Granton and Wardie Shore

E.N. Clarkson

O.S. 1:50000 Sheet 66 Edinburgh

B.G.S. 1:50000 Sheet 32E Edinburgh

Route: (Map 7)

Introduction

The sediments exposed along the shore between Silverknowes and Newhaven belong to the Lower Oil-Shale Group (Holkerian–Asbian) of the Lower Carboniferous Calciferous Sandstone Measures. These beds rest upon the Arthur's Seat Volcanic Rocks (Table 2). They are largely non-marine and were apparently deposited in a large freshwater or brackish lake extending into West Lothian and Fife and as far as the Pentland Hills. This lake, however, was subject to a periodic marine influence from the east, which became more manifest through time. Marine fossils in the Edinburgh district are confined to thin bands only. Non-marine or marginal marine fossils, however, are common at certain horizons, especially bivalves, ostracods, crustaceans, and fishes.

In northern Edinburgh the Lower Oil-Shale Group is folded into a dome with the underlying Abbeyhill Shales in the core of the dome at Drylaw. The WSW-ENE trending Granton Fault, which outcrops 800 m west of Granton Harbour, displaces the strata but good sections of the Granton Sandstones and the overlying Wardie Shales are to be found respectively to the west and east of the harbour (Tait, 1925).

Excursion A - Granton shore

This excursion can only be undertaken at low tide; total time 2 hours.

1. Craigleith Sandstone

From West Shore Road, just west of the Granton Gasworks [NT 220 773] follow the esplanade below Craigroyston House and Muirhouse. The sports ground was reclaimed from the site of the Old Granton Land and Sea Quarries, formerly quarried for building stone. From the western corner of the high sea wall observe the Craigleith Sandstone exposed in the high ground to the south, across the wave-cut platform forming the level public park. The top of this same sandstone is exposed on the shore below the esplanade. The sandstone is yellowish, current-bedded and coarse to fine grained.

2. Bituminous Shale

Directly overlying the Craigleith Sandstone is a bituminous shale bearing large ironstone nodules, sometimes containing poorly preserved fish remains. The shale, where exposed, contains abundant conchostracans. This forms a wave-cut platform upon which rests the Granton Shrimp Bed.

3. The Granton Shrimp Bed

The sequence overlying the bituminous shales contains three thin dark blue-grey calcareous horizons separated by shales (Briggs and Clarkson, 1983). Each horizon consists of thin organic laminae alternating with dolomite. The uppermost horizon, up to 30 cm thick, rests directly on a shale which in places is highly disturbed with NW-trending parallel folds normal to direction of slumping. The troughs of some 10 cm amplitude are filled with contorted material of the shrimp bed. Above this is a brecciated horizon, containing fragments of marine fossils, succeeded by finely laminated

calcareous shrimp-limestone once more.

The upper calcareous bed contains abundant specimens of crustaceans; common *Waterstonellagrantonensis*, rarer *Crangopsis*, and *Anthracophausia*, and very rare *Tealliocaris*. There are also hydroids which like the crustaceans, are preserved in fluorapatite. Palaeoniscid fishes are sometimes found, and several specimens of a conodont-bearing animal have been recorded. These fossils are found only in isolated patches a few metres across and the locality is now largely worked out, the bulk of the fossiliferous material having been removed to the Royal Museum of Scotland in 1985.

The site is now protected as an S.S.S.I. under the vigilance of the Park Patrol. It is illegal to hammer these exposures. Shrimp-bearing blocks may however be picked up amongst the pebbles on the beach.

4. Western Breakwater

Follow the esplanade as far as the point or walk along the pebble and sand beach. Sandy ribs with shaly partings dipping 12° WNW mark the base of the yellow Ravelston Sandstone. The thin shales within the sequence are in places crowded with ostracods. Exposures further along are very poor.

Return to West Shore Road via the esplanade.

5. West Side Granton Harbour: Wardie Shales and Coal (not shown on map)

From Granton Harbour walk westwards along the shore [NT 241 770]. The sequence is not well exposed but some 100 m from the western breakwater is an outcrop of the Wardie Coal. It is less than a metre thick but was formerly extracted. Just above the coal is a thin (20 cm) band of pyritous limestones and shales with *Lingula*. bivalves, and ostracods followed by black shales with ironstone nodules. The succession is intruded by thin olivine-dolerite sills. The General's Rock, 300 m west of the breakwater, shows the top of the Ravelston Sandstone.

Apart from the Wardie Coal, however, the sequence is better seen east of Granton Harbour.

Excursion B - Shore East of Granton Harbour

6. Wardie Shales

This excursion can only be undertaken at low tide: total time 1.5 hours.

This section in the Wardie Shales was the source of many of the fishes described in the early nineteenth century by Agassiz, and later by Traquair (1887–1914), who published an extensive faunal list in 1903. The sequence was detailed by Mitchell et al. (1962) and later by Wood (1975) who collected many fossil fishes from a particular horizon.

Much of the succession is of shale with ironstone nodules but there are some thin ostracod-bearing limestones. Some of the nodules bear fish remains but the vast majority contain only coprolites usually of spiral form. This stretch of shore is rather contaminated and it is recommended that any nodules should be boiled before breaking open to remove effluent.

The succession dips eastwards at about 10°. The sequence, as given by Mitchell et al. and amended by Wood (1975), is as follows:

	Fish Bed (vii)	7.6m
Black shales with ironstone	Fish Bed (vi)	5.0 m.
Nodules containing fish remains	Fish Bed (v)	4.7 m.
	Fish Bed (iv)	2.0 m.
	Fish Bed (iii)	0.9 m.
Coprolitic bituminous shale (beds not exposed)		7.6 m.

Black shales with thin limestone. Lingula and bivalves (beds largely unexposed but thin tuff bed 2.5 cm visible)	Fish Bed (ii)	3.0 m.
Wardie Coal (not now exposed)		1.0 m.
Nodular seatearth		1.4 m.
Yellow sandstone		3.5 m.
Unfossiliferous argillaceous beds with nodules; grey papery shale		6.4 m.
Dark papery shale	Fish Bed (i)	2.1 m.

The lower part of the succession below the Wardie Coal is sparsely fossiliferous though some fishes have been collected from Fish Bed (i). Move eastwards over these thin papery shales (which have few nodules) as far as the 1.2 m thick cross-bedded sandstone unit standing up as a prominent ridge with an undulating top. Directly below this the trace-fossil Thalassinoides can be seen at the top of the underlying shale. The sandstone is overlain by a non-marine seatclay, above which lay the Wardie Coal, though this is no longer exposed.

Eastwards from the sandstone are the most productive fish-bearing beds (especially Beds v-vii), with many ironstone nodules. Different types of nodules can be referred to specific beds. Many such nodules lie in abundance amongst the pebbles though the vast majority contain only coprolites.

The fishes that have been recorded are:

Cosmoplychius strialus (Ag) [most abundant]

Nemaloplychius greetlocki (Ag) [most abundant]

Elonichthys robisoni (Hibb) [most abundant]

Elonichthys puntatus (Ag)

Gonalodus punctatus (Ag) [most abundant]

Eurynothus crenatus Ag [most abundant]

Rhadinichthys brevis Traq

Rhadinichthys carinatus (Ag) [most abundant]

Rhadinichthys ferox Traq

Rhadinichthys ornatissimus (Ag)

Wardichthys ornatissimus

Cladodont undet

Ctenacanths undet.[most abundant]

Tristychius sp. nov.

Acanthodes sulcatus Ag

Rhizodus hibberti (Ag in Hibb)

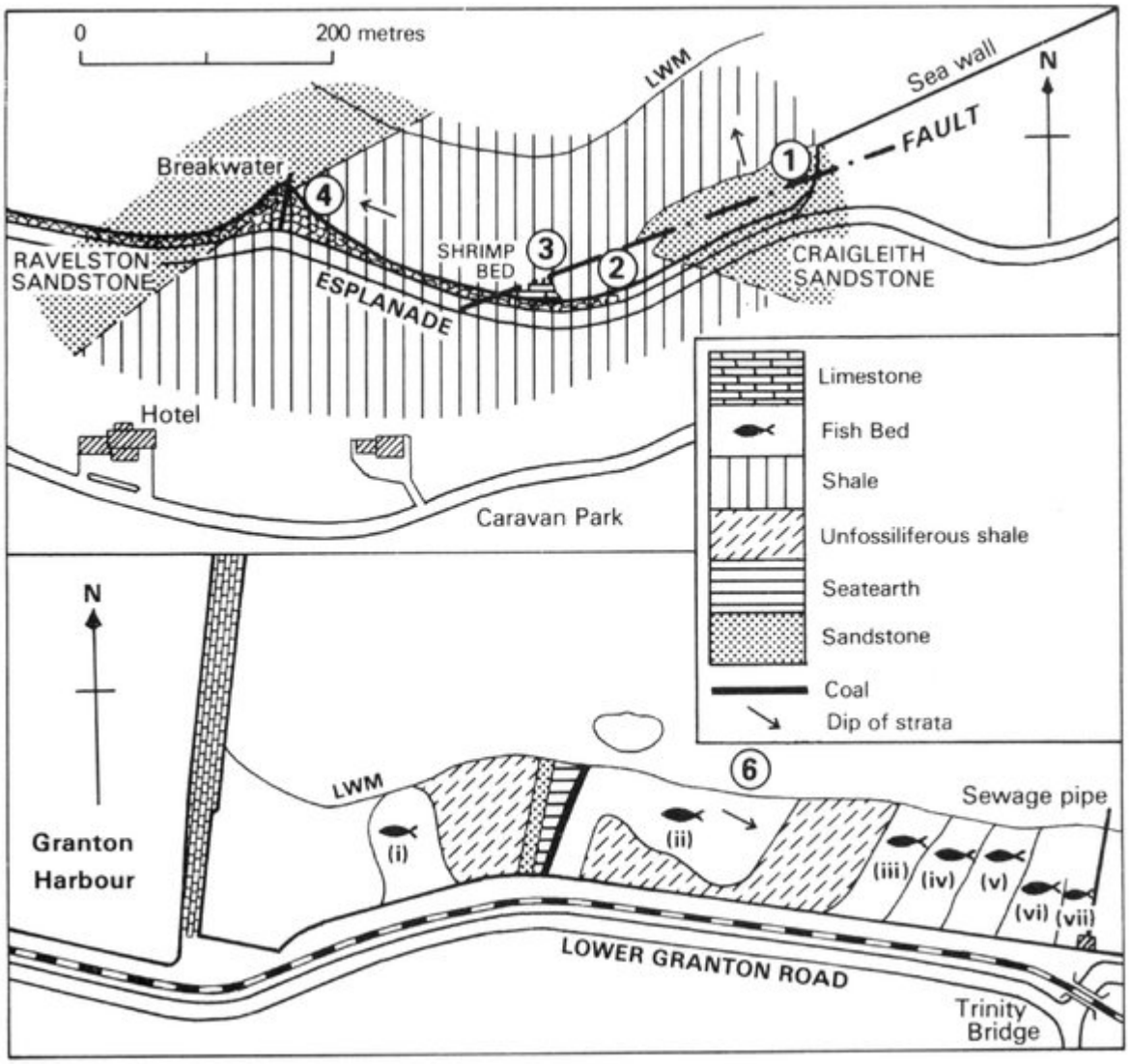
Megalicthys sp.

'*Ophriderpelon*'

East of the sewage pipe exposures are few and mud and the debris of new construction cover the beds. Return to Granton Harbour.

E.N. Clarkson

References



(Map 7) Granton and Wardie shore.

PERIOD	EPOCH/SERIES	AGE	ENVIRONMENT	TYPE OF ROCK/DEPOSIT
		Present day		
QUATERNARY	**Post-Glacial**		Temperate land High sea level	River alluvium Low raised beach
		10 000		
	Late-Glacial		Sub-arctic Very high sea level Arctic	Peat High raised beach Sands and gravels
		15 000		
	Glacial		Ice-cap with interglacials	Boulder clay (till)
		1 million		
TERTIARY **CRETACEOUS** **JURASSIC** **TRIASSIC** **PERMIAN**	**(Gap in geological record)**		Land, temperate to desert Earthquakes Mountain building	
		280 million		Igneous intrusions
CARBONIFEROUS	**Coal Measures**		Coal swamps, seas, deltas	Coal-bearing sediments
	Passage Group		Rivers, deltas	Sandstones, fireclays
	Upper Limestone Group			Mixed strata
	Limestone Coal Group		Coal swamps, deltas, coral seas	Coal-bearing sediments
	Lower Limestone Group			Limestone-bearing sediments
	Upper Oil-Shale Group		Freshwater lagoons, deltas	Oil-shale-bearing sediments
	Lower Oil-Shale Group			Oil-shales, sandstones
	Arthur's Seat Volcanic Rocks		Volcanic eruptions	Lavas, tuffs, vents
	Cementstone Group		Coastal, shallow lagoons	Mixed strata
		345 million		
DEVONIAN **(OLD RED SANDSTONE)**	**Upper Old Red Sandstone**		Rivers, arid desert	Red sandstones
	Pentland Hills Volcanic Rocks		Volcanic eruptions, earthquakes	Lavas, tuffs, intrusions
	Lower Old Red Sandstone		Desert, floods, rivers	Red conglomerates
		395 million	Earthquakes, mountain building	
SILURIAN	**Wenlock**		Barren land	Red sandstones
	Llandovery	*435 million*	Shallow tropical seas	Fossil-bearing mudstones
ORDOVICIAN		*500 million*		
CAMBRIAN		*570 million*		

(Table 2) Geological timescale.