

LEPIDOTES sp.: RHAETIAN FISH TEETH FROM BARNSTONE,
NOTTINGHAMSHIRE.

by

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Summary

On the basis of their morphology and histology, some of the teeth from a Rhaetian Bone-bed at Barnstone, Nottinghamshire are assigned to *Lepidotes* Agassiz, 1832.

Introduction

There are several species of Triassic fishes which in the complete specimen have small, rounded, crushing teeth situated in rows or patches on the jaws and roof of the mouth. In Rhaetian bone-beds generally, the only common and well known species with this type of teeth is *Sargodon tomicus* Plieninger, 1847. This name was first given to the incisor teeth of the species. The dome-like crushing teeth *Sphaerodus minimus* Agassiz 1844 and *Psammodus orbicularis* Meyer & Plieninger 1844 were later proved to be synonymous with *S. tomicus* (Guttormson 1937, p.30).

Other less common Rhaetian species with crushing teeth are included in the genera *Colobodus* Agassiz 1844 (Horwood 1916, p.417), *Lepidotes* (Richardson 1906, p.409) and *Paralepidotus* Stolly, 1920 (Guttormson 1937, p.24).

Crushing teeth of *S. tomicus* were described (Sykes, *et al.*, 1970, p.258) from the bone-bed samples collected at the Barnstone Railway Cutting (SK 739358). A closer examination of the crushing teeth of this material has shown that most of the very small specimens have an apical tubercle or a tooth cap which is set off-centre. The histology of these minute teeth has been found to be quite distinct from that of *S. tomicus*. The small tuberculate teeth are quite rare but consistently present in the sieved bone-bed material from Barnstone.

Lepidotid teeth

The Family Lepidotidae ranges from the Permian to the Cretaceous, some of the species from the later system having the largest and stoutest teeth. The marginal teeth are rather elongate and the inner teeth being lower having a short, hollow pedicel. Incipient germ teeth are formed facing in the opposite direction to the functional teeth and revolve 180° whilst the root of the functional tooth is being adsorbed (Zittel 1902, p.83). The teeth are smooth and oval or circular in upper view. They have a depressed, rounded dome or occasionally an obtuse dome with a median apical tubercle.

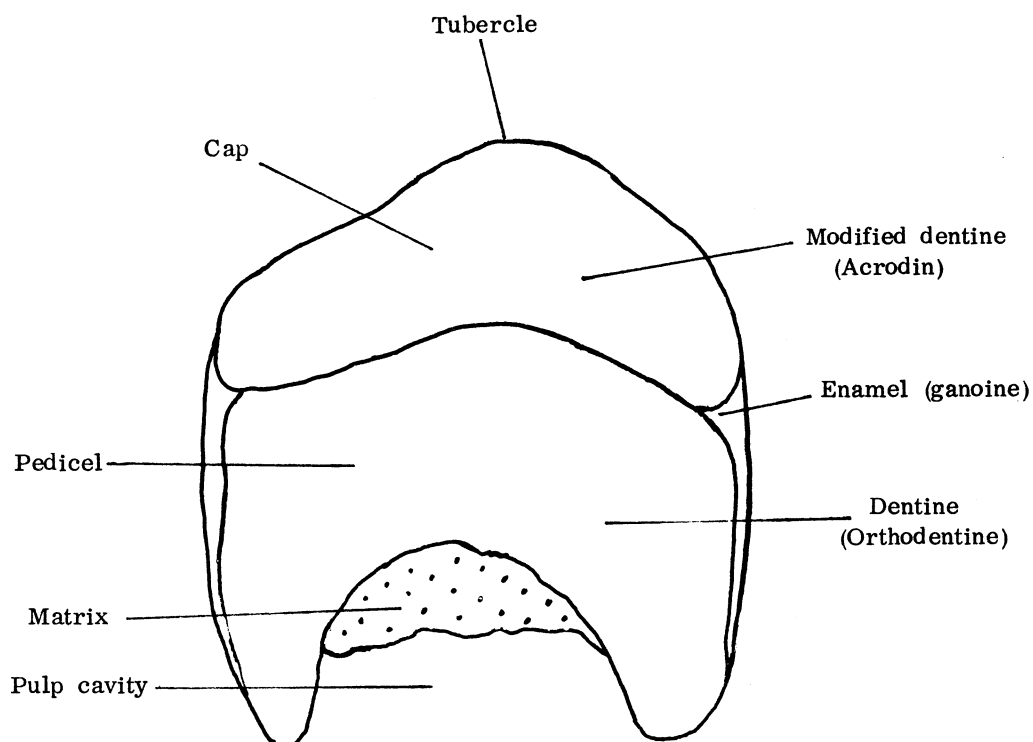
Description of teeth

The specimens consist of isolated tooth caps, or tooth caps on a short pedicel which has a pulp-cavity in the lower part making the pedicel walls quite thin. Most of the teeth are oval in upper view, some being subcircular. They range in size from 0.2 mm to 1.7 mm in height and 0.3 mm to 1.5 mm in diameter.

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pp.85-91, 1 text-fig., Plates 12, 13.

Some of the teeth have a tooth cap that does not cover the upper area of the pedicel and which is generally placed off-centre. This tooth cap varies in size in different specimens, from being small (pl.12, fig.1; pl.13, fig.1) to almost covering the upper surface of the pedicel (pl.12, fig.3; pl.13, fig.3). In the majority of specimens the tooth cap covers the upper area of the pedicel and generally this type (pl.12, figs 5, 6, 7, & 8; pl.13, figs 4, 5, & 6) bears an off-centre tubercle on its upper surface which can vary from a low papilla (pl.12, fig.5; pl.13, figs 4 & 5) to a high dome (pl.12, figs. 6 & 8; pl.13, fig.3). A few have a depressed dome without a tubercle (pl.12, fig.7; pl.13, fig.6).

Peyer (1968, p.90) states that the teeth of *Sargodon* and *Lepidotes* have three hard substances, namely enamel, dentine and modified dentine. Ørvig (1973, p.173) refers to these hard parts as ganoine, orthodentine and acroдин respectively (text-fig. 1).



Text-fig.1. Diagrammatic, median, lateral section of *Lepidotes* sp.

In the Barnstone specimens, thin sections show the tooth cap to be of modified dentine surrounded by a larger or smaller area of true enamel. The dentine shows a layered structure of lighter and darker material with usually a darker band at the top of the dentine (pl.13, figs. 1, 2, & 6) and occasionally a dark band in the form of a series of isolated patches (pl.13, fig.2). Radiating through the dentine there is a series of fine hair-like tubules which extend from the base to the top. Where the pulp-cavity is preserved it ends in the form of a high dome (pl.13, fig.3) from which tubules radiate, being more dense at the apex. The tubules pass into the modified dentine of the cap to a varying extent in different teeth. They are longer and more concentrated near the centre of each tooth but usually extend to the perimeter of the cap. The cap is always distinct from the enamel (text-fig.1) which is thin on the sides of the tooth but thicker where the cap does not cover the upper area. Layering can be noticed in the enamel, the layers over-lapping each other downwards.

Discussion

Species of fish with crushing teeth are found at many horizons of Triassic rocks. *Perleious stoschiensis* Stensiö (Stensiö 1932, p.218) from the Lower Triassic and *Aetheodontus besanensis* Brough (Brough 1939, p.52) from the Middle Triassic are two species which have non-striate crushing teeth, many of them with an off-centre tubercle. Some are oval in upper view though most are subcircular and some have a central tubercle.

Nephrotus chorzowensis H. v. Meyer (Schmidt 1928, p.367) has crushing teeth which are non-striate, vary between oval and circular in upper view and may have a small, off-centre tubercle (pl.13, fig.7). The marginal teeth are much larger and cylindrical.

Colobodus, *Sargodon*, *Paralepidotus* and *Lepidotes* are four genera recorded from the Rhaetian rocks which have knob-like crushing teeth. An apical tubercle is characteristic of the teeth belonging to the genus *Colobodus*, the tubercles being placed centrally on striate tooth caps (Woodward 1895, p.68). The tubercles consist of modified dentine with a dense tubular structure (Guttormson 1937, fig.16, p.22) and the dentine has a compact structure (pl.13, fig.9).

In the genus *Sargodon* (Woodward 1895, p.67) crushing teeth do not have an apical tubercle and their histology shows a quite distinctive pattern of branching tubules in the cap (pl.13, fig.8).

Teeth of *Paralepidotus* which were originally designated as *Lepidotes ornatus* (Agassiz 1832, p.145) were described from the Muschelkalk of Germany by Stolley (1920, p.41). They have also been found in the Rhaetian rocks of Italy (Guttormson 1937, p.26). The teeth are low and dome-like; the pulp-cavity extends upward until it almost reaches the cap of modified dentine which is penetrated by many fine tubules (Guttormson 1937, p.26).

Teeth of *Lepidotes* sp. are recorded from localities in the British Rhaetian rocks (Richardson 1911, p.68; Moore 1861, p.499), though they have not been previously recorded from Barnstone. The crushing teeth of fishes in the genus *Lepidotes* have a smooth cap on a short pedicel which is rounded and depressed or obtuse and occasionally tuberculate (Woodward 1895, p.77). *Lepidotes* teeth from the Wealden (Patterson 1966, p.285) include many specimens with a cap which has an off-centre tubercle (pl.12, fig.9).

The Barnstone teeth are characterised by their small size; by showing intermediate stages between their differing anatomical features, and their histology which shows that they all have internal features in common. They are unusual in that their range of morphological structure extends from teeth with a small cap of modified dentine to others in which the cap covers the crown of the tooth and usually bears a tubercle on its upper surface.

The diversity of teeth under review suggests some features in common with the teeth of several Triassic species. Some of the Barnstone teeth (pl.12, figs. 5 & 6, pl.13, fig.4) resemble occasional examples of teeth of species in the genera *Perleidus* and *Aetheodontus* though the majority do not. Many of the Barnstone teeth are similar to those of *Nephrotus chorzowensis* (pl.12, figs. 3, 4 & 7; pl.13, figs. 3 & 6) but the *N. chorzowensis* teeth have a characteristic white apical pimple (Schmidt, p.367) and in thin section they have a cloudy dark band concentrically through the cap (pl.13, fig.7, Ørvig 1973, p.168).

The teeth in the species of *Colobodus* are distinguished from the Barnstone teeth by the striate toothcaps, the centrally placed apical tubercle and the dense histological structure (pl.13, fig.9).

Tubules in the modified dentine of *Paralepidotus* are similar to those in the Barnstone teeth (Guttormson 1937, p.26, fig.20) though there are distinct differences between the two types of teeth, *Paralepidotus* teeth having rounded domes and generally being without apical tubercles.

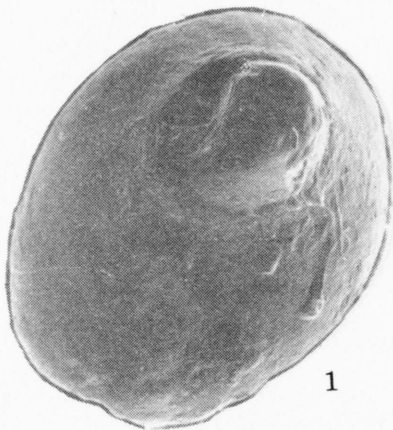
Explanation for Plate 12

- Figs. 1-8. *Lepidotes* sp. (Barnstone).
- Fig. 1. Broken pedicel with small cap; oblique, upper view, P58835.
- Fig. 2. Pedicel with large pulp-cavity and part of the basal attachment; small cap; lateral view, P58836.
- Fig. 3. Broken pedicel with medium size cap, upper view, P58837.
- Fig. 4. Broken pedicel with medium size cap, lateral view, P58838.
- Fig. 5. Broken pedicel with large pulp-cavity; cap with apical tubercle, oblique lateral view, P58839.
- Fig. 6. Detached cap with apical tubercle, upper view, P58840.
- Fig. 7. Pedicel with large pulp-cavity; cap with low, asymmetrical dome, lateral view, P58841.
- Fig. 8. Short broken pedicel with a cap having a high, dome-like tubercle, lateral view, P58842.
- Fig. 9. *Lepidotes* sp. (Wealden)
Lateral, median section of oval tooth, P58843

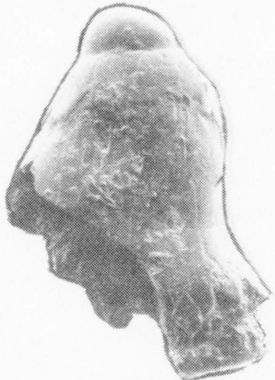
Dimensions (in mm)

	<u>Length</u>	<u>Width</u>	<u>Height</u>
Fig. 1.	0.3	0.5	0.3
Fig. 2.	0.5	0.7	1.0
Fig. 3.	0.4	0.6	0.8
Fig. 4.	0.6	0.8	0.5
Fig. 5.	0.9	1.2	1.7
Fig. 6.	0.4	0.4	0.7
Fig. 7.	0.6	0.7	1.1
Fig. 8.	0.7	0.6	1.3
Fig. 9.	-	2.0	1.7

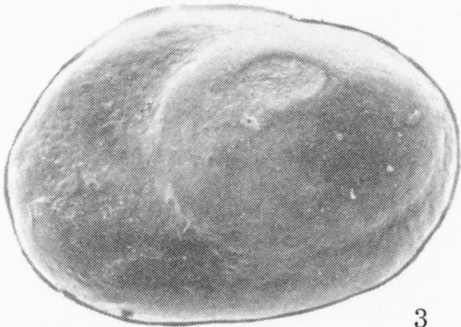
P. numbers refer to specimens in the British Museum
(Nat. Hist.).



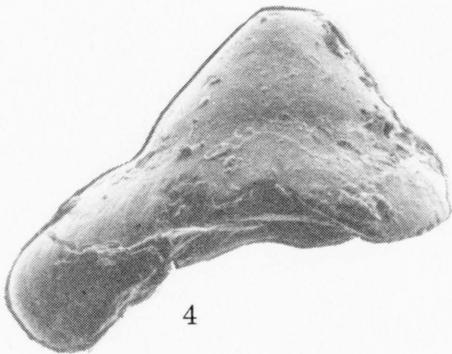
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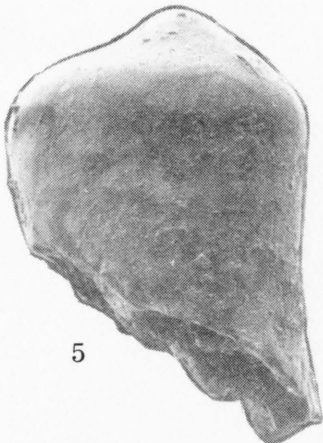
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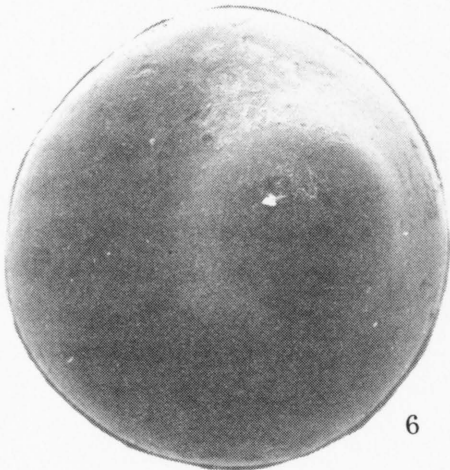
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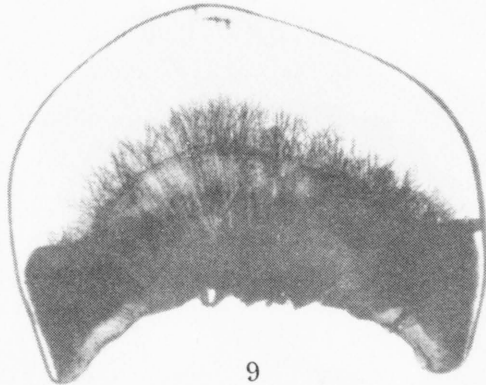
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8



9

In the case of *Lepidotes* there is more evidence for a closer affinity with the Barnstone teeth. Some of the specimens (pl.12, fig.7; pl.13, fig. 6) compare well with the low, depressed *Lepidotes* teeth. Good comparison can also be found (Woodward, pp.102, 103, 99) for the types with an obtuse dome (pl.12, fig. 8; pl.13, fig.3). The *Lepidotes* teeth from the Wealden show a variation of tooth caps which compare well with those observed on the Barnstone specimens (pl.12, figs.5,9; pl.13, fig.4). Thin sections of both these types of teeth (pl.12, fig.9; pl.13, fig.4) have similar features in the tubules of the dentine and the modified dentine. These features are also shown in the *Lepidotes* tooth figured by Ørvig (1973, p.168). It is therefore considered that the teeth under review should be referred to the genus *Lepidotes*.

Acknowledgements

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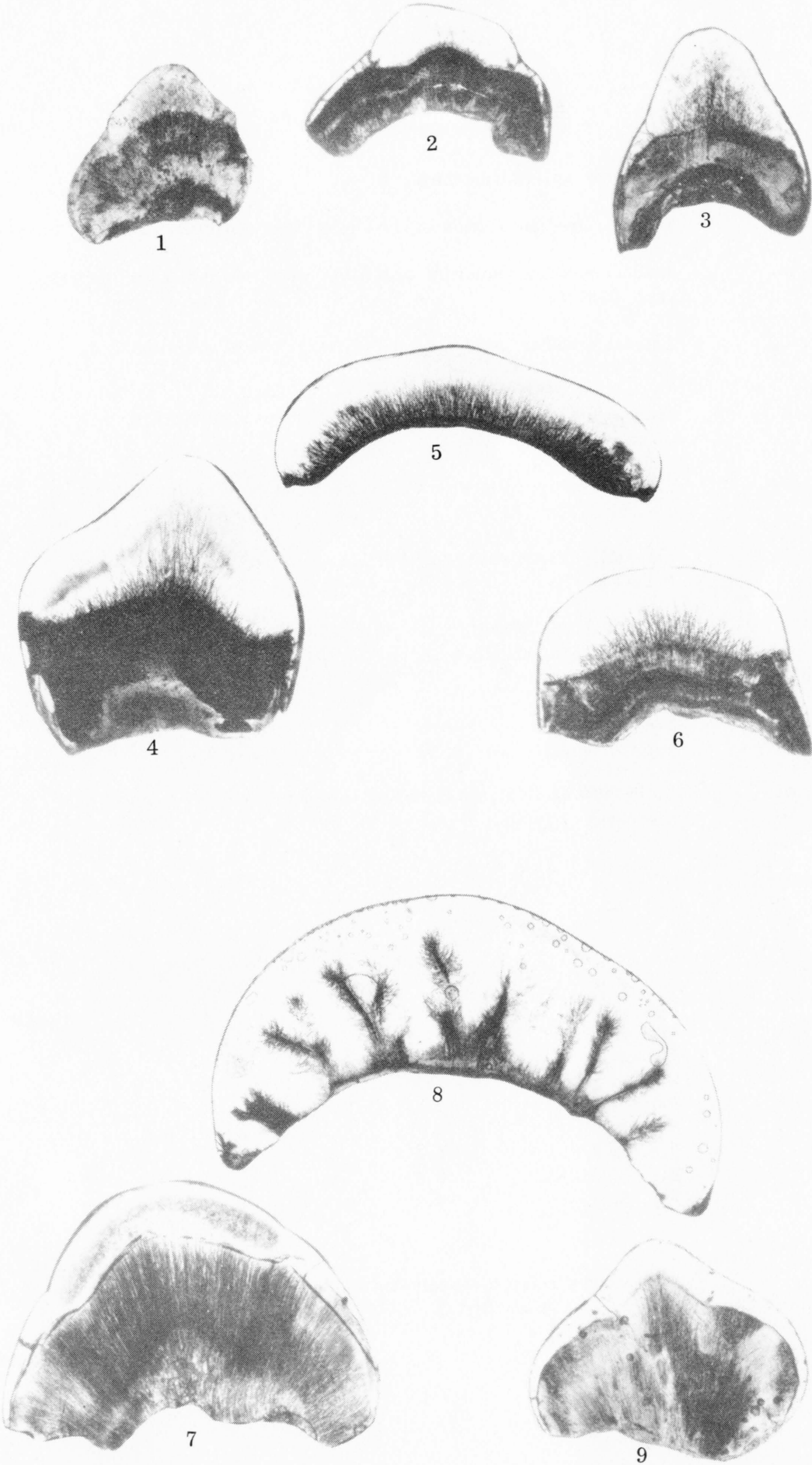
Explanation for Plate 13

- Figs. 1-6. *Lepidoles* sp. (Barnstone).
- Fig. 1. Lateral, median section of oval tooth with medium size cap, P58844.
- Fig. 2. Lateral median section of oval tooth with medium size, depressed cap, P58845.
- Fig. 3. Lateral, median section of sub-circular tooth with domed, medium size cap, P58846.
- Fig. 4. Lateral, median section of oval tooth having cap with apical tubercle, P58847.
- Fig. 5. Lateral, median section of isolated oval cap with low apical tubercle, P58848.
- Fig. 6. Lateral, median section of oval tooth with depressed cap, P58849.
- Fig. 7. *Nephrotus cf. chorzowensis* (Muschelkalk-Keuper Boundary Bone-bed Tiefenbach). Lateral, median section of oval tooth, P58850.
- Fig. 8. *Sargodon tomicus* (Barnstone).
Lateral, median section of isolated oval cap. P58851.
- Fig. 9. *Colobodus maximus* (Muschelkalk-Keuper Boundary Bone-bed Kirkberg), P58852.

Dimensions (in mm)

	<u>Width</u>	<u>Height</u>
Fig. 1.	0.7	0.6
Fig. 2.	0.9	0.5
Fig. 3.	0.7	0.7
Fig. 4.	0.9	0.9
Fig. 5.	2.1	0.9
Fig. 6.	1.0	0.7
Fig. 7.	1.2	0.9
Fig. 8.	2.7	1.6
Fig. 9.	0.9	0.8

P. numbers refer to specimens in the British Museum
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