

THE TOUTTIES

OS Grid Reference: NO881866

Highlights

The Toutties has yielded many good fish specimens from the Cowie Harbour Fish Bed. This Grampian site is important because the age may be latest Silurian (although that is controversial), and this represents one of the few British fish faunas of that age outside the Anglo-Welsh Borderland region.

Introduction

The Cowie Harbour Fish Bed crops out on the foreshore just south of the old harbour jetty to the north of Stonehaven, within rocks called 'The Toutties' (Figure 2.17). The geology of the site has been described by Campbell (1911, 1912b), Denison (1956), Armstrong and Paterson (1970) and Armstrong *et al.* (1978), and the fish fauna by Traquair (1912), Campbell (1913), Westoll (1945), White (1946, 1950a), Ritchie (1960, 1964) and Janvier (1981).

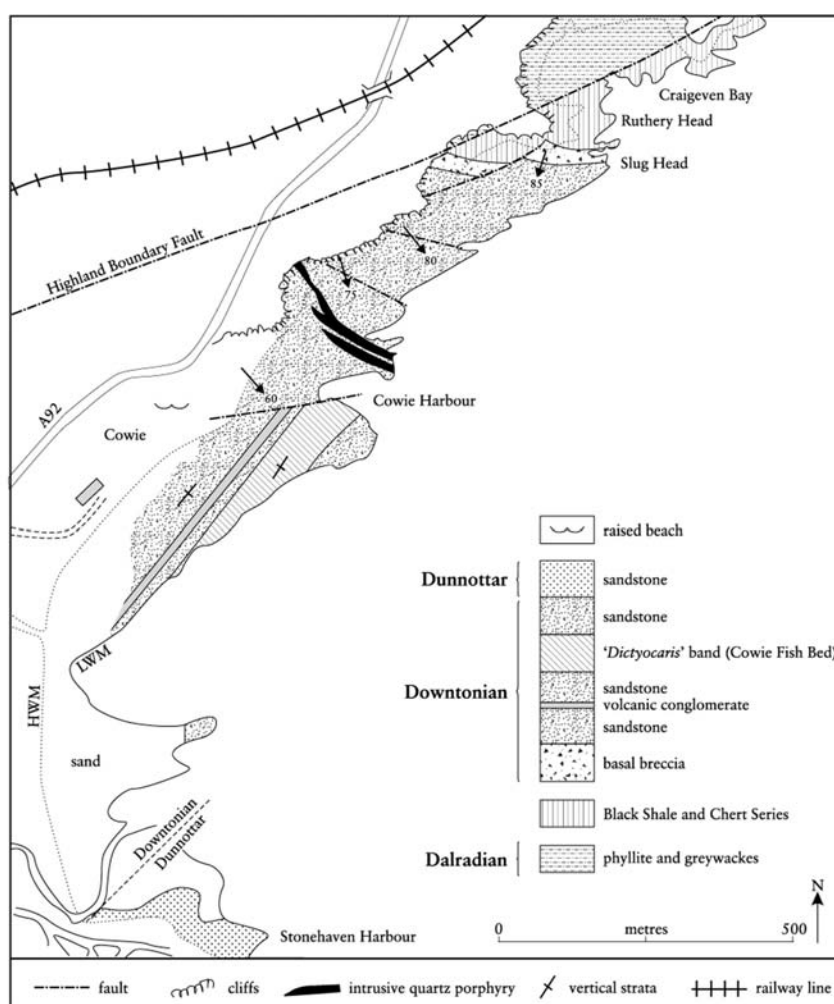


Figure 2.17: Geological sketch-map of the coast to the north of Stonehaven (after McGregor, 1978); The Toutties is the area of foreshore south of Cowie Harbour.

Description

In this vicinity Late Silurian strata rest unconformably on the much older (Cambrian age) Highland Boundary Group, which has been highly folded. The fish bed lies within the vertical Silurian strata and is faulted out at the southern end of the outcrop where the bed disappears

under the low-tide mark in Cowie Harbour. Armstrong and Paterson (1970) divided the Upper Silurian 'Downtonian' Stonehaven Group into the lower Cowie Formation (730 m thick) with the fish bed in its upper part, and the overlying Carron Formation (820 m thick). The fish bed occurs in a sequence of alternating grey sandstones and shales, with brown, grey and red cross-bedded fluvial sandstones below and above (Figure 2.18).

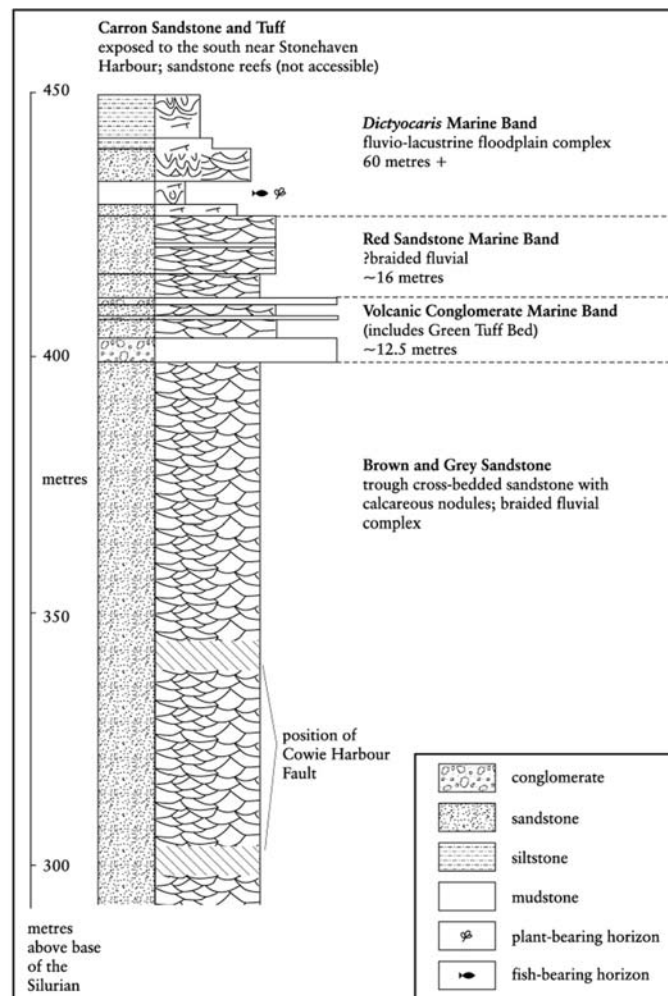


Figure 2.18: Stratigraphical log of the uppermost part of the Downtonian at The Toutties (after MacGregor, 1968).

The Cowie (Harbour) Fish Bed (also called the *Dictyocaris* Band or Member) was first described by Campbell (1911). Fossils had been collected for the Geological Survey by Macconochie in 1881, but the first agnathan fossils were not found until 1912, when a fish spine was discovered in a grey mudstone rich in the arthropod *Dictyocaris*. Cephalaspids also were found in a reddish sandy mudstone below this grey bed (Campbell, 1912a, 1912b).

Fauna

The recorded fish fauna from the Cowie Harbour Fish Bed includes an anaspid, a heterostracan and a cephalaspid.

AGNATHA

Anaspida: Birkeniiformes: Birkeniidae

Birkenia sp.

Osteostraci: Ateleaspidiformes: ?Ateleaspididae

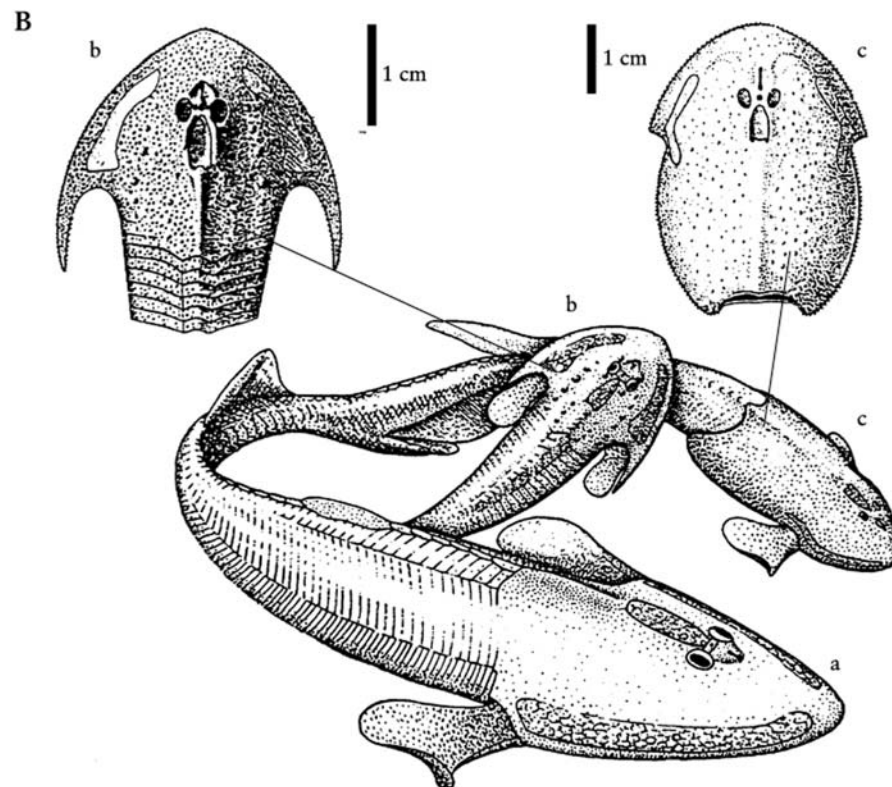
Hemiteleaspis heintzi Westoll

Heterostraci: Phialaspidiformes: Traquairaspididae

Traquairaspis campbelli (Traquair, 1913)

The anaspid is represented by possible scutes of *Birkenia* recorded by Campbell (1913). Ritchie (1960, 1964) also reported the discovery of an anaspid which, with its well-developed lateral fin folds, resembles the Norwegian genera *Pharyngolepis* and *Pterygolepis*.

Some of the remains noted by Campbell (1912) were regarded by Traquair (1912) as cephalaspid scutes and plates. Westoll (1945) described a new genus and species of hemicyclaspid *Hemiteleaspis heintzi*, based on the impression of a single, incomplete head shield plus several separate scales from Cowie Harbour. Scales were also found, in association with *Dictyocaris* at nearby Tewel Burn. Westoll (1945) considered that *Hemiteleaspis* was intermediate in form between the cephalaspids *Aceraspis* (which Westoll considered to be ? latest Ludlow in age) from Rudstangen, Norway, and *Hemicyclaspis* from the Downtonian (Píídolí) of the Welsh Borders and Jeløy, Norway. Janvier (1981, p. 131) regarded the hemicyclaspids as successive outgroups of the derived cornuate Osteostraci, with *Ateleaspis* from Slot Burn (q.v.) as the most primitive, followed by *Aceraspis* and *Hirella*, then *Hemiteleaspis* and finally *Hemicyclaspis* (Figure 3.14).



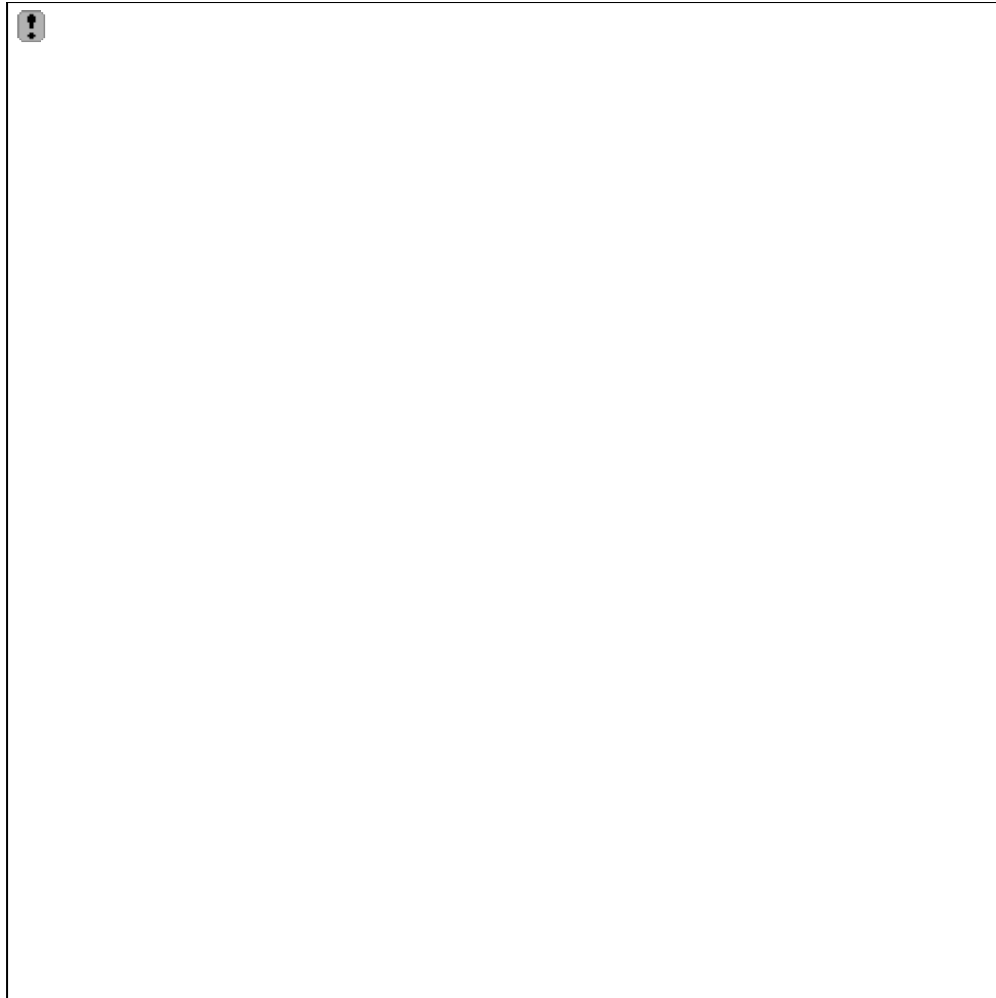


Figure 3.14: Osteostracans from the Ledbury cutting. (A) *Hemicyclaspis murchisoni* Egerton in rare preservation, one of many such slabs collected over 100 years ago, c. $\times 0.25$, (photograph courtesy The Natural History Museum, London, T05398/A). (B) Restoration of vertebrates found at Ledbury: a, *Hemicyclaspis murchisoni*; b, *Auchenaspis egertoni* Lankester; c, *Didymaspis grindrodi* Lankester (from Blieck and Janvier, in press).

Traquair (1912) named a new species of heterostracan from the Cowie Harbour Fish Bed as *Cyathaspis campbelli*. When White (1946) described *Phialaspis pococki* from the Pídlí of Shropshire, he erected the subspecies, *P. pococki cowiensis* based on plates from Cowie Harbour, but he later (White, 1950a) showed that these were actually ventral discs of *Cyathaspis campbelli*, which he assigned to the new genus *Traquairaspis* (Figure 2.19). This is the type species of the genus which until recently contained *Phialaspis*, a genus which is common in the Welsh Borders. Tarrant (1991) removed all the Welsh Borders species to *Phialaspis* and the new genus *Toombsaspis*, leaving *T. campbelli* as the sole species of *Traquairaspis*. It may be related to *Rimasventeraspis angusta* (Denison, 1963) from the Pídlí of Yukon, Canada, these two species forming the Family Traquairaspididae, according to Tarrant (1991).



Figure 2.19: The ventral disc of *Traquairaspis campbelli* (Traquair) (holotype, RSM) from the Cowie Harbour Fish Bed, $\times 1.3$. It has the characteristic serrated tubercles now known in related heterostraci throughout the circum-Arctic Siluro-Devonian and may be one of the oldest traquairaspidiforms (from Kiaer, 1932b).

In recent years traquairaspids have been recorded from the Downtonian (Píldolí) of the Mackenzie Mountains, Northwest Territories, Canada (Dineley and Loeffler, 1976) and the Peel Sound Formation and other units in the Central Arctic Islands (Dineley, 1990; Elliot, 1984). Talimaa (1995) also reports them from the Silurian and Lower Devonian of Timan–Pechova in northern Russia.

Interpretation

The 60 m or more of grey sandstones and shales containing the Cowie Harbour Fish Bed are interpreted as a fluvio-lacustrine floodplain complex (Armstrong *et al.*, 1978). This is the only section in Scotland that may contain Downtonian (Píldolí) rocks (Denison, 1956; Westoll, 1977), although that is still uncertain (Cocks *et al.*, 1992). If Wellman and Richardson (1993) are correct in asserting that there is evidence of a Wenlock age for the Dictyocaris Beds, then *Traquairaspis campbelli* is substantially older than had previously been thought. Consequently this heterostracan is thereby more of an age with those from the Canadian Arctic Cape Phillips Formation and Cape Storm Formation (Dineley, 1990). The vertebrate assemblage may be regarded as non-marine (Boucot and Janis, 1983).

Conclusions

The conservation value of this as an important site lies in its ?late Wenlock to late Ludlow or even basal Píldolí age, which is unique for Scotland. Also, it is the only site in Britain of that age that is part of the Scottish–Baltic fish province. The unique fauna of cephalaspids and heterostracans is not found elsewhere but may be related to Canadian and Baltic forms. Any further collecting at this locality would necessarily involve problems in view of its foreshore position, but a better understanding of *Traquairaspis* material is important for taxonomy.

Reference list

- Armstrong, M. and Paterson, I.B. (1970) The Lower Old Red Sandstone region. *Institute of Geological Sciences Report 70/12*, HMSO, London.
- Armstrong, M., Donovan, R.N. and Paterson, I.B. (1978) Day 2 Angus and Kincardine. In *A field guide to selected outcrop areas of the Devonian in Scotland, the Welsh Borderland and South Wales*, (eds P.F. Friend and B.P.J. Williams). The Palaeontological Association, 13–22.
- Boucot, A.J. and Janis, C. (1983) Environment of the Early Palaeozoic vertebrates. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **41**, 251–87.
- Campbell, R. (1911) Preliminary note on the geology of south-eastern Kincardineshire. *Geological Magazine*, **8**, 63–9.
- Campbell, R. (1912a) On the geology of south eastern Kincardineshire. *Proceedings of the Geologists' Association*, **23**, 295–8.
- Campbell, R. (1912b) Cambrian, Downtonian and Lower Old Red Sandstone rocks near Stonehaven. *Proceedings of the Geologists' Association*, **23**, 291–4, 297–8.
- Campbell, R. (1913) The geology of northeastern Kincardineshire. *Transactions of the Royal Society, Edinburgh*, **48**, 1–37.
- Cocks, L.R.M., Holland, C.H. and Rickards, R.B. (1992) *A Revised Correlation of Silurian rocks in the British Isles. Geological Society of London Special Report*, **21**.
- Denison, R.H. (1956) A review of the habitat of the earliest vertebrates. *Fieldiana: Geology*, **11**, 359–457.
- Denison, R.H. (1963) New Silurian Heterostraci from southeastern Yukon. *Fieldiana: Geology*, **14**, 105–141.
- Dineley, D.L. (1990) Palaeozoic fishing – The Franklinian Grounds. In *Canada's Missing Dimension: Science and History in the Canadian Arctic Islands* (ed. C.R. Harington), Canadian Museum of Nature, Ottawa, **1**, pp. 55–80.
- Dineley, D.L. and Loeffler, E.J. (1976) Ostracoderm faunas of the Delorme and associated Siluro-Devonian formations, Northwest Territories, Canada. *Special Papers in Palaeontology*, **18**, 1–214.
- Elliot, D.K. (1984) Siluro-Devonian fish biostratigraphy of the Canadian Arctic Islands. *Proceedings of the Linnean Society of New South Wales*, **107**, 197–209.
- Janvier, P. (1981) The phylogeny of the Craniata, with particular reference to the significance of fossil 'agnathans'. *Journal of Vertebrate Paleontology*, **1**, 121–59.
- Ritchie, A. (1960) A new interpretation of *Jamoytius kerwoodi* White. *Nature*, **188**, 647–9.
- Ritchie, A. (1964) New light on the morphology of the Norwegian anaspida. *Skifter dem Norske Vidensk-Akademi (NS)*, **14**, 1–35.
- Talimaa, V.K. (1995) Vertebrate complexes in the heterofacial Lower Devonian deposits of Timan-Pechova Province. *Ichthyolith Issues, Special Publication No. 1*, 39–42.
- Tarrant, P.R. (1991) The ostracoderm *Phialaspis* from the Lower Devonian of the Welsh Borderland and South Wales. *Palaeontology*, **34**, 399–438.
- Traquair, R.H. (1912) Note on the fish remains collected by Messrs R. Campbell, W.T. Gordon, and B.N. Peach in Palaeozoic strata at Cowie, Stonehaven. *Geological Magazine*, **5**, (10), 5.
- Traquair, R.H. (1913) *Ganoids of the British Carboniferous Formations*. Palaeontographical Society (Monographs), 183 pp.
- Wellman, C.H. and Richardson, J.B. (1993) Terrestrial plant microfossils from Silurian inliers of the Midland Valley of Scotland. *Palaeontology*, **36**, 155–94.
- Westoll, T.S. (1945) A new cephalaspid fish from the Downtonian of Scotland, with notes on the structures and classification of Ostracoderms. *Transactions of the Royal Society of Edinburgh*, **61**, 341–57.
- Westoll, T.S. (1977) Northern Britain. In *A Correlation of Devonian rocks in the British Isles* (ed. M.R. House), *The Geological Society Special Report*, No. 8, 66–92.
- White, E.I. (1946) The genus *Phialaspis* and the 'Psammosteus Limestones'. *Quarterly Journal of the Geological Society, London*, **101**, 207–42.
- White, E.I. (1950a) The vertebrate faunas of the Lower Old Red Sandstone of the Welsh borders. *Bulletin of the British Museum (Natural History) Geology*, **3**, 1–67.