

Part 3 The Little Gruinard River

3.1 Location, wildlife, inshore fisheries, salmon netting and salmon aquaculture

3.1.1 Location

The Little Gruinard River drains a catchment area of 81km² within one of the largest 'wilderness' areas in the British Isles. The highest point in the catchment is the summit of A' Mhaighdean (967m); other notable peaks on the perimeter of the catchment include Ruadh Stac Mor (918m), Beinn a Chaisgein Mhor (856m) and Beinn Airigh Charr (791m).

The Fionn Loch is by far the largest area of stillwater within the catchment; together with the Dubh Loch from which it is separated by a causeway, it has a surface area of just over 10km². Other lochs accessible to salmon include Lochan Beannach Mor and Lochan Beannach Beag (combined area of 0.44km²) and Loch na Moine Buige (0.24 km²). Several other lochs are located high in the hills above waterfalls and are inaccessible to salmon and sea trout: these include the Gorm Loch (0.28km²) and Loch Feith Mhic'-illean (1.7km²) on either side of A' Mhaighdean. More than 45 smaller lochs or lochans within the catchment are shown on the Ordnance Survey 1:50,000 Landranger 19 map.

From the Fionn Loch, the Little Gruinard River flows initially for only a few hundred metres to Eileach Mhic'ille Riabhaich (known locally as the 'Boat Pool') and then into Pait Fhearchair (the 'beautiful pass'). The river then gathers pace and flows in a northerly direction, descending 160m over a further 6km, before entering Gruinard Bay.

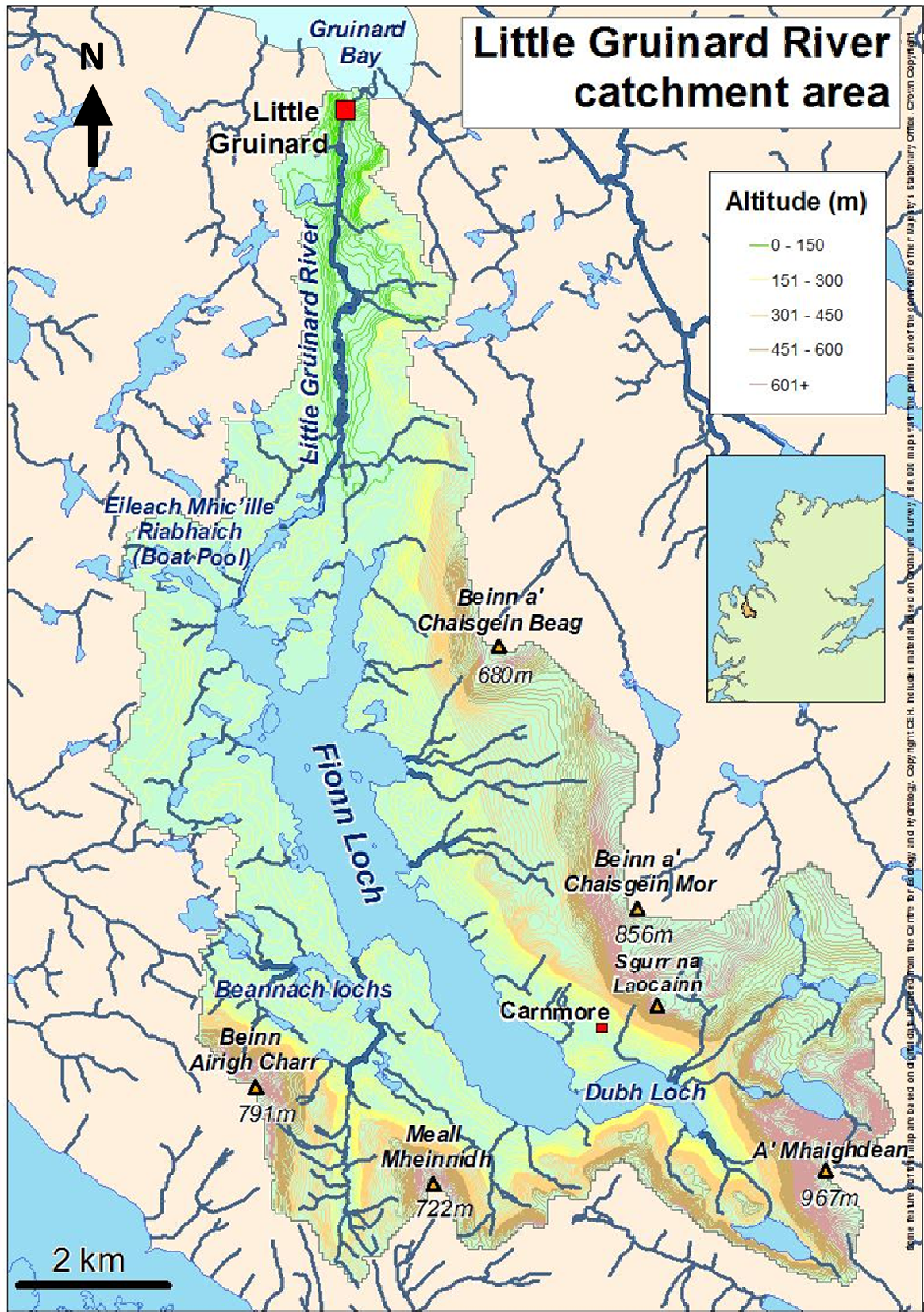
3.1.2 Estuary

The Little Gruinard flows for about 1km from its upper tidal limit to the low water mark.



View over the Little Gruinard river mouth to the Inverianvie sands with An Teallach in the distance (April, 2010).

Figure 3.1 The catchment area of the Little Gruinard River



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The estuary attracts many birds and other animals. Common fish-eating birds include gulls, divers, Cormorant, Shag, Red-breasted Merganser and Heron. Salmon and sea trout can form part of the diet of these birds; however other fishes including sandeels, juvenile Herring and Pollack (which are themselves predators of salmon and sea trout) form a larger part of their diet. Wild salmon and trout have evolved in a world with a wide range of natural predators and they are well adapted to avoid being eaten. Levels of predation of salmon and sea trout may increase and be a problem when stocks are already depleted for other reasons, or where fish health is compromised (e.g. sea lice infestations).

3.1.3 Gruinard Bay

Gruinard Bay is a relatively shallow bay, and is exposed to north westerly winds. It is perhaps best known for Gruinard Island, situated to the east of the bay, which became famous for anthrax experiments during the Second World War. The island is now populated by rabbits. Underwater habitats are diverse and include eel grass (*Zostera*) beds, sand, muds, shell shingle and rocky reefs with kelp.

Marine mammals found in the bay include Harbour Seal, Grey Seal, Porpoise, Bottlenose Dolphin and Minke Whale. Otters are regularly seen; birds which fish the waters between the mouth of the Little Gruinard River and Gruinard Island include White-tailed Eagle, Red-throated Diver, Black-throated Diver and Great Northern Diver.

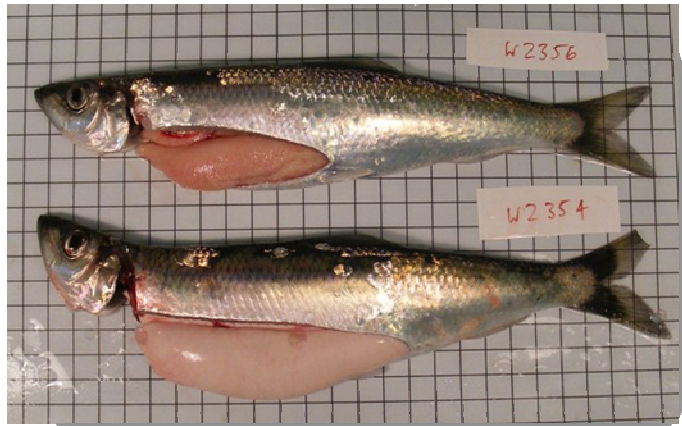
The bay is recognised as a nursery area for juvenile Herring and Sprat, and may be of international conservation importance for Blue ['Common'] Skate (*Dipterus batis*) and other rays. A freshly washed up egg case of a skate was found at Second Coast, 2km to the west of Little Gruinard, in 2008. There is much to do to learn more about fish populations and marine habitats within Gruinard Bay.



Egg case of Common Skate found in the strand line by Second Coast in 2008, against a 1cm grid (Peter Cunningham). Thornback Rays were also caught in the area in the past, including a fish of 17.25kg taken by A. Walker in the 1960s.

3.1.4 Inshore fish and Fisheries

In the 18th Century, local herring populations became the focus of a commercial fishery. In 1788, the town of Ullapool was developed by the British Fisheries Society to provide a base from which to exploit herring. By the middle of the 19th Century, the inshore fishery had virtually been abandoned. Although there were periods of recovery after then, the herring fishery was temporarily closed to allow stocks to recover in the late 1978 following a period of sustained over-fishing.



Herring in spawning condition caught in January 2010 in a neighbouring sea loch.

Thereafter, attention switched to mackerel, mainly caught further offshore. Mackerel move into inshore waters to feed on sprats, sandeels and juvenile herring in summer. Juvenile herring and sprats are also food for sea trout and salmon. During the 1980s and early 1990s large quantities of mackerel were landed or processed on east European 'klondyker' factory ships anchored in Loch Broom.

Stocks of haddock and cod have also declined greatly within the area in living memory. The local status of these and other white fishes is subject to ongoing investigation by Marine Scotland Science.

From the 1960s local boats began to fish for prawns (*Nephrops norvegicus*). Initially they were taken using creels, as mobile gear was banned in inshore waters. Then in 1984, the Inshore Fishing (Scotland) Act removed the ban on use of mobile gear in inshore waters, allowing trawlers and dredgers to work inshore waters alongside the existing creel fishery. This led to gear conflicts in many parts of Scotland.

Trawlers are prohibited from working Gruinard Bay and Little Loch Broom during the period from October to March, though during the late spring and summer months they may fish the northern part of the bay to the North West of Gruinard Island. Scallops are taken by dredgers and by SCUBA divers. Mussels, Horse mussels and winkles are collected by hand at low tide primarily for local consumption. Brown crabs and lobsters are taken by creel fishermen in rocky areas.

Formerly the Gruinard Bay – Loch Broom area was also noted for high quality sea angling. Ullapool hosted the European Sea Angling Festival in the 1960s. Sea angling boat charters are available at Ullapool.

The North West Inshore Fisheries Management Group is currently developing a fisheries management plan for the area⁹.

⁹ <http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/InshoreFisheries/IFGsMap/NorthWestIFG>

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3.1.5 Nearby salmon rivers

Juvenile salmon were found by the WRFT electro-fishing team in the little Inverianvie River which enters the sea within 1km of the mouth of the Little Gruinard. This river is accessible to salmon and sea trout for only 1,500 metres from the sea to an insurmountable waterfall.

The nearest river which supports a salmon and sea trout fishery is the Gruinard River which flows into Gruinard Bay 3km from the mouth of the Little Gruinard River. In many respects, the 'big' Gruinard River is remarkably similar to its smaller neighbour; the main river flows out of large loch (Loch na Sealga) and provides a similar mix of very high quality, generally stable riverine habitat for production of juvenile salmon. The Gruinard River supports the most productive salmon fishery in the area with extensive areas of spawning and nursery habitat, above as well as below Loch na Sealga. With a tradition producing spring fish in addition to summer grilse and salmon, the big Gruinard River is also of considerable importance for the conservation of native salmon.

Further east, the next nearest river (as the 'sea trout swims') is the Dundonnell River at the head of Little Loch Broom (20 km by sea); four salmon rivers: the Kanaird, Ullapool, the Lael, and Broom flow into 'big' Loch Broom (22km, 28km, 34km and 34km by sea from the Little Gruinard respectively).

To the west around the Greenstone Point headland are several rivers with salmon and sea trout which flow into Loch Ewe. These comprise the Allt Beith, and the rivers Tournaig (where WRFT has operated an upstream downstream trap since 1999), the River Ewe and Sguod river, all between 25 and 35km away as the fish swims. Of these, the River Ewe which includes Loch Maree is by far the largest freshwater system.

During the late 1980s and / or early 1990s rod catches of salmon and sea trout fell to their lowest levels on record in all the rivers in the area and other parts of the West of Scotland. Fishery proprietors and anglers became very concerned for the future of wild salmon populations. Although salmon catches recovered during the period 2004-2009, the future remains insecure. WRFT Fishery Management Plans for the rivers Kanaird, Dundonnell, Gruinard, Ewe, Broom and Ullapool provide further details.

3.1.6 Laide Netting Station

Historically, many more wild salmon were taken by salmon nets than by rod and line. A salmon bag-netting station which existed at Laide operated for 200 years until 1992, when the nets were removed for conservation purposes. As recently as 1982, the station took 3,000 salmon; catches fell to 200 fish in 1991 then recovered to 500 in 1992. An account of the latter years of operation at this netting station can be found on Gordon Harrison's website¹⁰.

Illegal netting is a longstanding problem and remains a potentially serious threat to the recovery of salmon and sea trout fisheries in the West of Scotland. With a modest recent revival of wild salmon

¹⁰ http://www.gordon-c-harrison.co.uk/content/last_days_at_laide_fishing_station/

populations around Wester Ross, interest in netting (legal and illegal) is likely to regenerate. Fisheries legislation is complex and is not easily understood. Licensed herring nets can still be legitimately used for catching fish for home consumption; an offence is caused only if they catch and kill salmon or sea trout. The use of ‘tangle nets’ for crayfish is currently illegal though it is uncertain whether all local fishermen are aware of current legislation. A website explaining the rules and regulations for fishing with nets, rod and line and other gear could be very helpful so far as informing local people of their rights and where there is potential for committing offences.

3.1.7 Intensive aquaculture

In contrast to many other salmon rivers in Wester Ross, there are no active salmon farms within 10km of the mouth of the Little Guinard River. The closest active marine salmon farm is at Ardessie in Little Loch Broom, 17km from the mouth of the Little Guinard as the fish swims. There are two sea bed leases at this site which is currently operated by Wester Ross Fisheries (Table 3.1).

The lease held by Marine Harvest for a site at Stattic Point lapsed in 2009; at the time of writing [June 2010] the future of this site is unclear.

Table 3.1 Active marine salmon farms within 30km (by sea) of the mouth of the Little Guinard River.

Company	Location	SEPA Biomass consent	Start year
Ardessie Salmon (leased to Wester Ross Fisheries)	Ardessie ‘A’ and Ardessie ‘B’, Little Loch Broom (2 sites)	262 & 400 [662 total]	1986 & 2004
Wester Ross Fisheries Ltd.	Ardmair, Loch Kanaird (2 sites are operated alternately)	1,050	1978
Wester Ross Fisheries Ltd	Corry, Loch Broom	1,050	1982
Scottish Sea Farms	Tanera Mor, Summer isles (2 sites)	1,250	1980
Scottish Sea Farms	Eilean Fada Mhor, Summer Isles	600	1980
Marine Harvest Scotland	Isle Ewe	1350	2004

3.2 Characteristics of the Little Gruinard River Catchment

3.2.1 Geology

The geology of the area was surveyed and is described by Peach and Horne (1913)¹¹. Most of the Little Gruinard Catchment is underlain by ancient metamorphic rocks of the Lewisian complex, primarily acidic gneiss with some intermediate and more basic rocks in the western part of the catchment area. On top of the highest summit in the south of the catchment area are small outcrops of Torridonian sandstone (Figure 3.2).

Looking over the south end of the Fionn Loch and Carnmore to the mountains beyond. Note the pinker Torridonian sandstone 'caps' of Rhu Stac Mhor and A' Mhaighdean above the Lewisian gneiss. An erratic boulder of Torridonian sandstone rests on an exposure of gneiss in the foreground of the picture.



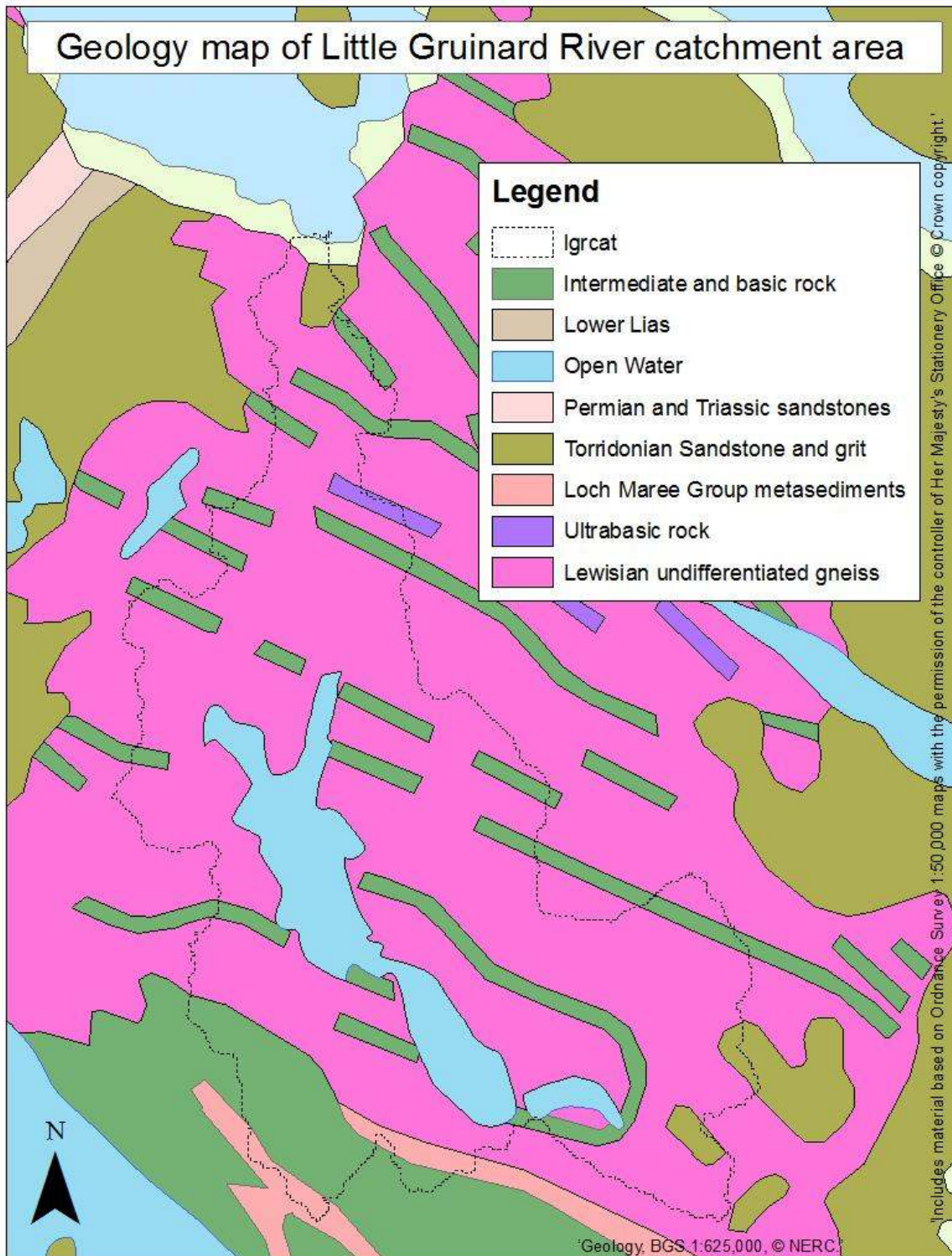
These rocks are hard, and resistant to both chemical and physical weathering. The waters entering the rivers and lochs of the catchment area are therefore naturally oligotrophic; biological productivity is limited by the availability of nutrients, particularly that of Phosphorus [P]. This is a key factor influencing the ecology and limiting the biological productivity of the area.



'Stepping stone' in the Little Gruinard River; a boulder predominately of gneiss with more basic amphibolites; note how the more basic material has been dissolved away from the more acidic rock to give the stone a rough pitted texture.

¹¹ The Geology of the Fannich Mountains and the country around upper Loch Maree and Strath Broom, 1913

Figure 3.2 Geological map of the Little Guinard catchment area



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The landscape has been shaped by the actions of ice over millennia. Glacial moraines have been reworked by streams and rivers. There are areas of more fertile alluvial ground at the head of the Dubh Loch, near Carnmore and around several streams which flow into the Fionn Loch. Deposits of peat are thickest in an area to the north west of the Fionn Loch, known as the 'Bad Bog'.



Soils are often thin or absent on higher ground, and usually underlain by glacial deposits on lower ground. Soils are predominately peaty podsols; however on the sides of the Little Gruinard valley there are some areas of brown earth which have provided better grazing and may have supported scrub woodland vegetation in the more distant past.

Brown earth soil by the side of the estate track to the west of the Gruinard River.

3.2.2 Climate and rainfall

Wester Ross has a moist maritime climate. Weather patterns are dominated by a westerly, Atlantic air-stream. Meteorological records from Kinlochewe (SNH Beinn Eighe Field Station) show 1973 - 2000 averages of monthly maximum and minimum temperatures of 12.2°C and 4.9°C respectively and average annual rainfall of 2278 mm. Within the Little Gruinard catchment, the average rainfall near sea level (at Little Gruinard) is around 1600mm, compared to 2800mm at the top of the catchment (Carnmore).

3.2.3 Hydrology

The Little Gruinard is a west-coast spate stream which rises and falls rapidly in response to rainfall. Peak flows are usually recorded during the autumn and early winter, and the lowest flows in the spring and summer. Flow patterns in the main river below the Fionn Loch are probably similar to those of the River Broom. In the Broom example (Figure 3.3), there were spates in excess of 5 m³/sec in June and July, but none in May and August. Note that spates lasted for only a few days, with discharge returning to levels below 5m³/sec within a few days (unless rainfall is sustained).

Salmon may enter the Little Gruinard River from the sea at all but the lowest water flows. However, movement upstream and over obstacles relates to the timing of higher flows (Walker and Walker, 1991)¹².

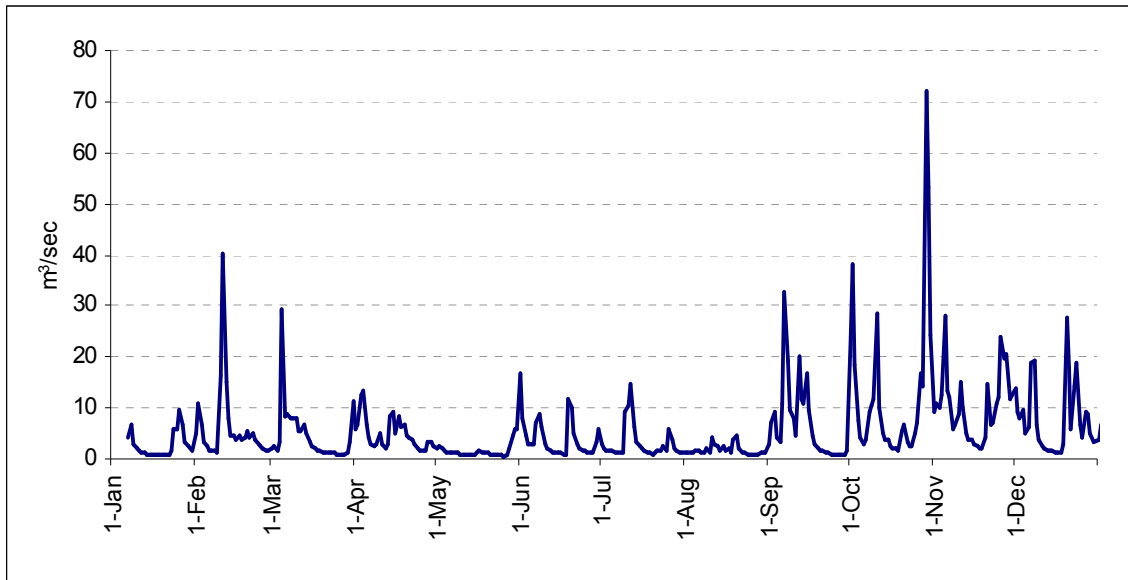


Figure 3.3 Discharge of the nearby River Broom, a similar sized west coast spate stream, at SEPA Croftown Gauging station by Inverbroom in 2001. Note how flows may change rapidly over a few days, and how summer levels tend to be much lower than autumn and winter flows. [Are their hydrographic records for the Little Gruinard from the 1960s?]

During the early 1960s, a major hydro-power scheme was proposed which would have led to the diversion of water from the Little Gruinard River. The scheme was fiercely opposed by the proprietor and abandoned. A water level gauging station was set up by the Bridge Pool.



The Bridge Pool and concrete foundations for a 'water gauging station' established to assess flows for a proposed hydropower scheme in the 1960s. What records are there of river flows?

¹² Walker and Walker (1991) The Little Gruinard Salmon Catch and Release Experiment . Fisheries Research Services Report No 2/91

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3.2.4 Water Quality

3.2.4.1 Water Quality Data

In the 1930s and 40s, Captain R. E. Sawyer of Inverewe took much interest in the trout lochs within the Little Gruinard catchment area. Sawyer corresponded with many leading scientists at laboratories around the UK as part of a quest to understand factors limiting the growth of trout in his lochs. Samples of water from lochs within the Little Gruinard catchment area were analysed.

Results are presented in Tables 3.2 and Table 3.3.

Table 3.2 Survey of pH of the Fionn Loch and Beannach [referred to as 'Beannach' in Captain Sawyer's notes] system, 30 May 1936.

Loch	Location	pH	Comments
Fionn	Boat House	6.6	
	Beannach Landing	6.6	
Beannach	Beannach burn	7.1	
	Burn by boat	7.2	Plenty caddis, one snail, no shrimp
	burn from Moine	7.0	
	burn from na Kappa	7.0	
	Fank Island	7.2	Plenty of shrimp in pairs
	Diver Island	7.0	A few shrimp

Table 3.3 Dissolved minerals in Inverewe Estate's lochs in 1937 (by Metropolitan Water Board, letter dated 5 July 1937, in Capt Sawyer's notes). Figures are in parts per 100,000.

Loch	Total Hardness as CaCO ₃	Calcium	Magnesium	Silica as SiO ₂	Phosphate as PO ₄
(Ghuiragarstidh	1.70	0	0.47	0.15	0.003)
Beannach	0.48	0.33	0.29	0.02	0.005
Fionn Loch	0.48	0.28	0.13	0.10	0.001
(na Baculah	2.60	1.06	0.32	0.05	0.001)
(River Thames	22.5	9.0	0.53	0.95	0.029)

Capt Sawyer's interest in water quality extended to progressing our understanding of how sphagnum moss acidifies water, and a letter was published in 'Nature' on the subject (Sawyer, 1944).

Walker (1991) provides water quality data for the Little Gruinard River from measurements taken in 1990. These are presented in Table 3.4.

Table 3.4 pH and Alkalinity measurements for the Little Gruinard River, from Walker, 1991.

Date	Place	River Level	pH	Alkalinity ($\mu\text{eq/l}$)	Conductivity (μS)
1/7/90	Garden Pool	+10	5.91	34	44
24/7/90	Garden pool	-2.5	6.36	54	48
17/8/90	Garden Pool	+14	6.12	36	46
28/8/90	Garden Pool	+6	6.51	46	46
29/9/90	Garden Pool	+24	6.35	39	43
2/9/90	Fionn Loch		6.33	52	48

Walker also provided pH figures for the pH of some of the nearby lochs; these range from pH5.45 for Loch nan Eun; to pH6.59 for an un-named loch near Loch Fada.

In summary, the waters of the Fionn Loch and Little Gruinard Rivers were found to be mildly acidic and poorly buffered; with the exception of the Beannach subsystem, where pH was higher. This can most easily be explained by the underlying geology of the Beannach subcatchment which includes base-rich amphibolites (metamorphosed basalt larva) of the 'Loch Maree series' that form much of Beinn Airigh Charr and Meall Mheinidh. Harriman (in Walker, 1991) did not consider the waters of the Little Gruinard system to be 'acid-sensitive'.

Moss Campion and Alpine Lady's Mantle growing on amphibolite ledges near the Carnmore – Letterewe path by the source of the Allt Poll Fraochain which flows into the Fionn Loch (June 2010).



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3.2.4.2 Freshwater Fish Directive

In 1976 the European Economic Community (now the European Union [EU]) introduced the Freshwater Fish Directive, which aimed to establish 'quality requirements for waters capable of supporting freshwater fish'. Rivers were divided into salmonid or cyprinid water, and water quality standards were set for each using certain criteria (e.g. pH, temperature, pollutants). In Scotland, The Scottish Environment Protection Agency (SEPA) is responsible for monitoring water quality and for assessing whether rivers and lochs are attaining the standards set, and if not, they must identify and rectify the pollution problem.

The Little Gruinard River was designated as a 'salmonid water' under the Freshwater Fish Directive in 1977.

3.2.4.3 Scottish River Classification Scheme

In 1996 SEPA established a further water quality assessment, the Scottish River Classification Scheme. This takes into account invertebrate and water chemistry information to classify rivers from A to D, with rivers graded C and D requiring government action to improve water quality. The Little Gruinard was classified grade A, indicating that the catchment has no major pollution problems.

3.2.4.4 Water Framework Directive (WFD)

In April 2006, the Controlled Activities Regulations (CAR) came into force. These are intended to give greater protection to river systems and coastal waters. SEPA has been given the task of monitoring and regulating activities which affect the 'ecological health' of rivers. Routine monitoring by (SEPA) includes distributions and densities of both aquatic plants and aquatic animals in river systems and coastal waters.

A draft Area Management Plan has been produced with guidance from an Area Advisory Group, which sets out priorities for actions to address issues of concern. This can be found on the SEPA River Basin Planning website¹³. The SEPA interactive map provides details of classification.¹⁴ Under the River Water Bodies Classification scheme, the Little Gruinard river is classified as 'Good' and the Fionn Loch as 'High'.

3.2.4.5 Nutrient status

The Little Gruinard is oligotrophic with low levels of dissolved nutrients throughout the year. Above Little Gruinard there is currently no permanent human habitation, no agriculture and therefore very little anthropogenic nutrient input compared to most other river systems in Scotland. Nutrient availability is further discussed in Part 6.

¹³ http://www.sepa.org.uk/water/river_basin_planning/early_basin_planning_work.aspx

¹⁴ http://www.sepa.org.uk/water/river_basin_planning.aspx#Interactivemap ;
<http://213.120.228.231/rbmp/>

3.3 Vegetation, ecology and important species

3.3.1 Vegetation

The Little Gruinard catchment supports a degraded, semi-natural ecosystem. The predominant vegetation type within the catchment area is heather moor (mainly at 250m - 500m altitude), followed by 'peatland', and 'other mosaics': mainly of grasses, sedges, mosses and lichens on ground above 500m. Plant growth within the Little Gruinard catchment area is restricted by a shortage of limiting nutrients (primarily Phosphorus P, and Nitrogen N), combined with grazing pressure which prevents most trees and shrubs from surviving. In 'nutrient hotspots', places where birds and other animals perch and defecate (green knolls, or boulders), plant diversity and growth is higher.

The islands of the Fionn Loch support mature woodland, including Scots pine, Willows, and Rowan.



Mature woodland is confined to the small wooded islands, Eilean Fraoch, Eilean nan Corrichean and Eilean a' Gharbh Uillt of the Fionn Loch, and to the plantation at Little Gruinard. The islands constitute a Site of Special Scientific Interest (SSSI): Eilean nan Corrichean has birch, with holly, rowan, alder, ash and Scots pine, with ferns and 'characteristic woodland herbs' representing

'fragments of the original vegetation cover of Wester Ross'¹⁵. Island soils may have been enriched by nesting birds, which include heron. Trees also grow on inaccessible ledges and on top of boulders out of reach from deer and sheep, vividly demonstrating the potential natural biodiversity of the otherwise largely denuded Little Gruinard catchment.



Aspen and Juniper trees growing on the bank of the Little Gruinard River.

¹⁵ Fionn Loch Island Site of Special Scientific Interest citation, 24 July 1986.

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Over the past 300 years, the vegetation of the catchment has been heavily influenced by grazing of cattle, sheep, goats and deer. Currently red deer are the dominant grazing animal. Man is the only predator of adult deer (some calves may be taken by foxes or eagles). This has not always been the situation: the natural fauna of the catchment included bear, wolf and lynx all of which may have taken deer. Wolves, an 'apex predator' were still present in Scotland around 1600; there is no evidence of them surviving beyond 1680¹⁶.

Man-made wilderness: looking south east over the Third Flats from near the estate track, taken on 12 May 2010. The landscape is almost entirely treeless: a result of centuries of grazing by livestock and deer, and wild fire? In 2007 a moorland fire spread down the valley in the foreground of the picture as far as a channel in the lower left of picture (shown by a red dotted line).



A forest on a boulder: out of reach of large grazing animals and fires, this boulder (circled in the picture above) is richly vegetated with rowan, willow and birch trees, an understory of heather, blaeberry and crowberry; and lichens and mosses. Is this how much of the rest of the valley looked in the past?

¹⁶ <http://www.wolfftrust.org.uk/a-lastwolves.html>

(below) *This nutrient & biodiversity hotspot above the neighbouring Guinard River is used by crows, birds of prey and animals such as fox. Fertilised plants attract Red Grouse and other herbivores.*



The loss of wolves from Scotland is likely to have led to changes in catchment ecology. In North America, wolves were reintroduced to Yellowstone National Park in 2002. This led to changes in the behaviour of Elk (the nearest North American analogue of the Red deer) and other large herbivores with corresponding changes in vegetation patterns along riparian corridors¹⁷. The reintroduction of wolves into Yellowstone has had far reaching effects, impacting the structure and diversity of the entire ecosystem. What would the Little Guinard catchment have looked like in the past?

Lochan Beannach Mor and Lochan Beannach Beag have small islands with a few trees. Native trees have been planted within a deer-fenced enclosure surrounding the lochsides.



Deer fences enclose regenerating woodlands around the Beannach lochs, and the lowest 4km of the Little Guinard woodland; land and woodland management is further discussed in Part 8 of this report.

The invasive non-native species [INNS], *Rhododendron ponticum* is spreading through the woodlands by the roadside only a few hundred metres from Little Guinard.

¹⁷ <http://www.bioinfo.rpi.edu/~bystrc/pub/artWolves.pdf>

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3.3.2 Species and habitats of conservation importance in the Little Gruinard catchment

3.3.2.1 Habitats Directive Species

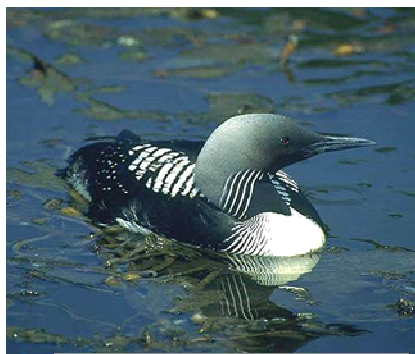
In 1992 the European Union set out to satisfy the requirements of the Biodiversity Convention signed at the Rio Earth Summit by introducing the Habitats Directive. The prime purpose of the Directive was to establish Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) for rare and endangered habitats or species. SNH are charged with establishing SACs and SPAs in Scotland, but also to promote the sensitive management of all listed species and habitats outside these conservation areas. Of the species and habitats listed in the EU Habitats Directive, at least 12 occur within the Little Gruinard catchment (Table 3.5).

Table 3.5 Species listed under the EU Habitats Directive which occur within the Little Gruinard River Catchment area

Annex 1	Annex 2
Blanket bogs	Atlantic salmon
Northern Atlantic wet heaths with <i>Erica tetralix</i>	Freshwater pearl mussel
Wet alder woodland	Otter
Caledonian pine woodland	Red-throated diver
	Black-throated diver
	Golden Eagle
	Merlin
	Peregrine
	?Dotterel
	Golden Plover

The Little Gruinard River system supports one of the best wild Atlantic Salmon (*Salmo salar*) populations in Europe, for which the river system has been designated as a Special Area of Conservation (SAC) under the EU Habitats and Species Directive¹⁸. The Little Gruinard is the only Atlantic Salmon SAC in the mainland of Western Scotland, an area where many other native wild salmon populations suffered severe declines during the 1990s and early years of the 21st Century.

- Black throated diver *Gavia arctica*



The Fionn Loch and neighbouring lochs comprise a designated Special Protection Area (SPA) for Black-throated Diver¹⁹ under the same legislation, part of the 'Wester Ross Lochs' complex. Black-throated divers have been shown to favour lochs with a high abundance of small salmonids (the birds' principal prey) and complex shorelines (Jackson, 2005).

Black throated diver (Laurie Campbell)

¹⁸ <http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0030183>

¹⁹ <http://www.jncc.gov.uk/default.aspx?page=1885>

- Freshwater pearl mussel *Margaritifera margaritifera*

The freshwater pearl mussel (FPM) is classified as Endangered on the IUCN Red List of Endangered Species due to its unprecedented, worldwide decline during the latter part of the 20th Century. Many factors have contributed to the decline including pearl fishing, pollution, siltation, and declines in host fish populations (www.fba.org.uk)²⁰.

There are still several million individuals living in the wild. Scotland is an international stronghold with an estimated 12 million pearl mussels in the cleaner rivers. However in many rivers, despite the adults reproducing successfully, there continues to be a near total loss of juveniles. The result is aging populations with the youngest individuals in some rivers being over 40 years old.

The Freshwater pearl mussel has a very interesting and complex life cycle which requires a host fish, typically a salmon fry or trout fry, for their larvae (glochidia). The relationship between freshwater pearl mussels and juvenile salmon is considered to be symbiotic (Ziuganov *et al*, 1994). Where present at high densities, they can represent the largest living animal biomass in a river environment. As their shells are made of calcium carbonate, mussels shells may also have a role in buffering low pH flushes in some situations. Mussel beds can be associated with high densities of juvenile salmon and adult salmon spawning habitat.



Within living memory, pearl fishermen visited the Little Guinard River (Lawrie, *pers comm*). The Little Guinard system would appear to provide ideal habitat for FPMs. No survey of the FPM population in the Little Guinard or big Guinard River has been undertaken to date. Could the river become a stronghold for the species?

Old freshwater pearl mussels can still be found in the Little Guinard River; is the populations still viable?

Two of the other listed species, **Otter** and **Red-throated Diver** could also benefit directly from action to conserve the catchment's fish stocks and riverine habitats. Conversely, salmon and trout populations will benefit from many of the actions to conserve other listed habitats and species, especially those that help to maintain the natural fertility and productivity of the catchment area.

²⁰ <http://www.snh.gov.uk/about-scotlands-nature/species/invertebrates/freshwater-invertebrates/freshwater-pearl-mussel/>

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3.3.2.2 Wester Ross Local Biodiversity Action Plan

The [Wester Ross Local Biodiversity Action Plan \(WRLBAP\)](#)²¹ was published in March 2004. The plan aims to raise local awareness and interest in biodiversity and to promote the sustainable management of biodiversity in Wester Ross. The plan was put together by a working group of local people representing a wide range of interests and organisations.

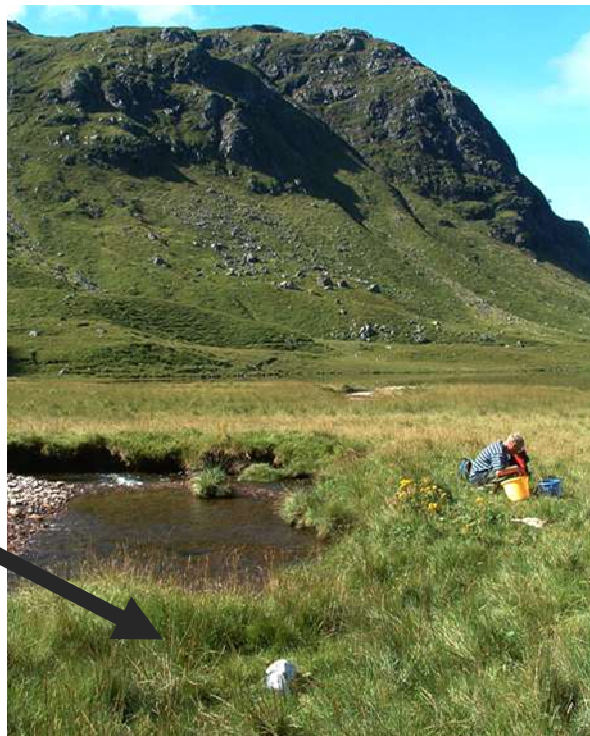
The plan listed a number of habitats and species of national and local priority in addition to those of 'European' concern listed earlier. These include 'lochs and rivers', 'wet alder woodland'; Sand Martin, Barn Owl, Woodcock, Greenshank, Azure Hawker (dragonfly), Brown Trout and Water Vole.

- Water vole *Arvicola terrestris*

The NW Highlands may be one of the last strongholds for water voles in the UK; elsewhere the spread of non-native North American mink has led to the loss of water voles from much of their former habitat. Signs of water voles were noted during field work around the Little Gruinard River and the Fionn Loch. The occurrence of mink within the catchment area in 2010 is cause for concern.



Streamside Water Vole habitat by head of the Dubh Loch, photographed during 2006 WRFT electro-fishing survey (photo of Water Vole left copyright Aberdeen University)



²¹ http://www.highlandbiodiversity.com/htm/counties/wester_ross/wester_ross.php

3.3.2.3 Native fish species

During the course of juvenile surveys carried out by the WRFT four indigenous fish species were identified within the Little Gruinard catchment. Atlantic Salmon (*Salmo salar*), Brown Trout (*Salmo trutta*), European Eel (*Anguilla anguilla*), and Arctic Charr (*Salvelinus alpinus*).

Salmon and sea trout (sea-going populations of Brown Trout) occur within the Little Gruinard River and accessible sections of tributary streams. Resident populations of Brown trout exist throughout the catchment, including the hill lochs. Further details of salmon and trout populations are given in Part 4 and Part 5.

- European Eel *Anguilla anguilla*

There is growing concern that eel numbers are declining in some parts of their range. In many respects, the life cycle of the eel is the opposite of that of the salmon. Eels spawn in the Sargasso Sea



and enter freshwater in the spring as elvers aged 2 where they may grow for ten or twenty years before returning to the sea as mature adults. Although eels eat trout eggs, fry and parr, trout, large salmon parr and trout are known to eat small eels.

Until the early 1990s, elvers were caught in the Little Gruinard River near the mouth of the river.



Since then, European eels were recorded during WRFT electrofishing surveys at sites as far upstream as the Beannach River though were more common in the lower reaches below the road. Juvenile fish surveys suggest that many of them remain within the lower part of the Little Gruinard River during their first spring - summer.

Eels also occupy the intertidal habitat and in some areas some may move to and fro between freshwater and the marine environment. However, at Tournai we've found a peak in silver eel migration in September and early October, and very few other records for eels moving downstream.



Elver fishing, Little Gruinard, 1999. (Pictures by James Butler).

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- Arctic Charr *Salvelinus alpinus*

Arctic Charr colonised Scotland from the sea at the end of the last period of glaciation. As temperatures rose, charr populations became landlocked within freshwater lochs in isolation from each other. Charr have been described as the ‘Darwin’s finches’ of the fish world as they quickly evolved to take on a range of forms and feeding habits (Adams, 2008)²². In Wester Ross, charr have been found in most of the larger lochs, and in Loch Maree two distinct charr populations have been found, one of which is benthic (a small fish with big eyes), the other thought to be mainly pelagic. Arctic charr live in the Fionn Loch. They are seldom caught by anglers and little is known about them. Charr are also present in the Beannach Loch system.

Arctic charr from a spawning stream in the neighbouring Gruinard River catchment.



A charr fry was caught near the mouth of the Beannach River in August 2009; this is the first record of an arctic charr fry taken during a WRFT electro-fishing survey.

Salmon fry (top fish) and Arctic charr fry (below) from the Beannach River just above the Fionn Loch, August 2009

²²<http://www.wrft.org.uk/files/WRFT%20Arctic%20charr%20discovery%20week%202008%20workshop%20report.pdf>

3.3.3 Some other species of importance to freshwater ecosystems

- Aquatic invertebrates

Aquatic invertebrates are a major part of the diet of juvenile salmonids. Growth rates and production of juvenile salmon relates to the abundance of larvae of mayflies, stoneflies, caddis flies and other insects.

Early in spring 2-3 cm long Perlodid larvae crawl out of the river and hatch into adult stoneflies. Large stonefly larvae are themselves predators of mayflies of which swimming *Baetis* spp., and flat-headed crawling *Ecdyonurus* spp. and *Rithrogena* are the most common species.



(left) Stonefly, *Perla bipunctata* (2 tails) and mayfly, *Ecdyonurus torrentis* (3 tails) larvae; (right) Large Brook Dun (*Ecdyonurus torrentis*), the largest mayfly species found in the river.



According to local anecdote, the Fionn loch was noted for large hatches of sedge flies which have become less common within living memory (Jackson, *pers comm.*). Studies of invertebrates within the catchment by Paul Tinsley-Marshall will provide a baseline for assessing future changes.

One of Paul Tinsley-Marshall's insect 'Malaise' traps by the Little Gruinard River in 2006.

- Water & / or fish-eating Birds

The Dipper is resident in the Little Gruinard catchment, and Heron and White-tailed Eagle are frequently seen and have bred. Common Gull, Common Sandpiper, Grey Wagtail and Greenshank are summer visitors to lochsides and nearby moorland areas. Ospreys may return to breed within the catchment area in the next few years. Snipe and Woodcock numbers increase in the autumn.

3.4 Human activities within the Little Gruinard River catchment area

3.4.1 Land ownership

The Little Gruinard River is located within the Letterewe Estate, one of the largest areas of privately owned land in Scotland²³.

3.4.2 Human population

In 2010, the only permanently lived in house in the catchment area is the keeper's cottage at Little Gruinard. The holiday lodge nearby sleeps 10, and is occupied through much of the spring summer and autumn. At the head of the Fionn Loch, Carnmore Lodge is used as a base for deer stalking during the autumn; a bothy nearby provides basic shelter for hill walkers and climbers for which the area is popular in summer. For one day in August each year the 'Great Wilderness Challenge' brings many hundreds of people through the area.

3.4.3 Land use and management

The Little Gruinard river catchment area is managed primarily for red deer and other wildlife. Over the past 20 years, Letterewe Estate has played a leading role in supporting wildlife conservation and management research in northwest Scotland. In June 2002, after three years of scientific research, a book "a Highland Deer Herd and its Habitat" was published to assist with the effective future management of Letterewe estate. Deer have an important role in the rural economy, providing an income from hunting and from sales of venison. The estate has also sponsored more recent research to learn about invertebrate communities on Letterewe Estate.

- Agriculture

Historically, cattle and sheep were grazed within the catchment, and there may have been small areas of cultivation. Sheep and cattle were removed from the catchment towards the end of the 20th Century. There was virtually no agricultural activity in the catchment other than temporary grazing of ponies by Carnmore in 2009.

- Muirburn

Traditional muirburn is a management tool intended to encourage the growth of young heather and grasses for grazing. However, in the West of Scotland muirburn may have contributed to a loss of heather and reduced grouse and hare populations (McVean and Lockie, 1969). From the fisheries perspective, windblown insects from moorland areas can form a substantial part of the trout & juvenile salmon diet at certain times of year. In 2007, an accidentally lit wild fire spread down the valley of the Little Gruinard, burning heather and grass moorland (see photos on page 37).

²³ <http://www.letterewe-estate.com/fauna.php>
<http://www.archive.org/details/hundredyearsinih00mack>

- Protected areas

The Little Gruinard SAC for Atlantic Salmon and the Wester Ross SPA for Black-throated Diver were formally designated in March 2005 (see above). The river is therefore now of international importance for the conservation of the Atlantic Salmon and Black-throated Diver. Designation brings with it the responsibility for maintaining 'favourable status'. Status is monitored by the Scottish Government and its agencies. The Fionn Loch Islands SSSI is also managed to maintain its scientific interest.

- Woodland regeneration areas

Two areas enclosed by fence to keep deer out were established by Letterewe Estate to foster regeneration of mixed woodlands. One of these encloses the lower 4km of the Little Gruinard; the other encloses much of the Beannach loch system and surrounding ground to the south west of the Fionn Loch.

3.4.4 Fishing rights and access

Rights to fish the Little Gruinard river and lochs within the catchment area belong to Letterewe Estate. The conservation of the wild salmon of the river is the Estate's top priority. Salmon fishing is strictly 'catch and release' and is available to the public through lets of the Little Gruinard holiday lodge. The estate also has a boat on the Fionn Loch for those who take Ardlair Lodge. Local residents who become members of Gairloch Angling Club have access to fish the Fionn Loch, subject to agreement of the estate keeper.

Fishing for a Little Gruinard salmon at Tattershall's corner.

