Detail of the nail-like hyoid bone of the Devonian fish *Homostius milleri*, also known as the *Asterolepis* of Stromness. Rebecca Marr © Stromness Museum

Review of Fossil Collections in Scotland

Highlands and Islands

National Museums Scotland

John Ellerman Foundation

Highlands and Islands

Inverness Museum and Art Gallery (High Life Highland)
Nairn Museum
West Highland Museum (West Highland Museum Trust)
Brora Heritage Centre (Brora Heritage Trust)
Dunrobin Castle Museum
Timespan (Timespan Heritage and Arts Society)
Stromness Museum (Orkney Natural History Society)
Orkney Fossil and Heritage Centre
Shetland Museum and Archives (Shetland Amenity Trust)
Bute Museum (Bute Museum Trust)
Hugh Miller's Birthplace Cottage and Museum (National Trust for Scotland)
Treasures of the Earth
Staffin Dinosaur Museum
Gairloch Museum (Gairloch & District Heritage Company Ltd)

Inverness Museum and Art Gallery (High Life Highland)

Collection type: Local authority (High Life Highland)
Accreditation: 2016

Castle Wynd, Inverness, Highland, IV2 3EB
Contact: inverness.museum@highlifehighland.com

Location of collections
The original museum was built in 1881 using funds raised by the Inverness Scientific Society and Field Club after these organisations took on responsibility for the collections in 1876. Previous locations of the collections were the Inverness Royal Academy and the town hall. The current building on Castle Wynd/Bridge Street dates from 1963 with additions in 1982 (café, new permanent galleries and temporary exhibition space) and 2006. The collection is housed in displays illustrating the geological history of the Scottish Highlands and a basement storeroom.

Size of collections
900-1,000 fossils.

Onsite records
Information is on an Adlib CMS, MDA cards and a Windows 3 notepad list; most of the fossils have entries on Adlib and 75% of these include images.

Collection highlights
1. Fish from the Devonian of north east Scotland.
2. Fossils linked to activities of the Inverness Field Club and its members.
3. Fossils linked to Hugh Miller (1802-1856), William Smith (1830-1907), Thomas Davidson Wallace (1841-1926), William Jolly (-1912), Angus John Beaton (1858-1945), James Fraser (1834-1929) and Charles MacLeod (-1919).
4. JMP de Jonge Cretaceous invertebrates from the Netherlands.

Published information
Faulkner, T. and Brazier, V. (2016). Tufa deposits at Inchrory and Glen Suie, Moray, Scotland. *Cave and Karst Science*. 43:17-20.
Jolly, W. (1870). Notes on the geology of Southerness, Kirkcudbrightshire. *Transactions of the Edinburgh Geological Society*. 1:278-284.
Swanston, W. (1893). The Silicified Wood of Lough Neagh (Concluded). *The Irish Naturalist*. *2*:102-106.

Collection overview
A portion of the fossils are from historic and scientifically important Middle Devonian localities: Tynet Burn (*Cheiracanthus*, *Mesacanthus*, *Diplacanthus*, *Osteolepis*, *Glyptolepis*, *Dipterus*, *Pterichthyodes* and *Coccosteus*, labelled as an equivalent to the Sandwick Fish Bed of Orkney), Edderton, Cromarty (*Dipterus*, *Pterichthyodes*, *Coccosteus*), Nairnside (*Dipterus*, *Coccosteus*, *Osteolepis*, *Glyptolepis*), Kingsteps and Lethen/Lethen Bar (*Osteolepis*, *Holoptychius*, *Asterolepis*, *Bothriolepis*), Eathie (*Gyroptychius*, *Dipterus*, *Cheiracanthus*, *Glyptolepis*, *Coccosteus*), Caithness/Orkney (*Osteolepis*, *Dipterus* and *Coccosteus*, with labelled *Dipterus* from Banniskirk, *Palaeospondylus* from Achanarras, and *Dipterus*, *Pterichthyodes* (Fig. 10), *Mesacanthus* and *Osteolepis* from Cruaday Hill Quarry, Orkney). Among these is a stromatolite from Yesnaby (Orkney). Upper Devonian fossils are from Alves (*Holoptychius*), Oakbrae (*Holoptychius*) and Scaat Craig near Elgin, Moray. Devonian plants include fragments from Achanarras and a *Thursophyton milleri* from the Cromarty fish beds, collected by Christine Matheson in 1990. Some of the above were collected/acquired as recently as 1999, and many have yellow labels, provided in the 1990s during review by SM Andrews. Others can be traced back to a donation in 1834 by Hugh Miller to

George Anderson, the then secretary of the Northern Institute. The collections of the Northern Institute were inherited by Inverness Museum and Art Gallery with re-examination in the 2000s confirming as many as seven fish from the original donation. A large proportion of the collection (50) are fossil fish from Nairnside and Caithness collected by Thomas Davidson Wallace (1841-1926), an honorary curator.

Figure 10: The Middle Devonian placoderm fish *Pterichthyodes milleri* from Eathie, Cromarty (Inverness Museum and Art Gallery)

Material from the Carboniferous is relatively extensive: fragmentary spines of the shark *Gyracanthus*, a complete *Elonichthys* (shark), specimens labelled as coprolites, typical plants (*Lepidodendron* including a specimen with a typed label referring to collector William Smith (1830-1907), a civil engineer on the Highland railway, rather than William 'strata' Smith (1769-1839). The fossils include solitary and colonial corals (*Lonsdaleia*), goniatites and brachiopods, notably several large productids, either isolated or in limestone, from sites along the routes of railway lines across the Highlands; dates provided are for and around the 1870s. A series of small fossils (plants (*Lepidodendron*), corals, brachiopods (*Productus*, *Discina*, *Spirifera*, *Lingula*), bivalves (*Nucula*), trilobites, crinoids (*Cyathocrinus*), bryozoan (*Fenestella*), echinoid plates, gastropods (*Pleurotomaria*, *Euomphalus*, *Belleophon*, *Buccinum*) and fish scales) from localities such as Bathgate in West Lothian, Dalry in Ayrshire and Dunfermline are stuck to small pieces of card with handwritten labels noting William Jolly (-1912) as the collector.

The remainder of the collection is almost entirely post-Palaeozoic. Vertebrate material comprises various shark teeth (Pliocene-Recent *Pterolamiops* tooth; *Acrodus* from Lyme Regis), shark vertebrae and spines from the Greensand, coprolites, mammoth teeth, fragments of a plesiosaur shoulder/pelvic bone from Helmsdale, dinosaur vertebra and Jurassic vertebrae from a fish and ichthyosaur. A bone fragment less than 10cm in length has a label handwritten directly onto the surface reading 'Pachydermata' (Fig. 11), a name given to an order of mammals, now obsolete, and the style suggesting an historic specimen. Invertebrate fossils are of corals (Jurassic *Trochocyathus* and *Isastrea*), brachiopods (small isolated terebratulids and rhynchonellids from the Jurassic), gastropods (Jurassic of Brora), bivalves (*Gryphaea* from Scottish localities (Morven, Isle of Skye,

Lochaline), *Ostrea*, *Plagiostoma*; *Lopha*, *Pecten* from the Oolite (Jurassic) of Brora and an assemblage in a slab from Cromarty), echinoids (*Cidaris*, *Micraster* and notable *Clypeaster* from the Eocene near the Egyptian pyramids), and crinoid ossicles and stems in limestone (one from Broxmouth near Dunbar); the few Palaeozoic invertebrate fossils are trilobites (*Olenellus* from Lyn Quarry, Ledmore, and *Calymene* from the Much Wenlock Limestone Formation, Dudley). Cephalopods include belemnites (some labelled Eathie Beach, Cromarty) and numerous ammonites: *Hildoceras* from the Liassic, *Lituites* collected by William Smith at Eathie (collector information as above), cardioceratids and *Korythoceras* from the Oxfordian of Laig Bay, Eigg, *Ludwigia* from Bearreraig Bay, Isle of Skye (collected by a former president of the Inverness Field Club in 1972) and *Clymonia sedgwicki*. Jurassic fossils from Eathie among other localities are attributed to Charles MacLeod. A rock labelled Hallaig Bay, Raasay, is a conglomerate containing ammonites and bivalves with a second assemblage of bivalves (*Inoceramus* and *Nucula*), gastropods and the ammonite *Euhoplites* and other ammonite fragments from the Lower Cretaceous Greensand. Bivalve and gastropod fossils are presented in several distinct styles, attributed to different collectors. A collection of old white boxes tied with string is labelled with taxon (mostly molluscs), age (Eocene (Bracklesham beds, London Clay), Oligocene, Pliocene, Corallian) and locality (Suffolk, Isle of Wight, Isle of Sheppey, Headon Hill); each has the initials 'JAB' and a date of or around 1888. Further round boxes glued to card are a collection of James Fraser molluscs. A third collection is the labelled Upper Cretaceous invertebrates (*Turritella*, *Ostrea*, *Vola*, *Gonioteuthis*, *Belemnitella*) from the Senonian near Noorbeek and Maastrichtian from Berg en Terblijt, both Zuid Limburg, Netherlands, attributed to JMP de Jonge.

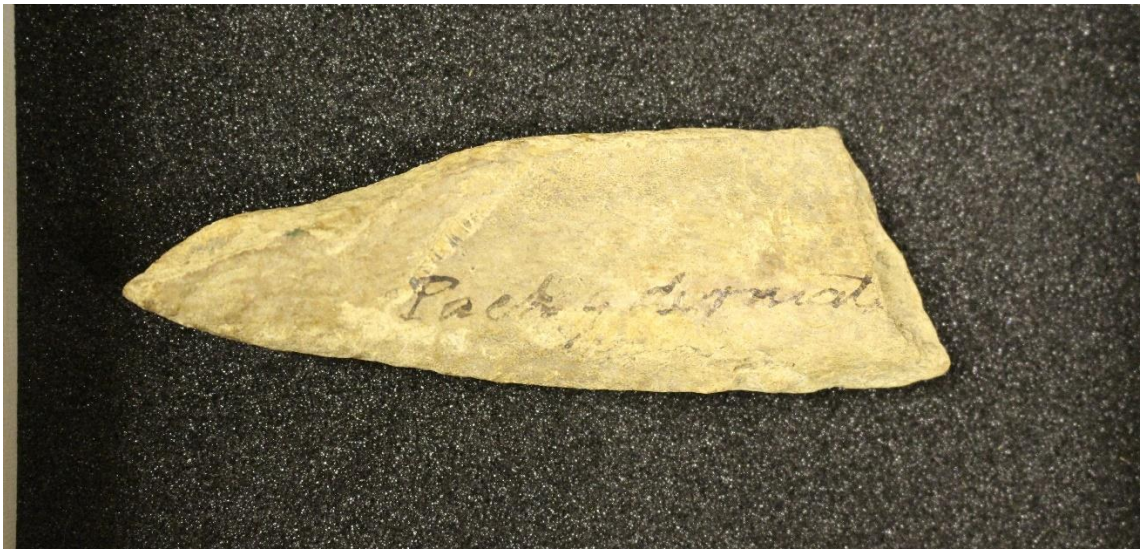

Figure 11: Fragment of bone with a handwritten label reading 'Pachydermata' (Inverness Museum and Art Gallery)

Plant material includes a sample of wood collected by Thomas Davidson Wallace from the submerged forest at Golspie (Jurassic), a large fossil tree trunk from Helmsdale, indeterminate remains from Big Burn near Inverness, Castletown Burn near Nairn and Muckovie Quarry, dated 1877-1880, plant fragments preserved in tufa from Inchrory, Cairngorms (Faulkner and Brazier 2016), and petrified oak from Lough Neagh, Northern Ireland (Swanston 1893).

Research/collection links

There are several interesting plant fossils, notably from Caithness/Sutherland, that could be studied as part of a collaborative project with Timespan and Brora Heritage Centre, where other material is located. It is also not known if the collection includes type and figured specimens; given the origins of several specimens it is likely some are present. It would be worthwhile examining the fossil collection again to determine if such specimens are present and provide a detailed overview for future reference.

Nairn Museum

Collection type: Independent
Accreditation: 2019

Nairn Museum, Viewfield House, Viewfield Drive, Nairn, IV12 4EE
Contact: manager@nairnmuseum.co.uk

Location of collections
Nairn Museum is located in a Georgian mansion house a short distance from the main street, with several exhibition rooms covering topics related to the town and its history. Collections are housed onsite across displays and several storerooms.

Size of collections
200-300 fossils.

Onsite records
Fossils are documented in a paper catalogue with information in an MDA card system. Work is in progress to enter all fossils on to an Adlib Museum Lite database.

Collection highlights
1. Devonian fish from historically and scientifically important localities in the local area.
2. Historical collections, notably the Cawdor Collection.
3. Fossils of the Triassic reptile *Stagonolepis robertsoni* with links to Reverend Dr George Gordon (1801-1893).
4. Miocene fossils from the Siwalik Hills, India, with links to Hugh Falconer (1808-1865).
5. Fossils linked to the founder of the Museum, Dr John Grigor (1814-1886).

Published information
Andrews, S.M. (1982). *The discovery of fossil fishes in Scotland up to 1845*. Edinburgh: Royal Scottish Museum Studies.

Figure 12: The Middle Devonian placoderm fish *Pterichthyodes* showing armour and scales (Nairn Museum)

Collection overview
A reference collection of mostly invertebrate and plant fossils, includes examples of Jurassic ammonites, nautiloids, coral (*Isastrea*), belemnites and bivalves (*Gryphaea,* oysters) and crinoids (*Apiocrinites*, *Pentacrinus*), echinoids from the Cretaceous Chalk and gastropods from the Cenozoic (probably Eocene), which are mostly from localities in southeast England, among other levels. Carboniferous brachiopods (*Spirifer*), crinoids, bivalves and plants (*Lepidodendron*, *Neuropteris*) are more widely sourced with labels for Burntisland, Water of Leith, Kintyre, Clitheroe, Yorkshire, etc.

The larger part of the fossil collection is comprised of fish (Fig. 12) and is assumed to be for scientific study. Approximately 50 Devonian fish (all *Asterolepis*) are from Kingsteps and Clune with the reverse of 'Royal Scottish Museum' labels used by SM Andrews to note which of the robust armour plates is preserved and orientation. The Cawdor Collection comprises approximately 100 Devonian fish from Nairn, Moray and Banff. These were collected in the 1830s by several workers, including William A Stables (?1810-?1890) who is noted as the factor for the Cawdor Estate in 1838. In 1884 part of the collection was donated to Nairn Museum by the 5th Earl of Cawdor; the whereabouts of the other, larger part is not clear. Tightly wrapped fish fossils with laminated labels (taxon, accession numbers) from the Cawdor Collection are likely to be ex-display material. Several boxes, each provided with a list of contents, contain Devonian fish from an unknown collector wrapped loosely in old newspaper (dated 1920s) on which origin is written (Edderton, Gamrie, Lethen, Clune, Cromarty, Caithness); given the localities, these are also likely to have historic/scientific value.

Other vertebrate fossils include a fish from the Eocene Lagerstätte at Monte Bolca, near Verona, Italy, a locality known for its diverse and well-preserved fossils. Several fossils highlight the exchange of material among museums along the Moray Firth. There are 10 fragments of the Triassic reptile *Stagonlepis robertsoni* from the Elgin area, one labelled with the name Reverend Dr George Gordon (a founding member of the Elgin Museum). A vertebrate fragment, labelled as a '*Leptorhynchus gangeticus* muzzle of a lower jaw Siwalik hills India', a crocodile, and part of a second crocodile rostrum (snout), potentially from the same locality, might both be linked to Hugh Falconer (a founder of the Falconer Museum, Forres). The fossils do not have any age details, although they are normally described as Miocene; fossils from the Siwalik Hills were more recently noted to represent a wider interval of time from the Oligocene to Pleistocene and a broader geographic area covering parts of India and Pakistan.

Research/collection links
Potential studies could focus on the Cawdor Collection, investigating the fish taxa and their origin with research into the collection historically and the location of the other part(s). The two vertebrate fragments from the Siwalik Hills, both diagnostic, could add to what is known about the fauna from the locality, with the potential for collaboration with the Falconer Museum and the Natural History Museum, London, and Oxford University Museum of Natural History where large collections of material are held.

West Highland Museum (West Highland Museum Trust)

Collection type: Independent
Accreditation: 2015

Cameron Square, Fort William, PH33 6AJ
Contact: info@westhighlandmuseum.org.uk

Location of collections
The West Highland Museum was founded in 1922 by a local group, led by Hertfordshire-born Victor Hodgson (1875-1929), and constructed in a former branch of the British Linen Bank in 1926 following fundraising. Collections are on display with storage in various cupboards and an attic room.

Size of collections
10-20 fossils.

Onsite records
Information is currently on an Adlib Lite CMS with plans to use Ehive in the future. Fossils were examined recently by Lucy Muir with confirmation/revisions of identifications highlighted on notes associated with relevant specimens.

Collection highlights
1. Fossils from the Scottish islands linked to Alexander Carmichael (1832-1912), the Scottish exciseman, folklorist, antiquarian and author.

Collection overview
Fossils are local: an ammonite from Arisaig, spiral shell found at Achandarroch, Ballachulish, *Gryphaea* from Lochaline, brachiopod without locality, Furid fish (from the taxonomic family: Furidae) found on the east coast of Eigg and block of limestone containing fish fragments. A gastropod, rock, crinoid, bivalve, brachiopod and nodule are listed under one accession number. Samples not on display are labelled as mudstone with ammonites from the Jurassic of Eathie (Cromarty) and a Jurassic shell assemblage from Staffin Beach, Isle of Skye.

Brora Heritage Centre (Brora Heritage Trust)

Collection type: Independent

Coalpit Road, Fascally, Brora, Sutherland, KW9 6LE
Contact: heritagebrora@gmail.com

Location of collections
Fossils are all on display

Size of collections
40-50 fossils.

Onsite records
Object entry forms exist for specimens acquired during the employment of current staff.

Collection highlights
1. Fossils from the local area and historic localities in Sutherland and Caithness.

Collection overview
Fossils were collected from the Jurassic rocks exposed on beaches and in rivers locally. Vertebrates are represented by 7 Devonian fish, one labelled as the placoderm *Pterichthyodes milleri* with fragments of *Osteolepis*, *Glyptolepis* and plates from the head shield of another placoderm, perhaps *Coccosteus*, among others. Invertebrates include orthoconic (straight shelled) nautiloids, internal and external moulds of ammonites, belemnite guard fragments, gastropods, coral (*Isastrea*) and bivalves (*Pholadomya* of various sizes, a *Ctenostreon*, an oyster or *Gryphaea* embedded in rock, a *Plagiostoma* and three examples of *Aequipecten,* (Fig. 13)) from the Jurassic. Plants are represented by a single piece of fossil wood. There are several samples of the Jurassic Brora Coal, used primarily in local industry (salt extraction, brickworks, distillery and woollen mill) rather than in domestic dwellings due to its poor quality and softer consistency than the typical coal from the Carboniferous.

Figure 13: The Jurassic bivalve *Aequipecten* from the Sutherland Coast (Brora Heritage Centre)

Dunrobin Castle Museum

Collection type: Independent

Golspie, Sutherland, KW10 6SF
Contact: info@dunrobincastle.co.uk

Location of collections
The Museum, located in the formal gardens below Dunrobin Castle, was originally built as a summerhouse by William, Earl of Sutherland, with later extension by the 3rd Duke. The Museum is as it was in the Victorian-early 20th century. Fossils in the collection are all on display.

Size of collections
80-100 fossils.

Onsite records
Collections are documented in an index card system and electronic database; information for fossils is present on index cards.

Collection highlights
1. Fossils typical of the geology of Sutherland.
2. Fossils from locally important sites (Clynelish, Brora, Helmsdale).
3. Collection attributed to Sir Humphrey Davy (1778-1829).

Collection overview
The fossils in the Museum reflect the underlying geology of Sutherland and are organised by age (stratigraphically). The first case represents the Devonian with fossils including scales of the fish *Holoptychius* from Dornoch, a slab of Upper Devonian sandstone showing fish from Dura Den, Fife, and a trackway comprising three continuous lines across the surface. Several slabs of sandstone are labelled as 'Ichnites' (an old term used for fossilised footprints) from Tarbatness, dated 1864 and 1865. These are more likely to be sedimentary structures produced in soft sediment under turbulent water (scour marks) and the traces of objects being carried (tool marks).

A wall case labelled as Liassic (Lower Jurassic) contains fossils of ammonites (*Paltchechioceras cf. aplanatum*), bivalves (*Hippopodium*, *Pholadomya* and *Plagiostoma*), belemnites and brachiopods (rhynchonellids), mostly from Dunrobin Bay. A partial fragment of a vertebrate rostrum (snout) labelled as a *Plesiosaurus* has no locality details and is assumed to be from the same area. Rocks of this age represent the Dunrobin Bay Formation/Group (Hettangian-Pliensbachian).

Fossils in a case labelled as Callovian (Upper Jurassic) comprise belemnites (*Cylindroteuthis*), bivalves (*Pholadomya murchinsoni*, *Anisocardia cf. globosa*, *A. tenera*, *Cercomya undulata*, *Pleuromya uniformis, Pinna lanceolota*) and ammonites (*Kosmoceras cf. grossoure*) from localities around Brora (the saltpans, Inverbrora, 'the pit' Brora, and 'the Brickworks' Brora). These probably represent the Brora Brick Clay and other members of the Brora Argillaceous Formation.

The next case is labelled as Oxfordian (Upper Jurassic) with a variety of fossil bivalves (*Chlamys*, *Ctenostreon proboscideum*, *Aequipecten*, *Trigonia*, *Gryphaea*), ammonites (*Euaspidoceras clynelishensis* and indeterminate whorl fragments), gastropods, brachiopods (terebratulid and rhychonellid) and indeterminate fragments. Several fossils are of the plant *Bucklandia milleriana* (Fig. 14) with additional specimens similar in appearance but unlabelled. Many of these specimens have a noted origin of Clynelish Quarry and the light-coloured sediments suggest most are from the Clynelish Quarry Sandstone (Brora Arenaceous Formation), found along the Brora River and previously excavated from quarries to the west of Brora. The Clynelish Quarry Sandstone is

however Callovian (*Quenstedtoceras lamberti* Zone); the cabinet might include fossils from the younger Brora Sandstone, also part of the Brora Arenaceous Formation, which is Oxfordian in age.

Figure 14: The Jurassic plant *Bucklandia milleriana* from Clynelish Quarry (Dunrobin Castle Museum)

The Kimmeridge (Upper Jurassic) is represented by fragments of wood (from Little Ferry Links), plants, ammonites (*Waldheimia* from Port Gower, perisphinctid ammonites from Allt na Cuile), belemnites (*Pachyteuthis abbreviata*; *Cylindroteuthis spicularis* from Wick or Eathie), coral in natural and polished form (*Isastrea oblonga* from Port Gower), brachiopods (*Rhynchonella* from Culgower), echinoids (*Hemicidaris*) and rocks with shell debris. Some of these fossils might be from the Allt na Cuile Sandstone.

Fossils are included in a collection of 67 geological specimens attributed to Sir Humphrey Davy (1778-1829), physicist and chemist. A label in the displays describes the 'Sir Humphrey Davy collection from Sutherland. Made in 1811 and 1812 whilst studying at Dunrobin'.

Research/collection links

A long (more than 70cm), thin triangular-shaped fossil is present that would be worth investigating further. Potential projects might look at the *Bucklandia milleriana* specimens and the origin of the marine reptile fossils. Fossils from the historic Clynelish Quarry are being studied by staff at the Horniman Museum, London, and another project is focusing on a plesiosaur skull.

Timespan (Timespan Heritage and Arts Society)

Collection type: Independent
Accreditation: 2017

Dunrobin Street, Helmsdale, Sutherland, KW8 6JA
Contact: enquiries@timespan.org.uk

Location of collections
Timespan, established in 1986, includes a museum of local history, a café, bakery and shop. The geology and herb gardens in the grounds were set out in 1987. Fossils are on display and in an attic storeroom.

Size of collections
10-20 fossils.

Onsite records
Information is on an Adlib Lite CMS.

Collection highlights
1. Fossils represent the local Devonian and Jurassic, which form part of a SSSI.

Figure 15: Articulated vertebrae of a Jurassic marine reptile from Crakaig, Sutherland (Timespan)

Collection overview
Fossils onsite tend to be of Jurassic age and local origin: fossil wood ranging from trunks to fragmentary pieces, variably sized samples of the coral *Isastrea* in natural and polished form, limestone and mudstone lithologies with water-worn fossils (ammonites, bivalves, etc), ammonites from Clynelish and belemnites (isolated and in matrix) from local beaches. Vertebrate fossils include examples of ichthyosaur vertebrae, one a short, articulated section collected by Michael Dudgeon in 1995 at Crakaig, Loth (Fig. 15), an ichthyosaur caudal vertebra found on the beach at Helmsdale by

David Cowrie in 2017, and an indeterminate small, light brown-coloured bone no more than 15cm in length (Fig. 16). Many fossils are attributed to Margaret Davidson and dated 1987, such as a Jurassic ammonite from Helmsdale beach, a section of fossilised tree trunk cut and polished to show rings, and two samples of the Jurassic coral *Isastrea*. A box containing 20 fish fossils (*Osteolepis*, *Dipterus,* etc) has distinct square labels noting origins of Weydale and Achanarras. Some or all of these were acquired/donated as recently as 2017.

Research/collection links

The small, brown bone could be investigated further to determine identification, origin and context. A potential project could focus on the palaeoecology of the fossils and how life and the environment changed through time, for example, using the structure displayed in Dunrobin Castle Museum; this could be undertaken as a collaboration with Brora Heritage Centre and Dunrobin Castle.

Figure 16: A small bone from the Jurassic of Sutherland (Timespan)

Stromness Museum (Orkney Natural History Society)

Collection type: Independent
Accreditation: 2019

52 Alfred Street, Stromness, Orkney, KW16 3DH
Email: custodian@stromnessmuseum.org.uk

Location of collections
The Orkney Natural History Society was founded in 1837 and the Stromness Museum set up to house their collection. Originally located at 110 Victoria Street, it moved to Flett's Commercial Hotel in 1852 and an upper floor in the new town hall before finally moving to the current building in 1862. The lower floor and adjacent Pilot House were incorporated into the Museum at later dates. Fossils are on display and stored in cupboards and a small store in the office area.

Size of collections
100-200 fossils.

Onsite records
Information is in an Adlib CMS and the Museum's minute books. Fossils are included in an online catalogue at: https://www.stromnessmuseum.org.uk/collections.

Collection highlights
1. Devonian fish from the north east of Scotland.
2. Fossils linked to Reverend Charles Clouston (1800-1884, first president of the Society) and Hugh Miller (1802-1856).
3. Material potentially linked to various explorers with local connections, such as Captain James Cook (1728-1779), Dr John Rae (1813-1893), Dr William Balfour Baikie (1824-1864) and the Victorian naturalist George Ellison (1862-1941).

Published information
Lang, W.H. (1927). XIX. Contributions to the study of the Old Red Sandstone Flora of Scotland. VI. On *Zosterophyllum myretonianum*, Penh., and some other plant-remains from the Carmyllie Beds of the Lower Old Red Sandstone. VII. On a Specimen of *Pseudosporochnus* from the Stromness Beds. *Earth and Environmental Science Transactions of The Royal Society of Edinburgh*. 55:443-455.
Miller, H. (1849). *Foot-prints of the Creator or the Asterolepis of Stromness.* Edinburgh: Johnstone and Hunter.
Flett, J.S. (1900). XIII. The Old Red Sandstone of the Orkneys. *Earth and Environmental Science Transactions of The Royal Society of Edinburgh*. 39:383-424.

Collection overview
A large part of the collection is from the Devonian of Orkney, Shetland, Caithness and Sutherland. Fish are diverse with Middle Devonian fossils of *Dipterus*, *Osteolepis*, *Pentlandia*, *Coccosteus*, *Cheiracanthus*, *Diplacanthus*, *Pterichthyodes*, *Cheiracanthus*, *Diplacanthus*, *Gyroptychius Dickosteus*, *Tristichopterus*, *Cheirolepis*, *Microbrachius*, *Glyptolepis*, *Homostius* and *Diploterus*. Interesting specimens are the lower jaw of a *Thursius* collected by Dr Grant from Stromness, a large complete *Coccosteus*, a partial hyoid bone from Westray, and a near complete *Pterichthyodes* overlain by a complete *Osteolepis* or similar. A complete and well-preserved hyoid bone on display is labelled as a 'Thurso *Asterolepis*' (Fig. 17). Origins include the quarries at Bookan and Gairsty (Sandwick), and Cruaday Hill, West Shore, Furso, Deerness and Point of Ness in the vicinity of Stromness on Mainland, Orkney. A 'nail'-shaped fish bone (Fig. 18) labelled as *Homostius milleri* is referred to, but not the figured specimen, in *Footprints of the Creator* (Miller 1849). A fossil fish with a label reading 'Fossilised fresh-water fish found in Cruaday Quarry, Sandwick, Orkney and

identified by Dr. Douglas Simpson, librarian of King's College, University of Aberdeen, to be of the species Diplopterus aggassizi and to belong to the so-called Lower Old Red Sandstone period…. It was given to me by John Spence, Esq., Hyval, Sandwick, Orkney. Jas. L. Hibbert, 3 Sept. 1961' might be a specimen mentioned in Flett (1900). Plant fossils include samples of *Calamophyton* (Du[nrisdale] Quarry), *Thursophyton* and indeterminate fragments (Quoyloo, Glebe Quarry and Lyking around Sandwick, among other localities) with a fossil of *Pseudosporochnus* from Lyking, Sandwick, labelled as being presented by James Robertson in 1828, appearing in a publication by Lang (1927). Other fossils are the coprolites from various sources, several blocks of stromatolite from West Shore, Stromness, collected by David Fergusson, and a large tree fossil from Inganess Bay, donated by Tom Muir from Kirkwall.

Figure 17: Hyoid bone of a Devonian fish labelled as 'Thurso *Asterolepis*' (Stromness Museum)

The remaining part of the collection comprises fossils from outwith Scotland: *Didymograptus* from localities including Llanvirn (Pembrokeshire) and two *Ogygia* trilobites from the Ordovician, coral *Omphyma* from the Much Wenlock Limestone Formation and an orthoconic nautiloid from the Silurian, the coral *Pachypora* from the Devonian of Torquay, examples of the plants *Lepidodendron*, *Stigmaria*, *Calamites*, and *Neuropteris*, the brachiopod *Spirifer* and two crinoid fragments from the Carboniferous. The Jurassic is represented by the bivalve *Pecten*, echinoid *Cidaris* and brachiopod *Terebratula*. Cretaceous fossils are a sponge in flint from Salisbury, *Raphidonema* from the Faringdon Sponge Gravel, a belemnite, isolated echinoderm spine (perhaps *Cidaris*) and fossil wood from Australia. Cenozoic fossils are an Eocene leaf, a large *Ostrea* from the Eocene Barton Beds with a gastropod *Clavella* probably from the same source, and three *Carcharodon* teeth. Other fossils include Jurassic plesiosaur vertebrae (3 articulated), an ichthyosaur jaw from Wilmcote (near Stratford on Avon), horse teeth from the Neolithic of Meols, Cheshire, and an *Equus* bone from the Neolithic of Leasowe, Cheshire. The Cowan Collection is a random set of fossils, such as graptolites and *Gryphaea* with rocks samples, not from the local area.

Research/collection links

It is assumed that many of the Devonian fish fossils have been examined for scientific study in the past, although only one of the specimens on display is known to be mentioned in a publication, the

Homostius milleri fish bone in *Foot-prints of the Creator* (Miller 1849). Additional historic and scientific links could be investigated in a broader project to re-examine the Stromness collection of Devonian fish and similar material in other collections across Scotland. Some of the fish are interesting in terms of their preservation, such as the two overlapping fish and the large *Coccosteus*. An investigation of the mammal fossils from Cheshire could determine how they came to be in the collection.

Figure 18: The nail-shaped hyoid bone of the Lower Devonian fish *Homostius milleri* (Stromness Museum). Rebecca Marr © Stromness Museum

Orkney Fossil and Heritage Centre

Collection type: Independent

Viewforth, Burray, Orkney, KW17 2SY
Contact: info@orkneyfossilcentre.co.uk

Location of collections
The visitor centre, located in 19th century farm buildings, was opened in 1993 to display objects in the collection of Leslie Firth (1933-2013), a local builder, and his father. In 2000, Leslie Firth gifted the Centre to the community and it became a registered charity. Display space was extended in 2012/13 to house an exhibition on the Churchill Barriers with the *Scapa and the Scuttle* exhibition added in 2019. Fossil fish are also exhibited in the Centre; Leslie Firth was the owner of the Cruaday Quarry, Sandwick, a source of Devonian fish well-known for fossils as far back as the mid 1700s, in which he developed an interest. Fossils are all onsite in displays and stores.

Size of collections
500 fossils in the Museum collection with an additional undocumented collection of local fossil fish.

Onsite records
Information, including notes and comments at the time of entry, in an Excel spreadsheet file is in the process of being transcribed into a Collectibles Organizer Deluxe database with the potential to include images and provide online access in the future.

Collection highlights
1. Range of fossil fish from the Devonian of north east Scotland.
2. Examples of fossils from well-known localities around the world.

Collection overview
Fossils from Scotland are mostly fish from the Devonian, displayed by group. These are lungfish (*Dipterus* from Achanarras and Murkle Bay, Caithness, and Cruaday, Orkney; *Pentlandia* from South Ronaldsay), placoderms (*Coccosteus* and *Pterichthyodes* from Cruaday; *Microbrachius* from South Ronaldsay; *Millerosteus*), acanthodians (*Diplacanthus*, *Mesacanthus* and *Cheirocanthus* from Cruaday; acanthodian from Cromarty), lobe-finned crossopterygians (*Gyroptychius*, *Tristichopterus* and *Osteolepis* from Cruaday; *Thursius* from Murkle Bay; *Glyptolepis* from Achanarras on loan from National Museums Scotland; *Gyroptychius* from Caithness; *Osteolepis* from the Spittal Beds, Caithness) and ray-finned actinopterygians (*Cheirolepis* from Cruaday; *Palaeospondylus* from Achanarras). A number of large slabs of rock show accumulations of several types of fish (*Cheiracanthus*, *Osteolepis*, *Gyroptychius*, *Coccosteus*, *Mesacanthus* and *Diplacanthus*), often with more than one example of each. Devonian material includes fossil worm burrows, stromatolites, plants (*Cooksonia*), indeterminate plant debris from the Devonian of Orkney, and an interesting specimen of a plant preserved with an *Osteolepis*. Other fish are the Silurian jawless fishes (*Thelodus*, *Birkenia* and *Lasanius,* almost certainly from Lesmahagow, Lanarkshire, or Muirkirk, Ayrshire), and *Rhizodus* scales from the Carboniferous Oil Shale of Bathgate, West Lothian. A fossil labelled ‘Hillside Sept 1893’ (but no age) appears to be a sarcopterygian fish shoulder element, which should be investigated. Non-Devonian Scottish fossils are the Cambrian Pipe Rock from Sutherland, Carboniferous rugose corals from East Lothian and algal limestone from Fife collected by William J Baird 1984, and a large slab of Permian sandstone labelled as Elgin, Moray, showing a reptile trackway. Examples of the shrimp *Tealliocaris* are likely to be from the Gullane Shrimp Bed in the Lower Carboniferous Oil Shale Group of East Lothian. Fossils of the eurypterids *Erretopterus* and *Slimonia* and the arthropod *Ceratiocaris* are from the Silurian Lesmahagow Inlier, with the arthropod *Dictyocaris* more specifically from Dunside on Logan Water.

Other fossils onsite are from outwith Scotland. Vertebrates are represented by a *Carcharodon* tooth from Belgium, complete fish in nodules from the Cretaceous Santana Formation of Brazil, a squashed vertebra from the Jurassic of Wyoming labelled *Diplodocus*, a Jurassic coprolite, two dinosaur eggs from the Cretaceous of the Gobi Desert, Mongolia, several Permian coprolites, Permian amphibian (*Apateon*), and large casts of the Permian *Sclerocephalus*, Jurassic ichthyosaur *Stenopterygius* and marine crocodile *Steneosaurus*. Fossils from the Eocene Green River Formation of Wyoming are of the fish *Knightia*, *Gosiutichthys*, *Priscacara*, *Diplomystus* and *Miplosus* with *Leptolepis* representing the Jurassic Solnhofen Limestone. Fossils of the fish *Anthracosteus* and *Amia* from the Eocene Messel of Germany have been set in Perspex. A skeleton of the fish *Amblypterus* from Odernheim, Germany is accompanied by a Permian reptile, *Micromelerpeton*, from the same locality. Another fossil is labelled as 'the larval phase of a large amphibian of the group *Eryops*', the taxon *Eryops* being a semi-aquatic temnospondyl. Mammal fossils include a woolly rhino limb bone, *Mammuthus* (woolly mammoth) tooth, *Palaeoloxodon* ('forest elephant') tooth, third indeterminate tooth, mammoth tusk, and other vertebrae and limb fragments from the Thames Gravel deposits which might be associated with a mammoth tooth and woolly Rhino bone. Miscellaneous material includes shark teeth (*Edestes*) from the coal measures of Illinois and a fragment of vertebrate (mammal or reptile) skull.

Figure 19: Plant fragments from the Carboniferous of Piesburg, Germany
(Orkney Fossil and Heritage Centre)

Invertebrates include the graptolite *Didymograptus* from the Ordovician of Abereidy Bay, Wales, brachiopods (Devonian *Cyrtospirifer* from Belgium; *Stringocephalus* from the Devonian of Germany), bivalves (*Trigonia* from the Cretaceous of Belgium), gastropods, sponges, coral (*Favosites* from the Much Wenlock Limestone Formation of Shropshire and brain coral from the Eifel region, Germany) and echinoderms (crinoids *Eucrinus* from the Triassic of Germany and *Palaeocrinus* from the Jurassic of Dorset; Jurassic brittle star *Ophioderma* from Dorset; echinoids *Micraster*, *Echinocorys* and *Clypeus* from the Jurassic Inferior Oolite and/or Chalk). Trilobites are from the Cambrian of Utah (*Asaphiscus*, *Peronopsis*), Ordovician of the Welsh Borderlands (*Ogyginus* from Builth Wells, *Ogygiocarella* from Shropshire), and Devonian of Morocco and France (*Phacops*). Miscellaneous specimens are a Carboniferous jellyfish and arthropods such as ants,

flies and moths in amber/copal, the lobster *Mechochirus*, shrimp *Aeger*, crab-like *Eryon* and *Mesolimilus* from the Solnhofen Limestone, and crabs *Cyclocancer* and *Coeloma* from the Oligocene of Belgium. Cephalopods are from the Ordovician of Sweden (*Lituites*), Devonian of Morocco (goniatites and nautiloid *Orthoceras*) and Germany (*Cyrtoceras*), non. loc. Triassic (*Cenoceras*), the Jurassic of Germany (*Dactylioceras*, *Salpingoteuthis, Lesueurilla*), Yorkshire (*Phylloceras*), Lincolnshire (*Eparietes*, *Asteroceras*), Dorset (*Ludwigia*, *Pictonia, Promicroceras*, *Epaspidoceras*, *Nautilus*), Somerset (large nautiloid) and Isle of Skye (*Belemnites*, *Megateuthis*), and Cretaceous of Kazakhstan (*Belemnitella*), France (*Anahoplites*, *Douvilleiceras*) and Japan (*Yubariceras*, *Mesopuzosia*). Specimens without locality are the Jurassic *Harpoceras*, *Dactylioceras*, *Hildoceras*, *Androgynoceras*, *Kosmoceras* and *Parkinsonia*.

Plant fossils are mostly Carboniferous: several *Lepidodendron*, 'tree fern' from Warwickshire, *Neuropteris*, *Imparipteris* frond and additional fragments from Piesberg, Germany (Fig. 19), *Neuropteris* and *Annularia/Asterophyllum*, *Neuropteris* from Wigan, and *Bothrodendrum* and *Lepidostrobus* from Crock Hay, Wigan, among others. Other material includes polished sections of cedar, oak and pine, five samples from Madagascar and a section of trunk in a shale that might be Jurassic. Several other fragments are perhaps from the Permian of Germany.

The Centre also houses an extensive collection of fish (perhaps one hundred) from the Devonian of Orkney. Most are complete and at least moderately articulated and, though not labelled, could be identified relatively easily.

Research/collection links

Some of the specimens would be worth investigating further, notably the vertebrate fossil described as similar to *Eryops*. *Lasanius*, *Birkenia* and *Thelodus* are rare fossils known from a very limited number of specimens; there is interest in studying examples of these and a visit was made to the Dick Institute, Kilmarnock, by a researcher at the University of Manchester to see examples there. The fossil labelled 'Hillside Sept 1893' might be important historically.

Shetland Museum and Archives (Shetland Amenity Trust)

Collection type: Local authority (Shetland Amenity Trust)
Accreditation: 2019

Hay's Dock, Lerwick, Shetland, ZE1 0WP
Contact: info@shetlandmuseumandarchives.org.uk

Location of collections
The current Museum opened in 2007, bringing together the museum and archive collections. Fossils are included in displays on local geology with an offsite facility and shipping container for storage several miles away.

Size of collections
50 fossils.

Onsite records
Information for the fossils is on a Calm CMS.

Collection highlights
1. Fossils from Shetland localities.

Published information
Beardmore, S. R. In Review. Shifting continents and a Devonian Lake full of fish: the extraordinary geology of the Shetland UNESCO Global Geopark. Geoconservation Research Special Issue.
Finlay T.M, A.S. Woodward and E.I. White. (1926). XII.—The Old Red Sandstone of Shetland. Part I. South-Eastern Area. *Earth and Environmental Science Transactions of The Royal Society of Edinburgh.* 54:553-572.
Hooker J.D (1853). Note on the fossil plants from the Shetlands. *Quarterly Journal of the Geological Society of London*. 9: 49-50.
Newman M.J, and J.L. Den Blaauwen. (2018). A redescription of the endemic antiarch placoderm *Asterolepis thule* from the Middle Devonian (Givetian) of Shetland and its biostratigraphical horizon. *Scottish Journal of Geology*. 54:69-75.
Peach, B.N. (1877). Notes on the fossil plants found in the Old Red Sandstone of Shetland, Orkney, Caithness, Sutherland and Forfarshire. *Edinburgh Geological Society*. 3:148-152.
Traquair, R.H. (1908). On fossil fish remains from the Old Red Sandstone of Shetland. *Transactions of the Royal Society of Edinburgh*. 46: 321-329.
Watson, D.M.S. (1932). On three new species of fish from the Old Red Sandstone of Orkney and Shetland. *Memoirs of the Geological Survey of Great Britain, Summary of Progress for 1931*. 2:157-165.
Watson, D.M.S. (1934). Report of fossil fish from Sandness, Shetland. *Memoirs of the Geological Survey of Great Britain, Summary of Progress for 1933.* 1:74-76.
Westoll, T.S. (1937). The Old Red Sandstone fishes of the north of Scotland, particularly of Orkney and Shetland. *Proceedings of the Geologists' Association.* 48:13-45.
Woodward, A.S., and E.I. White. (1926). The fossil fishes of the Old Red Sandstone of the Shetland Islands. *Transactions of the Royal Society of Edinburgh: Earth Sciences*. 54:567–571.

Collection overview
Most of the fossils are from Shetland with a strong focus on specimens from the Devonian, one of the few/only fossil bearing levels present. Fish include labelled specimens of *Dipterus*, *Pentlandia*, *Osteolepis*, *Tristichopteris* and *Stegotrachelus*, some identified tentatively, with numerous fragments not identified beyond 'fish' likely to represent these and a wider range of taxa. An important locality is the Exnaboe fish beds (Shingly Geo) at the southern end of Shetland. Exnaboe is the type locality for *Stegotrachelos finlayi* with examples also collected from the Ness of Sound (Woodward and

White 1926; Swartz 2009). Several large (30cm across) associated fossil fragments with an unusually bubbled surface texture are labelled as the Devonian fish *Coccosteus* (perhaps the head, plates of the anterior body and segments of the front fins), although they could equally represent a large eurypterid (the head, body tergites and segments of the clawed chelicerate appendages) (Fig. 20). Plant fossils from the Devonian are also diverse with fragments from Footabrough, Fair Isle (*Dawsonites*), Grutness, North Voe and Huxter. Additional specimens have labels for '*Corduroy* plant' (fragments of stem that are typically 10-15cm across with a distinct striped appearance), *Hostimella* from Leebitton, and *Svalbardia scotica* from the Middle Devonian of Buness, Fair Isle (collected by a palaeobotanist from Bristol University). The Devonian fossils include an example of worm burrows.

Figure 20: Fragments with unusual surface texture labelled as the Devonian placoderm fish *Coccosteus* (Shetland Museum and Archives)

Also present are specimens of crinoidal limestone (Zoar, Hillswick), a fossil shell (Arisdale, Yell) and trace fossil without locality information. A Pleistocene Icelandic clam was collected during dredging. Not from Shetland are a shark tooth and coral *Favosites* with a note stating the identification was provided by Nigel Trewin. Other fossils comprise mixed invertebrate and plant material: ammonites, flint echinoids, brachiopod, *Stigmaria*, belemnites and indeterminate fossil fragments in black or grey limestone matrix. A box of Jurassic fossils includes ammonites (some cut and polished), belemnite fragments, bivalves, brachiopods (several rhynchonellids) and a colonial Carboniferous coral. These are presumably for handling/education with several additional fossils as part of an 'activity desk' in the Museum.

Research/collection links

Potential projects could focus on the Devonian plants and/or trace fossils from Shetland. Further investigation of the large associated pieces labelled as *Coccosteus* is also suggested to confirm identification and origin.

Bute Museum (Bute Museum Trust)

Collection type: Independent
Accreditation: 2016

Stuart Street, Rothesay, Isle of Bute
Contact: info@butemuseum.gmail.com

Location of collections
The Buteshire Natural History Society was founded in 1905 and the current building, purpose-built by the 4th Marquis of Bute, used to house the collection from 1927. In 1992 ownership of the Museum and the collection transferred to the Bute Museum Trust. The collection is housed onsite in displays.

Size of collections
30-50 fossils.

Onsite records
Not known.

Collection highlights
1. Fossils from the Isle of Bute.
2. Arctic clay fossils.

Collection overview
Fossils are from rocks exposed on the Isle of Bute. There is a single fossil from the Devonian, labelled as a fish operculum. Carboniferous fossils are entirely of plants: *Lepidodendron*, *Stigmaria*, *Cordaites*, *Sphenopteris*, *Annularia* and additional specimens labelled as a conelet of clubmoss, leaf stem and leaf litter. Bivalves and gastropods from the Clyde Beds (Clyde Clay Formation), an Arctic clay, are labelled *Astarte sulcata*, *Saxicava rugosa*, *S. norvegica*, *Tellina bathica*, *Cyprina islandica*, *Mya truncate* and *Natica* with additional shells in a display on the origin of the clay deposits. The molluscs in the Clyde Beds are normally indicative of cold water and their occurrence across Bute and the Clyde area is an indication of a cooler climate 10,000 to 12,000 years ago (end of the last Ice Age).

Research/collection links
The fish operculum could be investigated further to confirm identity and origin.

Hugh Miller's Birthplace Cottage and Museum (National Trust for Scotland)

Collection type: Independent
Accreditation: 2016

Church Street, Cromarty, Ross-shire, IV11 8XA
Contact: BalnainHouse@nts.org.uk (Regional Office)

Location of collections
Hugh Miller's Birthplace Cottage and Museum comprises a thatched cottage built in the early 1700s, where Miller was born, and the adjacent Georgian villa, built by his father in 1797. Fossils illustrating local geology are located in both buildings, although the main displays and storage are in the latter.

Size of collections
200-250 fossils.

Onsite records
All fossils have an accession number and object entry form (stored offsite); a Microsoft Excel list was provided by the JEPC to the Museum for future reference.

Collection highlights
1. Fossils linked to Hugh Miller (1802-1853).
2. Several fossils have been figured, notably by Hugh Miller.

Published information
Anderson, L.I. (2005). Hugh Miller: introducing palaeobotany to a wider audience. In: Bowden, A.J, C.V. Burek, and R. Wilding. (eds.). *History of palaeobotany: selected essays. Geological Society, London, Special Publications.* 241:63-84.
Egerton, P.G. (1860). Palichthyologic Notes: No.12. Remarks on the Nomenclature of the Devonian Fishes. *Quarterly Journal of the Geological Society*. 16:119-136.
Miller, H. (1858). *The cruise of the Betsey*; with Rambles of a Geologist'. Edinburgh: Constable.
Miller, H. (1857). *The testimony of the rocks: or, Geology in its bearings on the two theologies, natural and revealed* (Vol. 1). Edinburgh: Shepherd and Elliot.
Miller, H. (1864). *Edinburgh and Its Neighbourhood, Geological and Historical: With the Geology of the Bass Rock*. Edinburgh: Adam and Charles Black.
Miller, H. (1849). *Foot-prints of the Creator or the Asterolepis of Stromness.* Edinburgh: Johnstone and Hunter.
Miller, H. (1859). *Sketch-book of popular geology*. Edinburgh: Constable.
Miller, H. (1841). *The old red sandstone: or, New walks in an old field*. Edinburgh: Johnstone
Taylor, M.A. (2002). Hugh Miller and his fossils - a bicentenary appreciation. *Edinburgh Geologist*. 38:10-19.

Collection overview
The collection comprises a range of fossils from the local area and across the UK. Vertebrates include Lower, Middle and Upper Devonian fish: *Cephalaspis* headshield, *Dipterus, Cheirolepis*, *Pterichthoydes*, *Osteolepis*, *Diplacanthus*, *Mesacanthus*, *Cheiracanthus*, *Coccosteus*, *Palaeospondylus* (donated in 2002 by G Matheson), *Glyptolepis*, *Holoptychius*, *Asterolepis* and acanthodians, from Cromarty (Edderton), Angus, Lethen Bar (Nairn) and Caithness, among other localities. Some of the specimens are preserved in split nodules with part and counterpart pieces (*Glyptopteris*, *Pterichthyodes*, *Diplacanthus*, *Cheiracanthus*). Several specimens of *Coccosteus* from Edderton and *Pterichthyodes* have old labels identifying them as part of Hugh Miller's private collection. Many of the fossil taxa are associated with reconstructions. A plaster cast of a *Coccosteus* cranial buckler from the Middle Devonian of Cromarty, perhaps painted by Hugh Miller

and with an additional label ‘8’, is figured in Egerton (1860). A large cast is of the head of a *Homostius milleri* from the Devonian Spittal Flagstones of Spittal Quarry, Caithness, dated 1886 and representing the first cast from the original. Other vertebrates are various shark teeth, marine reptile bones (vertebrae and ribs), and the tooth and anterior part of a *Rhizodus* jaw from the Carboniferous.

Figure 21: The Lower Devonian alga *Parka decipiens* (Hugh Miller’s Birthplace Cottage and Museum)

Invertebrates include the trilobites *Elrathia* from the Cambrian of Utah, an *Ogygiocarella* or similar in dark mudstone and ‘*Phacops caudatus*’ (= *Dalmanites caudatus*) from the Ledbury tunnel, the sponge *Raphidonema* (from the Cretaceous Faringdon sponge gravels), a rugose coral, *Isastrea* coral from the Upper Jurassic of Helmsdale, Sutherland, *Paraconularia* (taxon thought to be related to Cnidaria, although still under discussion), brachiopods (terebratulids from the Cretaceous Chalk), gastropods, crinoids (including a stem and articulated calyx, and three specimens showing small disarticulated ossicles and sections of articulated stems preserved three-dimensionally in a sandy rock), echinoids (*Micraster*) and various bivalves (inoceramids, *Gryphaea*, *Plagiostoma*, *Pecten* and oysters, including a ‘*Lima gigantea* Oolite near Broadford Skye Sept 1868’ and oyster from Cajamarca, Peru). There are several samples of Much Wenlock Limestone Formation containing invertebrate coral reef debris. A box is labelled as insects in amber, although the specimens seem to be in more recent copal. Cephalopods are represented by fragments of isolated and disarticulated belemnite guards from the local area and Germany, nautiloids, ammonites such as *Hildoceras* from the Liassic of Whitby*, Dactylioceras*, *Amoeboceras* from Eathie, and other fragments labelled as Eathie, an ammonite impression with label reading ‘Col Miller private collection Eathie, Cromarty, 184[]’ (no final number given), and another ‘am altemans von Buck Eathie’. Several specimens are labelled as death assemblages of ammonites killed by an underwater landslide resulting from an earthquake on the Great Glen Fault 165 million years ago (Eathie, Cromarty), a dramatic origin. A box of approximately 25 small ammonites was donated by Nigel Trewin.

Plant fossils are of *Stigmaria* including one with ‘rootlets’ attached, *Pinities*, *Neuropteris*, and various indeterminate fragments of trunk, ferns (figured), bark impression, and plant root with scale-like patterns. Labels highlight 45 million-year-old (Tertiary) dawn redwood (*Metasequoia*) leaves from

British Columbia, Canada, a section of 135 million-year-old fossil wood from the Kimmeridge (Upper Jurassic) of Helmsdale, Sutherland, 'Bonnyrigg coal pit L.C.M. April 3 1869', '*Sphenopteris* aff. Burdiehouse Limestone Coal measures Dec 1868' and a root of a fossil tree from Bonnyrigg. A further specimen has a label reading 'Edinburgh Museum for Science and Art Natural History No. 82'. Fragments of the Devonian algae *Parka decipiens* are also present (Fig. 21). There are two plaster casts of seed cones, one painted and the other figured. Anderson (2005) figures conifer branches from Eathie Haven, Cromarty.

Specimens provided for handling are Devonian fish (acanthodians, *Osteolepis, Dipterus and Coccosteus*, several of the latter donated by Nigel Trewin) from Eathie, Cromarty, isolated shark teeth, a 160 million-year-old shark tooth (labelled as the great White shark *Carcharocles*, although the age given is too old be this particular taxon), tooth from the Atacama Desert, Peru, and a complete fish in a light-coloured matrix potentially from Lebanon. More unusual is a cave bear tooth from Romania, tortoise egg from the Pleistocene of France and a coprolite. The windowsills of the thatched cottage also hold fossils of Carboniferous plants (*Stigmaria*), ammonites, belemnites, bivalves, corals, Devonian fish (acanthodians) and rocks showing assemblages of ammonites and bivalves, many from the local area.

Research/collection links

Fossil material in displays is on loan from National Museums Scotland, including among others a specimen of the bivalve *Scrobicularia piperata* figured in Taylor (2002) and a specimen of the plant *Cladophlebis denticulata* figured by Hugh Miller (1857).

Treasures of the Earth

Collection type: Independent

Corpach, Fort William, PH33 7JL
Contact: info@treaseuresoftheearth.co.uk

Location of collections
Treasures of the Earth is a private collection founded in 1990 by a father and son interested in geology. The building is a former church with displays on the ground and balcony levels. The fossils are all on display.

Size of collections
30-50 fossils.

Onsite records
Not known.

Collection highlights
1. Examples of fossils from well-known and historic localities worldwide.

Collection overview
The fossils are from well-known sources across Scotland, the UK and worldwide: pterosaur *Pterodactylus* from the Jurassic Solnhofen Limestone of Germany, coprolites dated to 180 million years ago, a complete juvenile *Ichthyosaurus communis* from Lyme Regis, Dorset, a fish from the Cretaceous Santana Formation of Brazil, several shark teeth, and the skulls of a *Smilodon*, *Mesochippus* and *Merycoidodon gracilis* from South Dakota. Several slabs from the Eocene Green River Formation of Wyoming show recognisable fish (*Knightia, Diplomystus*, *Priscacara*) and rays (*Xiphotrygon*), although only examples of *Knightia* are labelled. Casts are of a Devonian placoderm fish, a large fish from Brazil, *Tyrannosaurus rex* skull and a mosasaur skull.

Invertebrate fossils are the Carboniferous arachnid from the West Midlands dated to 300 million years ago, dragonfly from the Family Aeshnidiidae from the Solnhofen Limestone and tar with the beetle *Cybister* from McKithirt Pits, California, dated to 75,000 years ago. Cephalopods are represented by the ammonites *Harpoceras*, *Ludwigia*, *Ranenia*, *Dactylioceras* and *Amoeboceras* collected from the Isle of Skye, large *Titanites* ammonite, and additional ammonites and nautiloids from Morocco. Other fossils are an articulated crinoid calyx and stem, a polished slab from Morocco containing orthoconic nautiloids (labelled as belemnites), sand dollars (echinoids) and trilobites from Morocco (*Elrathia*, *Asaphus*, *Crotacephalina*, *Metacanthina*, *Cyphaspis*, *Zlichoraspis*, *Ceratarges*, *Ogyginus* and *Ductina* with other phacopids). A block from Scotland contains numerous *Gryphaea* and is perhaps from the Jurassic Broadford beds of the Isle of Skye.

Plants include *Lepidodendron*, a single specimen with fragments of leaves, conifer cone and seeds, mostly from the Carboniferous, an *Araucaria* pine seed cone from the Jurassic of Patagonia and a piece of amber. There are pieces of fossil wood, including several trunk sections more than 50cm across, from Washington state and Arizona. Other large samples are described as logs of stone from Portland Down, Dorset.

Staffin Dinosaur Museum

Collection type: Independent

Eillishadder, Culnacnoc, Portree, IV51 9JE, Isle of Skye
Contact: dugaldross@aol.com

Location of collections
The collection was established in 1976 by Dugald Ross, a local crofter, following the discovery of dinosaur bones and trace fossils locally in Jurassic rocks. The collection is displayed and stored in the single room of a croft house on the Trotternish Peninsula.

Size of collections
40-50 fossils.

Onsite records
Provenance of fossils is documented in paper records.

Collection highlights
1. Fossil material from the Middle Jurassic.
2. First evidence of, and the first actual bones of, dinosaurs in Scotland.
3. *Stegosaurus* specimen predating all other fossils of the taxon known to science by 5 million years.

Published information
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Collection overview
The fossils are all Jurassic in age and almost entirely from the Isle of Skye, the exceptions being from the Jurassic of Eathie (Cromarty) and Helmsdale (Sutherland). Many footprint and track fossils, often overprinted by mudcracks and/or ripple marks, have been collected as large slabs of sedimentary rock or as casts from annual excavations. Sources are nearby (Valtos, Kilt Rock) with examples being a replica *Megalosaurus* trackway (found Staffin Bay 2001, original left in situ), prints from an unidentified carnivore found in 2002 at Valtos, tracks from a juvenile *Coelophysis* (in a yellow-coloured matrix) found in 2018 at Valtos, three more prints from north of Kilt Rock in 2002 with one labelled as *Coelophysis*, a hadrosaur footprint found in 1982, and a large track with adult and juvenile prints among the examples present. Invertebrate traces have also been collected, such as the worm burrows from Elgol.

Figure 22: Fin spine of the Jurassic shark *Hybodus* from the Isle of Skye (Staffin Dinosaur Museum)

Vertebrate body fossils include a *Stegosaurus* ulna and radius, *Cetiosaurus* tail vertebra, replica of a *Cetiosaurus* femur, teeth (plesiosaur, dinosaur) and original and replica dinosaur tail vertebra. A dorsal fin spine from the shark *Hybodus* (Fig. 22), approximately 15cm in length, originated from the Bathonian of Culnacnoc. A replica of the end of a dinosaur bone and an original section of a long bone found in 1994 are labelled as *Cetiosaurus*; this is the first recorded dinosaur fossil from Scotland. An unusual fossil is the impression of an articulated ichthyosaur jaw with teeth.

Fossils are otherwise mostly cephalopods and bivalves from the Jurassic, many comprising part and counterpart specimens revealed in split nodules: *Stephanoceras*, *Ludwigia*, *Kosmoceras*, *Emilaea* and *Dorsetensia* from Bearreraig, Rigg and Flodigarry; some are labelled as Oxford Clay Beds. Nautiloids include coiled and orthoconic forms, with a large example of the latter, measuring more than 50cm, supported in matrix. Belemnites are preserved as isolated guards and cross sections, with a cluster in rock from Eathie and others identified as *Cylindroteuthis* and *Megateuthis*. Bivalves are represented by several *Gryphaea*, oysters and *Plagiostoma*. Other fossils are assemblages of bivalves and ammonites in matrix, a gastropod, Jurassic coral from Helmsdale, fossil wood of various sizes and a single leaf imprint.

Research/collection links

Work to find, document and publish the various fossils is ongoing and has already helped to recreate the landscape of the area in the Middle Jurassic. The fossils are being studied in a collaboration of staff and researchers at the University of Glasgow, University of Edinburgh and National Museums Scotland.

Gairloch Museum (Gairloch & District Heritage Company Ltd)

Collection type: Independent
Accreditation: 2016

Gairloch, Ross-shire, IV21 2BH
Contact: info@gairlochmuseum.org

Location of collections
Gairloch Museum opened in 1977 to house the growing collection of objects donated by local people. In 2019 the Museum moved to its present location on the main road through Gairloch. Collections are housed onsite in displays and a storeroom.

Size of collections
5 fossils.

Onsite records
Information is in an Adlib CMS.

Collection overview
There are examples of the Jurassic bivalve *Gryphaea* onsite, although their origin is not known. It is possible that they were eroded from the Jurassic rocks on the Isle of Skye and washed to a beach near Gairloch where they were collected. A block of Cambrian Pipe Rock, showing the infilled traces of worm burrows on a beach 550 million years ago, is on display (Fig. 23).

Figure 23: Invertebrate burrows in basal Cambrian Pipe Rock (Gairloch Museum)