Rushton, A. W. A. and Stone, P. 2011. Two notable fossil finds in East Falkland: a ‘starfish’ and a large trilobite. *Falkland Islands Journal*, Vol. 9, Part 5, 5-13.

TWO NOTABLE FOSSIL FINDS IN EAST FALKLAND: A ‘STARFISH’ AND A LARGE TRILOBITE

by

Adrian Rushton and Phil Stone

The fossilised marine fauna contained in the sandstone and mudstone of the Fox Bay Formation is a well-known feature of the Falkland Islands’ geology. The fossils are of Devonian age, about 400 million years old, and were first discovered by Charles Darwin during HMS Beagles’s stay at Port Louis in 1833. Many fossils have been collected since then from localities spread across both East and West Falkland but the abundant and well-preserved material recovered from the Fox Bay area in West Falkland led to the fossiliferous rock unit becoming known as the Fox Bay Formation. The two notable specimens described in this article were both found close to Darwin’s original collecting sites in Berkeley Sound, East Falkland, and demonstrate that new discoveries are always possible despite his best efforts and those of his geological successors. Both specimens were actually found some time ago but have only recently come to wider attention.

The first specimen, resembling a starfish, is a new record for the Falkland Islands, nothing of the kind having been previously discovered. It was collected by Coleen Biggs during a boat trip from Stanley to Berkeley Sound during the summer of 1973-74. Coleen recalls that she was one of a group aboard Mick Clarke’s boat ‘Nancy’ and that after calling at Johnson’s Harbour and Port Louis they all went ashore in Fish Creek, at a locality known informally as ‘Fossil Creek’. It lived up to its name and Coleen came away with the starfish. Shortly after that she left the Falklands but recently returned – to discover the starfish amongst property packed up and stashed away in her parents’ house all those years ago. A conversation with Emma Edwards then led to the starfish being loaned to the British Geological Survey for a more detailed assessment. A resin cast of the fossil was prepared at The Natural History

Museum, London, and will be retained in the museum's fossil collections, whilst the original specimen has been returned to the Falkland Islands.

The second specimen, a trilobite, is not a new record, but is an exceptionally large and well-preserved example of a species that is otherwise well known from the Fox Bay Formation. It was found near Port Louis in February 1995 by Ragnhild Brännström from Sweden, whilst she was a volunteer assisting with a botanical survey. The trilobite ended up back in Sweden, but was soon sent to The Natural History Museum, London, for identification. Communication then lapsed, but has recently been re-established and Ragnhild has kindly agreed to donate the fossil specimen to the museum collection.

The fossil starfish from the Fox Bay Formation.

In terms of strict zoological classification the fossil is not the remains of a true starfish, but of a member of the Ophiuroidea, a group that includes the brittle-stars of modern seas that have slender flexible arms radiating from a central disc. Their name derives from the Greek *Ophis*, a snake, and *–ura*, tail, referring to the writhing movement of their arms, which they use for foraging and crawling over the sea-bed. The ophiuroids are a very ancient group of animals that first appeared in the fossil record over 470 million years ago.

The body of the Falklands ophiuroid was built up around hundreds of small plates or ossicles composed of lime. These ossicles have dissolved away, leaving an impression in the rock (Figure 1-top image). By making an artificial cast of the impression (Figure 1-bottom image), we get a better idea of the appearance of the underside of the animal at the time it was buried. The mouth was in the centre, surrounded by five V-shaped pairs of larger plates. Five arms radiate from the centre, but we can see only three of them, the other two being almost wholly broken away. In many ophiuroids the disc, which surrounds the bases of the arms, is framed by strong plates, but in the one from the Falklands the disc is only faintly outlined.

Where the arms extend beyond the disc, they are free to flex. Each arm has a groove extending for the length of its under-surface, with ossicles on either side of the groove

(see Figure 1, bottom image); this is a feature of several ancient ophiuroids, but not their modern counterparts. There are short spines, apparently one on each ossicle, sticking out from the sides of the arms (see Figure 1, top image), whereas modern ophiuroids may have several such spines on each ossicle.

Complete fossil starfish are not commonly found, because when one dies and decays, the myriad small ossicles are scattered. However, on occasion, a sudden event such as an underwater mud-slide buries all the animals on the sea-floor, 'freezing' them in the position of death; such events may give rise to a 'starfish bed' that yields many of these elusive fossils. There is no suggestion that the solitary Falklands specimen was preserved in this particular way, but 'starfish beds' are known from the Bokkeveld Group in South Africa, which contains strata equivalent to the Falklands' Fox Bay Formation; and it is now well-established that before the Atlantic Ocean opened the two areas were adjacent.

Only an impression of the underside of the Falklands ophiuroid is preserved, and then only partially, so reliable formal identification may not be possible. For such identification, the specimen would need to be compared closely, and in detail, with other examples of Ophiuroidea including those known from the Bokkeveld Group. So far, the comparisons which have been possible have not tracked down a convincing analogue.

The fossil trilobite from the Fox Bay Formation.

The trilobite is a fine example of the homalonotid *Burmeisteria herschelii*. The thorax and pygidium (tail shield) are preserved in three dimensions (Figure 2). Although the cephalon (head shield) is missing, eleven or twelve of the thirteen body segments are present, together with the front part of the pygidium. The specimen, very large compared with most others from the Falklands, shows the highly vaulted character of the thorax, the animal's flanks being nearly vertical. A striking feature of *B. herschelii* is the array of knobs along the body. These, which are the bases of short thorn-like spines, seem to vary in arrangement from one specimen to another. Ragnhild's specimen provides a useful corrective to the flattened specimens occasionally found in East Falkland and the small and fragmentary, though well preserved, specimens

from West Falkland, as illustrated recently in *Fossils from the Falkland Islands* (2002) and *Rocks and Fossils of the Falkland Islands* (2005).

To illustrate *B. herschelii* more fully, two other examples from The Natural History Museum's Falkland Islands holdings, are shown in Figure 3; they are relatively large examples of a cephalon (3a-c) and a pygidium (3d,e), and both come from Pebble Island, West Falkland. The pygidium was collected by H. A. Baker during his geological survey of the islands in 1921-22 and was donated to the museum in 1936. The cephalon came to the museum in 1956 as a bequest from the estate of A. G. Bennett, though the specimen had actually been collected by members of the British Graham Land Expedition (with which Bennett had no direct involvement) sometime between 1935 and 1937. Baker and Bennett both made significant contributions to scientific study of the Falkland Islands, details of which are available in *The Dictionary of Falklands Biography* (2008).

Burmeisteria herschelii was originally defined in 1839 by Roderick Murchison in his seminal work *The Silurian System* that described the oldest fossiliferous rocks and fossils in Britain. Murchison wrote "This is the only foreign specimen figured in this work, and I have selected it, because it marks the fact, that the eminent astronomer, after whom it is named, occupied a portion of the time he spent in Southern Africa in promoting geological investigation". Murchison was ever careful to give full credit to the greatest scientists of his day (though it is recorded that he did less justice to many of his less aristocratic assistants). Sir John Herschel, who, according to Holmes (2008, p. 465), was esteemed as "the greatest astronomer and general scientist of his day", had in 1833 taken his family and his 20-foot telescope to South Africa, and spent four years, primarily mapping systematically the stars of the southern hemisphere, just as his father, Sir William, and his aunt, Caroline Herschel, had done for the northern hemisphere. While there he made time for botanical, zoological and meteorological studies, and in 1836 met with Charles Darwin when HMS Beagle called at the Cape of Good Hope during the homeward voyage.

B. herschelii was first described from the Falkland Islands in 1913, in a paper by the American palaeontologist John Clarke, who used material provided by Governor Allardyce's wife, Constance, from a then newly-discovered fossil site on Pebble

Island, West Falkland. Specimens subsequently collected from this locality are shown in Figure 3. As with the ophiuroid, the trilobite has analogues in the Bokkeveld Group of South Africa, whence good specimens were discovered around 1850 and described by the British palaeontologists Daniel Sharpe and John Salter; their contemporary illustration, published in 1856, is shown in Figure 4. Ragnhild's Falkland specimen is rather larger than, and more convex than, the splendid thorax and pygidium featured by Sharpe and Salter.

Although at the time of their publication no determinable trilobites had been found in the Falkland Islands, Sharpe and Salter were aware of the association between the South African fauna and that collected in the Falklands by Charles Darwin. In respect of Bokkeveld Group brachiopods they noted: "… the only locality where any of these South African species have previously been found is in the Falkland Islands; and it is very remarkable that, of the nine species brought from those islands by Mr Darwin … five are contained in the collection from the Cape." It should then have been no surprise when *Burmeisteria herschelii* turned up in the Falklands, though in 1913 John Clarke was still taken aback by the closeness of the trans-Atlantic fossil assemblages.

Acknowledgements

We thank Aeron Hunter and Phil Crabb (both of the Natural History Museum, London) respectively for discussion of the Ophiuroidea and for taking the photographs. PS contributes by permission of the Executive Director, British Geological Survey (NERC).

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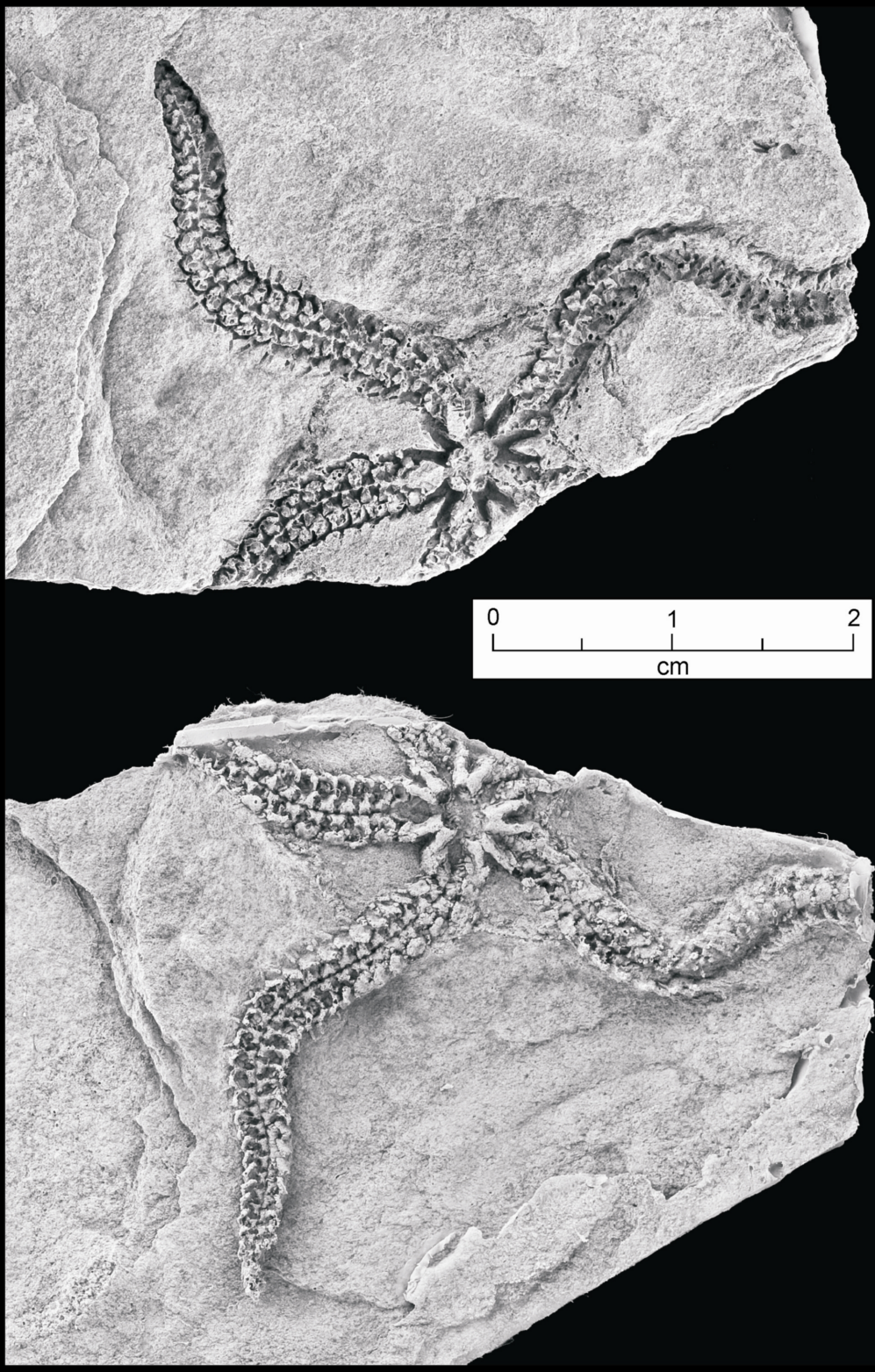
Figure captions

Figure 1. The Falklands ‘starfish’. The top image shows the natural impression (intaglio) of the underside of the fossil ophiuroid. The bottom image features a resin cast of the same specimen, showing the appearance of the animal after death. (©Natural History Museum, London).

Figure 2. The homalonotid trilobite *Burmeisteria herschelii*, thorax and pygidium, side and rear views. (©Natural History Museum, London).

Figure 3. *Burmeisteria herschelii*. Aspects of the cephalon (a-c) and pygidium (d, e) illustrated by historical specimens from the Natural History Museum. (©Natural History Museum, London).

Figure 4. *Burmeisteria herschelii* as illustrated in an account of South African geology published in 1856 in the *Transactions of the Geological Society of London*.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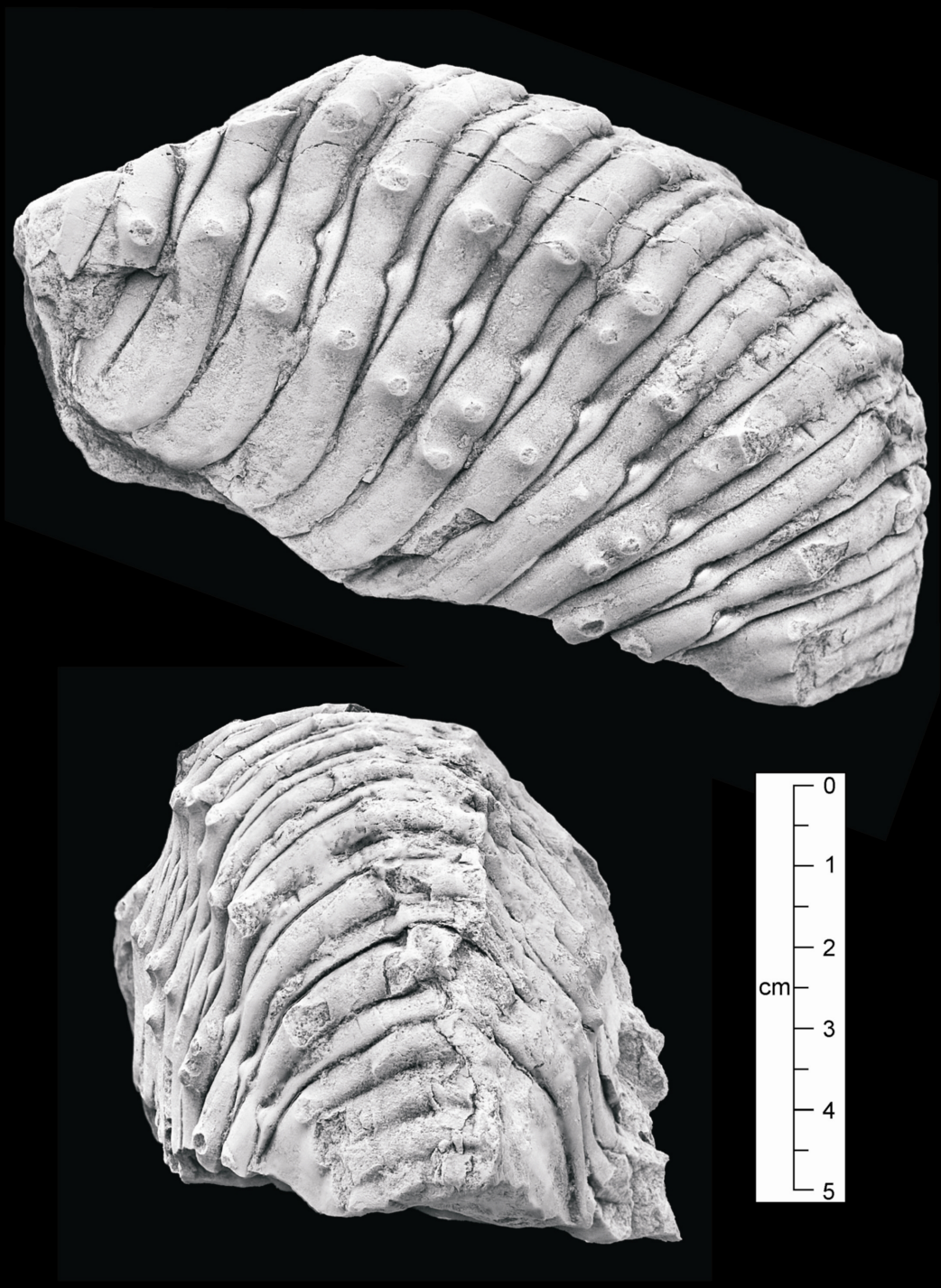
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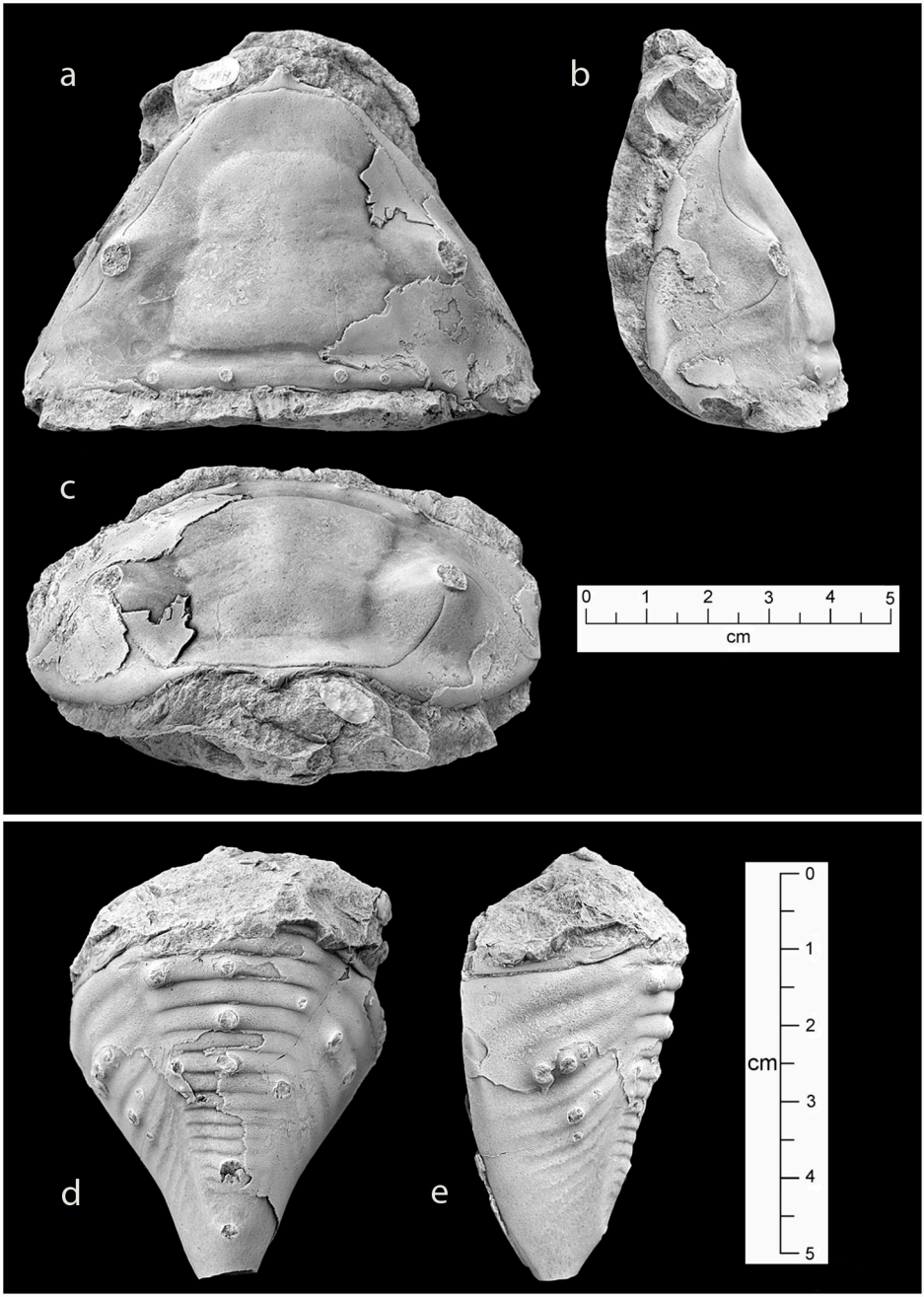
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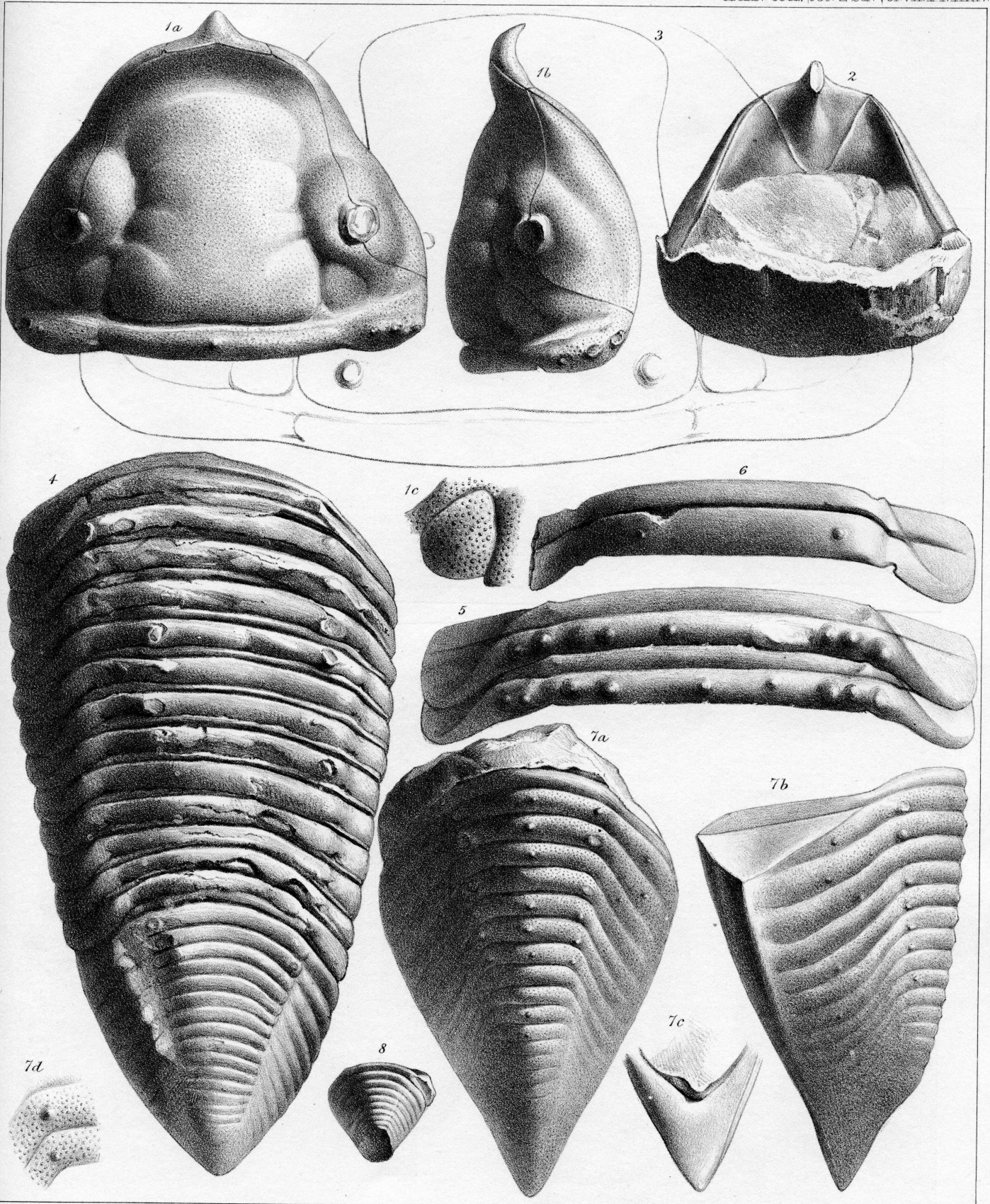

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FOSSILS FROM SOUTH AFRICA (*Palæozoic.*)