, one may consult Kielan-Jaworowska, 1968, and Kozur, 1972). Briefly, the single elements commonly found are but parts derived from an assemblage or apparatus which is more truly representative of a biological species. Certain of the elements are homeomorphic: they may occur in, or be derived from more than one apparatus. If one followed the International Code of Zoological Nomenclature very strictly, particularly articles 17 (4) and 24b (i) (Stoll, ed. ch., 1961, pp. 17, 27), it would be possible to place two or more very distinctive apparatuses (and all their constituent elements) in synonomy under the senior name of a minor element which the apparatuses possess in common. Several such cases have been described (Kielan-Jaworowska, 1966, 1968; Szaniawski & Wrona, 1973). Those unfamiliar with scolecodont nomenclature may envision the almost endless possibilities for confusion by imagining the application of these rules to automobiles: a Fiat and a Mercedes might be placed in

the same taxon by virtue of possessing in common the same standard-pitch screws! Clearly, such an application of the rules does not bring order to the classification of automobiles or scolecodonts, but leads to chaos, and the blurring of very important distinctions, which (in the case of scolecodonts) may be of the utmost evolutionary and stratigraphic significance. It is the opinion of this writer that, in scolecodont nomenclature as in wider fields of human endeavor, a framework of rules, however necessary and however cleverly constructed *a priori*, is no guarantee of good results. Rules must be applied with wisdom, and with at least as much attention to the intent as to the letter. We suggest four guidelines for scolecodont work in the near future:

1) Avoid sweeping, large-scale taxonomic revision, which is premature at this stage, and creates confusion in the nomenclature.

2) Avoid using poorly defined, undistinguished elements as senior synonyms for distinctive apparatuses and their components; especially avoid the purely formal taxonomic lumping-together of dissimilar apparatuses (the "Mercedes-Fiat Fallacy" discussed above).

3) Avoid naming undistinguished minor elements, though these may be illustrated and noted.

4) Find and describe new apparatuses; such work adds few new names, but much real knowledge to the study of polychaete jaw remains.

For the apparatus described in this paper, the chances for nomenclatural confusion are minimized by the fact that neither the apparatus nor any of its components have been named before. By using the terminology of Jansonius & Craig (1971), who have conveniently systematized the usage of earlier workers, the author hopes to promote a simplifying standardization in description.

SYSTEMATIC DESCRIPTION

Class **Polychaeta** Grube, 1850
Order **Errantida** Audouin & Milne-Edwards, 1832
Family uncertain
Genus *Sciotoprion* gen. n.

Type species: *Sciotoprion klondikensis* sp. n.

Derivation of name: from the Scioto River, and Greek *prion*, saw (a uniform ending for polychaete jaw apparatuses, introduced by Kielan-Jaworowska, 1962).

Diagnosis. — Asymmetrical jaw apparatuses of labidognath type. First maxillae elongate, each with prominent falx; inner margin edentulate or paucidentate; with edentulate or poorly denticulate posterior-dorsal ridge, and an inner wing; myocoele strongly enclosed. MIr (right first maxilla) with bight and pointed shank. MIl (left first maxilla) with

shorter, accessory posterior-dorsal ridge; posterior margin obliquely truncate. Second maxillae each with anterior denticles largest; ramus projecting laterally, almost normal to dentary; myocoele partially enclosed.

Occurrence. — Middle Devonian of Ohio, Upper Devonian of southeastern Poland.

Remarks. — In addition to the type species, the new genus includes *Sciotoprion lublinensis* (new combination for ?*Langeites lublinensis* Szaniawski & Wrona, 1973, pp. 252—253, Pl. 5, Fig. 8*a*—*b*, 9*a*—*b*).

The MI of *Sciotoprion* differs from that of *Langeites* Kielan-Jaworowska, 1966, in its more prominent falx, its edentulate or paucidentate anterior inner margin, its more strongly developed posterior-dorsal ridge, and its consistent lack of fusion between MIr and the right basal plate.

The closest affinities of *Sciotoprion* are with the family Paulinitidae, but as members of that family have MI markedly different in proportions, with well-developed inward-directed denticles all along the inner margin, we refrain from assigning *Sciotoprion* to the Paulinitidae.

Sciotoprion klondikensis sp. n.

Holotype: Joined MIr, MIl, MIIr, and MIIl; USNM 189887, Pl. XIX, Fig. 2.

Type horizon and locality: Middle Devonian (Eifelian), Klondike Member of the Columbus Formation, 9.4 m beneath contact with overlying Delaware Formation, Klondike Quarry, Scioto Township, Delaware County, Ohio.

Derivation of name: *klondikensis*, found at Klondike Quarry.

Diagnosis. — MIr and MIl each with a single denticle projecting inward from the inner margin. MIIr and MIIl each with two large anterior cusps succeeded posteriorly by several small denticles, then by seven to 11 moderately large, backward-directed denticles.

Material. — Six designated paratypes (two of which are partial apparatuses) are in the ZPAL collection, and are listed with the holotype in the table of dimensions (below). Other specimens include: 32 MIr, 30 MIl, eight MIIr, and seven MIIl.

Dimensions. Width/length, in mm.

Mus. cat. no.	MIr	MIl	MIIr	MIIl
USNM 189887	0.19/0.83	0.24/0.76	0.43/0.63	0.35/0.53
ZPAL Sc. IV/1	0.32/1.37	—	—	—
ZPAL Sc. IV/2	—	0.34/1.33	—	—
ZPAL Sc. IV/3	—	—	0.61/1.08	—
ZPAL Sc. IV/4	—	—	—	0.64/1.24
ZPAL Sc. IV/5	—	0.37/1.57	—	0.48/1.27
ZPAL Sc. IV/6	damaged	0.38/1.50	—	0.54/1.19
Avg. of n jaws	0.40/1.30	0.35/1.28	0.33/0.94	0.54/1.08
n	12	7	9	8
Avg. w/l	0.35	0.27	0.35	0.50

Description. — MIr strongly elongate, with a prominent, slender falx, curved inward and somewhat upward at the tip; somewhat less than halfway back from the anterior end, on the inner margin, is a single, short, rounded denticle, directed inward and slightly backward; the inner margin continues posteriorly into a prominent ridge which is about a third the length of the jaw, and which is edentulate or bears up to seven very small denticles; beneath and inward from the ridge is an inner wing, broadest anteriorly and tapering to the posterior tip of the shank; outward from the ridge is a trough leading posteriorly to the bight, which is about 0.2 to 0.25 the length of the jaw; there is no ramus, but in front of the bight the margin is turned up to form a knob; outer margin curving outward slightly at the middle of the jaw, then forming an arc forward and inward to the tip of the falx; myocoele strongly enclosed, its opening rounded and extending posteriorly behind the shank.

MIl differing from MIr in the following characteristics: main posterior ridge edentulate, or rarely bearing up to four minute, vestigial denticles; beneath and inward from the ridge is a large, flaring inner wing, broadest about one-third of its length back, and tapering to the obliquely truncate posterior margin; outward from the ridge is a well-defined longitudinal trough and a prominent ridge running from the posterior margin forward a little less than one-fifth the length of the jaw, and terminating just posterior to a subdued knob formed on the outer margin by the upturned edge of the myocoele opening; myocoele opening rounded-subquadrate.

MIIr about three-fourths of the length of MIr, with two large, inward-directed anterior cusps, succeeded posteriorly by three small denticles, and then by about eight medium-sized denticles projecting upward, inward, and slightly backward; dentary gently curving convex-inward; antorior-lateral margin arcuate, convex-outward in front, then bending outward to form a pronounced ramus at the middle of the jaw; ramus broad, declining from the body of the jaw, then gently upturned at the truncate lateral extremity; posterior-lateral margin forming a bight with ramal angle almost 90°; myocoele partially enclosed; myocoele opening occupying the posterior half of the ventral side of the jaw, its anterior margin differentiated by a roughened surface, and its inner margin rolled slightly downward into a lip.

MIIl differing from MIIr in the following characteristics: about three-fourths the length of MIr; the two large anterior cusps succeeded posteriorly by three or four small denticles, then by about 11 medium-sized denticles; dentary curving slightly concave-inward for the anterior half, and convex-inward for the posterior half of the jaw, thus describing an s-shaped curve; ramal angle about 90°; inner margin of myocoele opening rolled downward and inward to form a narrow inner wing which is broadest at its front and tapers rearward.

Remarks. — On the holotype MIl there is a transverse groove running from the outer margin inward, meeting the anterior margin of the smaller posterior-dorsal ridge at about a right angle; the posterior-lateral portion of MIl in the holotype is thus a right triangle, with hypotenuse along the margin; the transverse groove and the groove between the two posterior-dorsal ridges appear more translucent and thinner than the rest of the jaw. It is possible that this triangular portion represents the left basal plate (laeobasal plate), which has become progressively fused with the MIl during ontogeny. In larger specimens of MIl, the transverse groove has disappeared. Such a process of fusion of the right basal plate with MIr has been documented for certain genera by Kielan-Jaworowska (1966, pp. 45—46). If our suposition is correct, that the MIl incorporates a fused laeobasal plate, its suggests a possible recapitulation in ontogeny of the phylogenetic derivation of some assymmetrical labidognath apparatuses from ancestors which were symmetrical, at least in that they possessed both right and left basal plates.

On the MI jaws there is generally a narrow escarpment of longitudinal or somewhat oblique trace, arising near the tip and dying out before reaching the straight portion of the jaw. The slope of this escarpment is always down toward the posterior, and its alignment is parallel to the fibrous, satiny lineation apparent in some of the lighter-colored jaws, but its exact position is otherwise variable. A similar escarpment is found running along the anterior margin of the first cusp of MII jaws. Less common are transverse escarpments, partially girdling the shaft of the falx, and sloping down toward the tip (Pl. XIX, Fig. 2*a*). It is uncertain whether these features represent natural characteristics of the jaws of the living apparatus, or if they are deformatio features. The transverse escarpments might possibly be traces of injury healed by regeneration.

Sciotoprion klondikensis differs most notably from *S. lublinensis* (Szaniawski & Wrona, 1973) in its prominent single denticle projecting from the inner margin of the MI.

The MII of *Sciotoprion klondikensis* bears a superficial resemblance to *Dinoscolites mirabilis* Stauffer, 1933 (pp. 1199—1200, Pl. 61, Fig. 1) from the Ordovician of Minnesota. The latter form has small denticles between its two large anterior cusps, and the shape of its anterior lateral margin, its small ramal angle, and the shape of its ramus serve to distinguish it easily from the new species.

There is within the new species a variation in the form of the falx, from a very tight hook (Pl. XX, Fig. 2), to sickle-shaped (Pl. XX, Fig. 1), to almost scythe-shaped (Pl. XIX, Fig. 2). Such geometry is apparently not a taxonomically important characteristic.

Although more material has been published on Devonian scolecodonts than on those of any other system, no scolecodonts identifiable with the components of this apparatus have been previously described. Elements

belonging to *Sciotoprion klondikensis* are absent immediately above the Klondike Member, in the otherwise scolecodont-rich limestone of the Delaware Formation at the type locality; nor do they occur in the Delaware Formation at the other different localities studied by Eller (1964). This indicates a limited geologic time-range for the new species, or a sensitive facies-dependence. Either possibility would make this a useful fossil for geologic interpretation, whether for purposes of correlation, or enviromental reconstruction. Further sampling will be necessary to determine its stratigraphic and areal distribution.

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APARAT SZCZĘKOWY WIELOSZCZETA Z DEWONU STANU OHIO (USA)

Streszczenie

Z wapieni eiflu, formacji Columbus, ogniwo Klondike, w Delaware County w Stanie Ohio w Stanach Zjednoczonych opisano aparat szczękowy wieloszczeta *Sciotoprion klondikensis* gen.n. sp.n., którego przynależność do rodziny nie została ustalona. W tych samych wapieniach znaleziono nie opisane dotychczas skolekodon-

ty i aparaty szczękowe innych wieloszczetów. Nowy gatunek charakteryzuje się wydłużonymi szczękami pierwszej pary (MI) z dobrze rozwiniętym przednim zębem oraz z pojedyńczym wyraźnym ząbkiem w połowie długości brzegu wewnętrznego. W pierwszej prawej szczęce występuje zatoka, a w lewej, w miejscu zatoki występuje grzbiecik, który być może odpowiada zrośniętej lewej płytce bazalnej. Szczęki drugie (MII) mają dwa pierwsze zęby duże, za którymi występuje rząd ząbków małych. Dotychczas nie opisano skolekodontów, które mogłyby być zidentyfikowane jako należące do wyżej opisanego aparatu, co sugeruje, że nowy gatunek ma albo bardzo ograniczone występowanie stratygraficzne, albo też występowanie jego związane jest tylko z pewnym typem facji. Gatunek ten może mieć więc wartość geologiczną dla celów korelacji, bądź też dla rekonstrukcji środowiska.

ПОЛЬ С. БОЙЕР

ЧЕЛЮСТНОЙ АППАРАТ POLYCHAETA ИЗ ДЕВОНА ШТАТА ОГАЙО (США)

Резюме

Описан челюстной аппарат *Sciotoprion klondikensis* gen. n., sp. n., найденный в известняках эйфельского яруса формации Колумбус, свиты Клондайк, в Делавэр штата Огайо (США). Его принадлежность к семейству не определена. В этих же известняках были найдены сколекодонты и челюстные аппараты других многощетинковых, которые до сих пор не описывались. Новый вид отличается удлиненными челюстями первой пары (MI) с хорошо выраженным передним зубом и одинарным, отчетливым зубчиком посредине внутреннего края. В первой правой челюсти наблюдается лунка, а в левой вместо лунки располагается выступ, который очевидно соответствует сросшейся левой базальной пластинке. Вторые челюсти (MII) обладают двумя первыми крупными зубами, за которыми располагается ряд маленьких зубчиков. До сих пор не описывались сколекодонты, которые можно связывать с аппаратом такого типа, и поэтому можно предполагать, что новый вид либо характеризуется ограниченным стратиграфическим распространением, либо же его распространение приурочено к фации определенного типа. Описанный вид может иметь значение в геологической корреляции или в реконструкциях условий данной среды.

EXPLANATION OF PLATES

Plate XIX

Sciotoprion klondikensis sp.n.

Fig. 1. Incomplete apparatus (ZPAL Sc. IV/5) consisting of MIl and MIIl: dorsal-inner view, showing elements nestled together in probable life-position, the ramus of MIIl wrapped behing MIl. Behind the large falx of MIl are two cusps belonging to MIIl, the smaller denticles of which are somewhat damaged.

Fig. 2. Holotype (USNM 189887), the most complete apparatus, consisting of MIr, MIl, MIIr, and MIIl: *a* dorsal view; *b* ventral view.

Plate XX

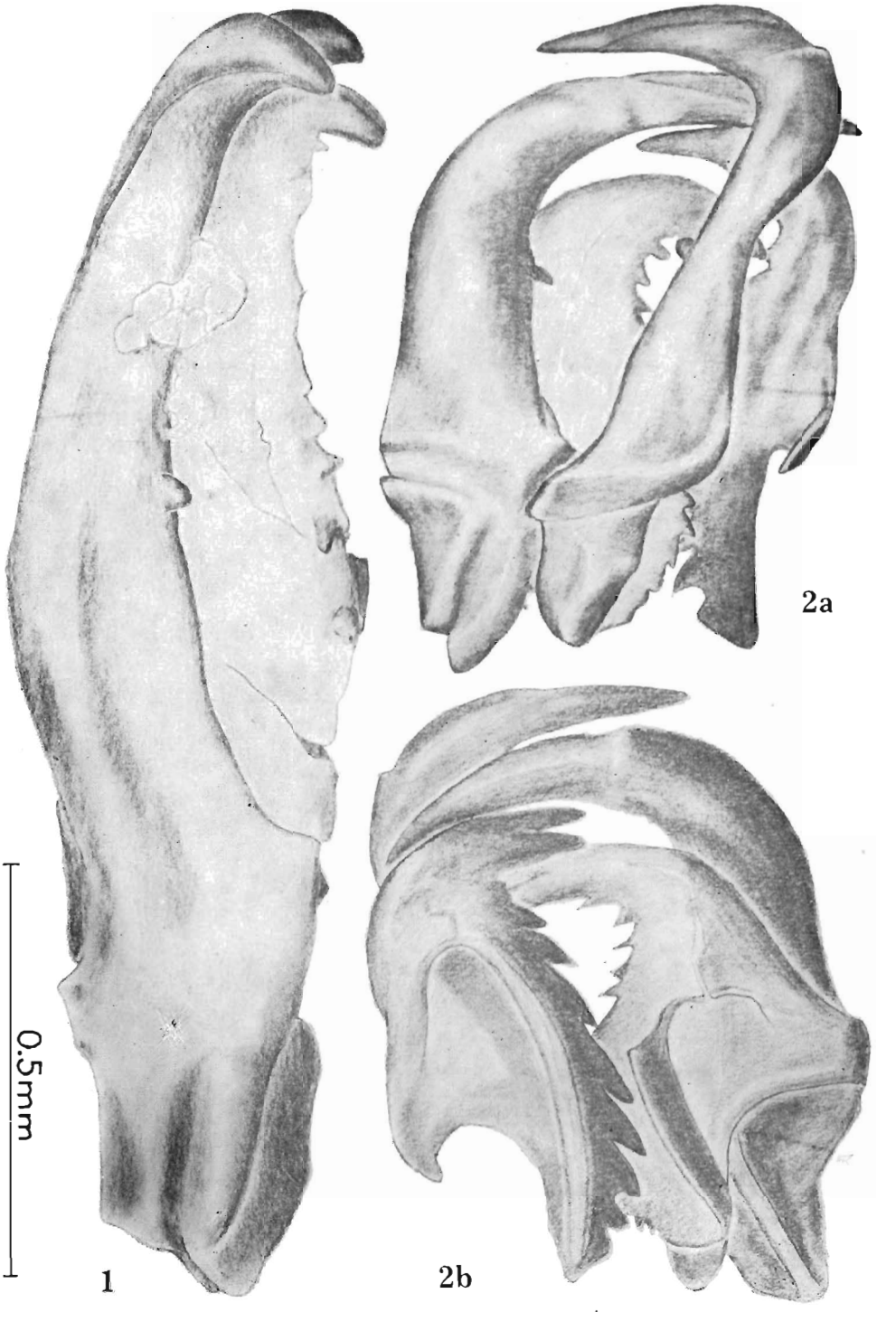
Sciotoprion klondikensis sp.n.

Fig. 1. MIl (ZPAL Sc. IV/2): *a* dorsal view; *b* dorsal-inner view; *c* ventral view.

Fig. 2. MIr (ZPAL Cc. IV/1): *a* ventral view; *b* dorsal view.

Fig. 3. MIIl (ZPAL Sc. IV/4): *a* ventral view; *b* dorsal view.

Fig. 4. MIIr (ZPAL Sc. IV/3): *a* dorsal view; *b* ventral view.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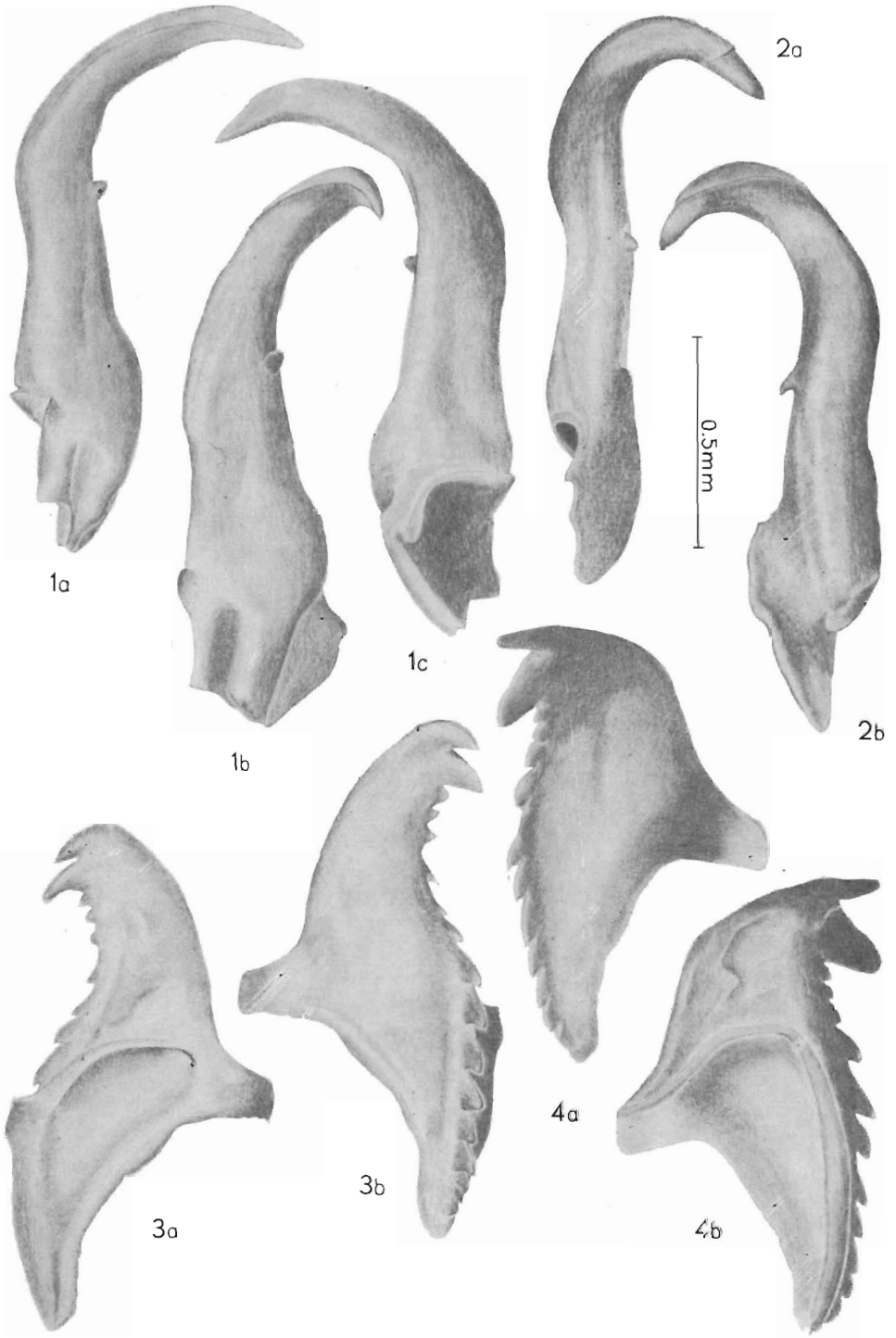
2b


1a
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3a
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4b