

Sealochs in west Scotland

Area summaries

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Loch Etive

Location

Position (centre)	NM 000 330	56°27.5'N 5°15.2'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)

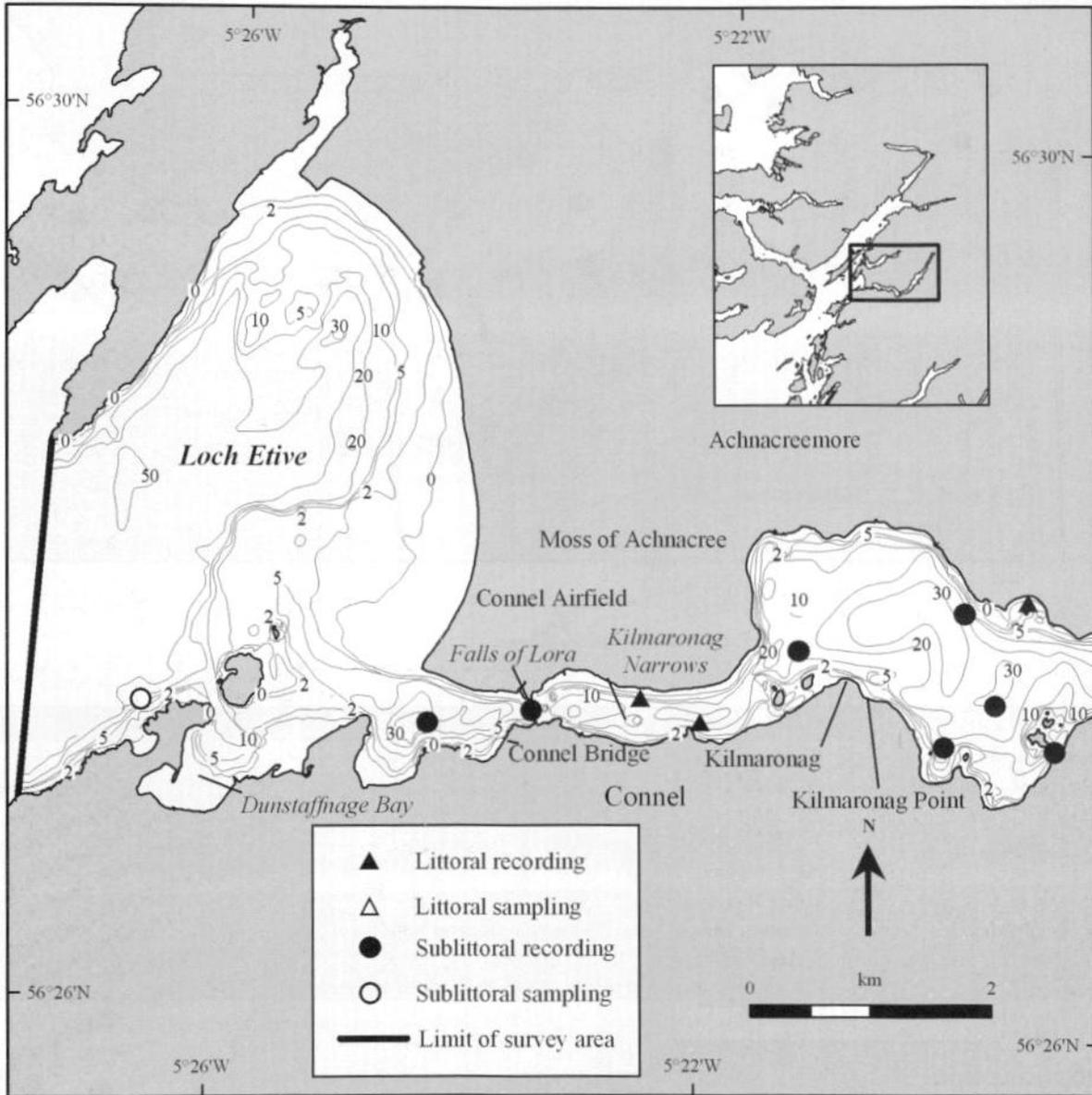


Figure 11.1 Main features of the area, showing sites surveyed.

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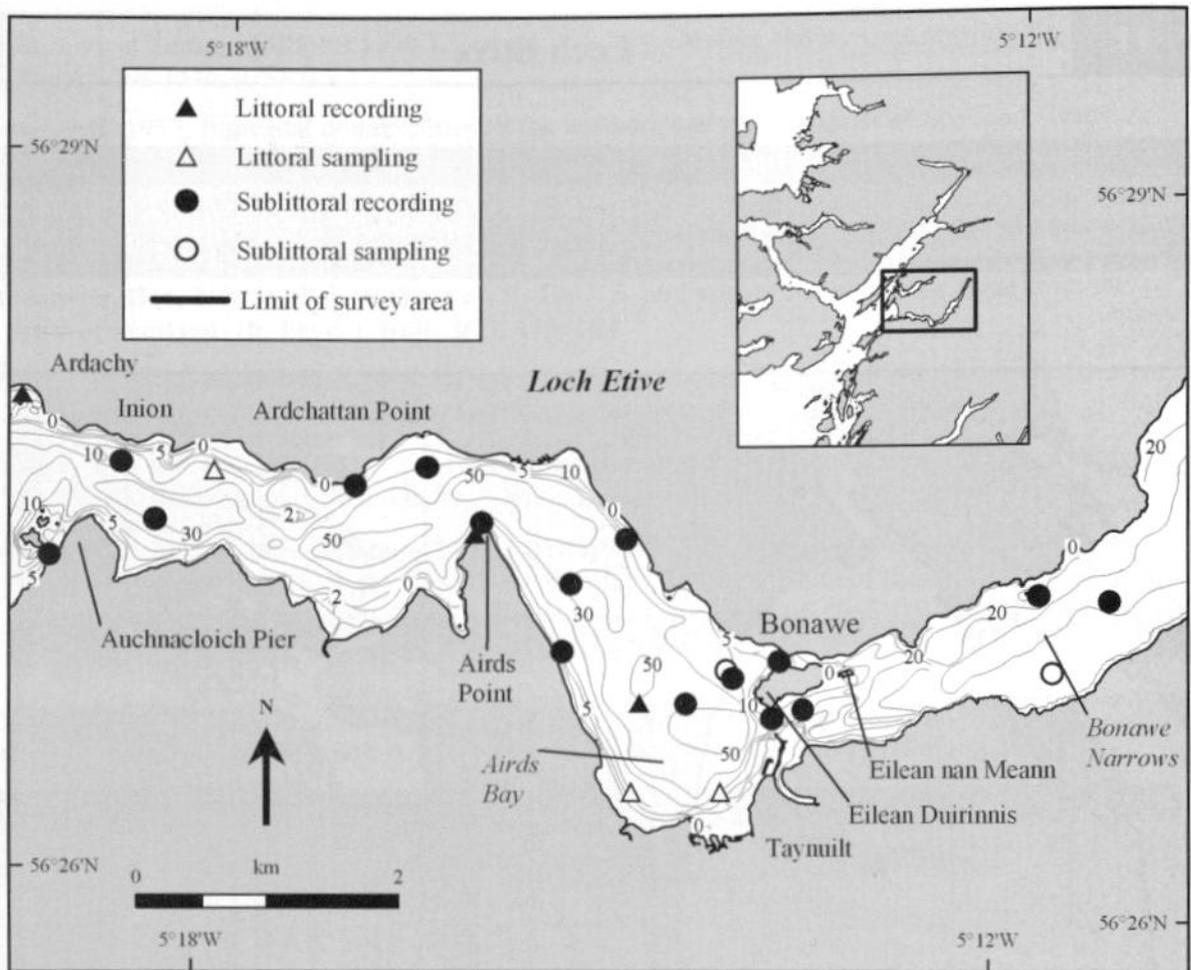


Figure 11.1 (continued)

Physical features	
<i>Physiographic type</i>	Fjord with six sills
<i>Length of coast</i>	83.75 km
<i>Length of inlet</i>	29.5 km
<i>Area of inlet</i>	29.5 km ² (HW); 27.7 km ² (LW)
<i>Bathymetry</i>	139.0 m (max)
<i>Wave exposure</i>	Varies from moderate to very sheltered
<i>Tidal streams</i>	8 knots at Falls of Lora; 2.5 knots at Bonawe Narrows
<i>Tidal range</i>	Springs: 1.8 m; neaps: 0.7 m (Bonawe)
<i>Salinity</i>	Ranges from marine at mouth of loch to brackish at eastern end

Introduction

Loch Etive, which penetrates deep into the mountains north of Oban, is one of the longest and deepest sealochs in Scotland. It is a fjord with an unusually large freshwater input and has a salinity regime unlike any of the other Scottish sealochs. The shallow bedrock entrance sill at the Falls of Lora creates a spectacular rapids and restricts the rate of water exchange with the deeper inner basins. A further major sill half-way along the loch at Bonawe partially isolates the large and very deep inner basin from the rest of the loch. The loch has six sills in total and reaches a maximum depth of 139 m. This sill and basin structure, combined with the large freshwater input from Rannoch Moor and Loch Awe, has created a salinity gradient where salinity decreases towards the head of the loch and increases in deeper water. The surface layers have a variable

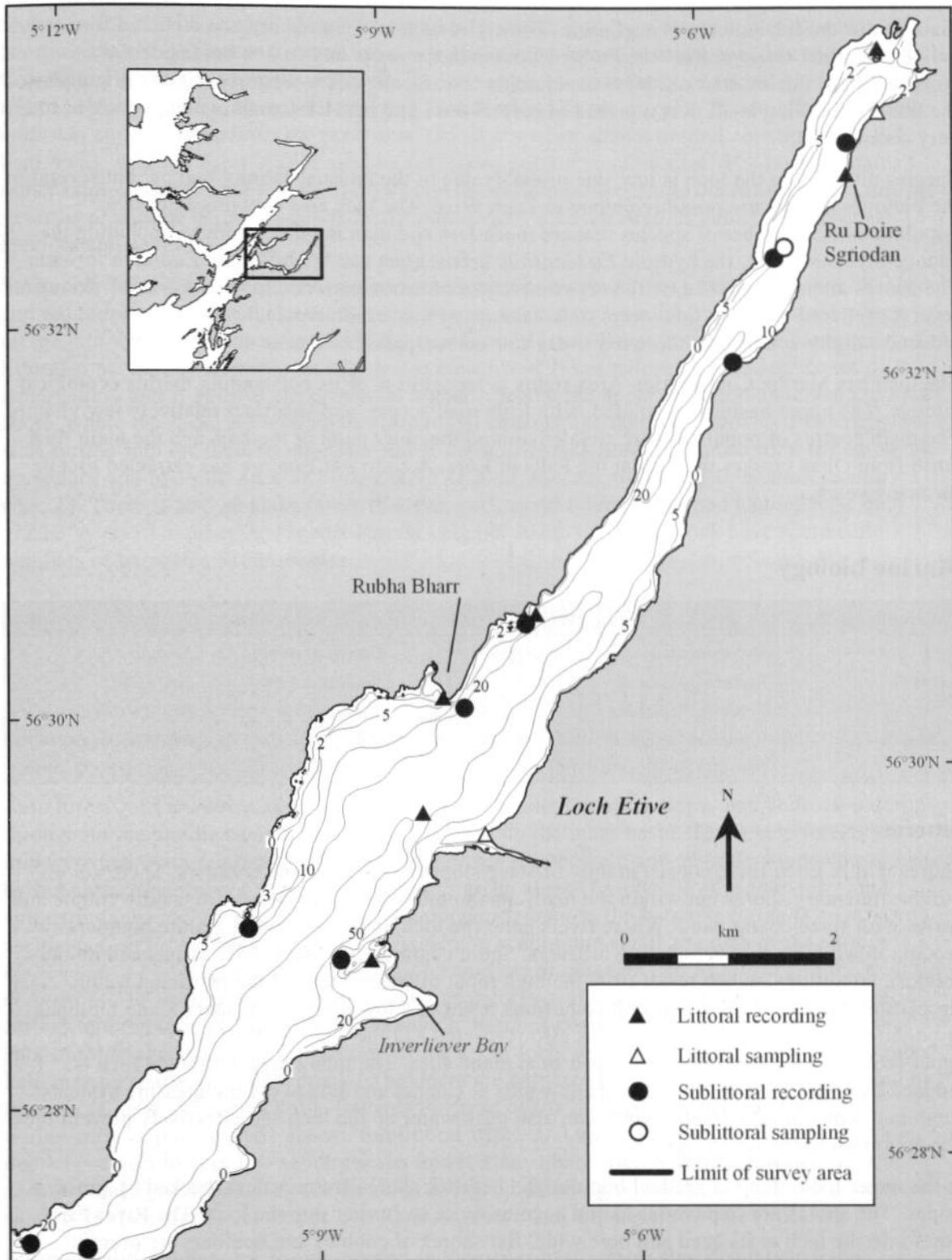


Figure 11.1 (continued)

salinity and are permanently brackish but, below 15 m depth, conditions are more stable and the water is almost fully marine.

There is a strong tidal flow across the sills in the loch and this is particularly pronounced through the Falls of Lora and its approaches. Tidal streams here can reach speeds of over 8 knots. In the

main basins the tidal stream is negligible. The entire loch is sheltered or very sheltered from wave action. The tidal range outside the Falls of Lora is in the order of 1 to 3 m but inside the constriction of this shallow sill it is considerably less. Strong south-westerly winds can prevent the tide from falling at all over a period of several days and intertidal zonation at the loch head is very compressed.

Species diversity in the loch is low, due probably due to the unusual salinity regime, but several of the biotopes present are possibly unique to Loch Etive. The loch also contains extensive populations of a number of species that are much less common in other sealochs, including the sponge *Mycale lobata*, the hydroid *Eudendrium arbusculum* and the bryozoan *Eucratea loricata*. The shores are impoverished, with very compressed zonation patterns. In the sublittoral, there are several sheltered rock and tide-swept rock habitats with communities indicative of variable or reduced salinity conditions; these have very few counterparts in other sealochs.

The loch has Marine Consultation Area status in recognition of its outstanding marine ecological interest. The upper basins are isolated, with little road access, and so attract relatively few visitors. The main centres of population are situated around the outer parts of the loch and the main road north from Oban crosses the loch at the Falls of Lora. A quarry at Bonawe has extracted granite for many years.

Marine biology

Marine biological surveys

	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	11	September 1990	Holt (1991)
	Recording (epibiota)	5	1967–1972	Gage (1974)
Sublittoral	Recording (epibiota)	1	1995	MNCR survey 624
	Recording (epibiota)	32	September 1990	Holt (1991)

Littoral

Shores within Loch Etive consist mainly of steep slopes of bedrock and boulders. There are no truly sedimentary shores but within the many small embayments the shores are mainly cobble and gravel with some coarse sand. Where rivers enter the loch, there are fans of granite boulders brought down from the surrounding hillsides. Shore communities are heavily influenced by the brackish conditions, which result from the high input of freshwater and the restricted water circulation in the loch. The brackish conditions result in a low diversity of species and biotopes throughout the loch. The shore extent is also restricted and the width of the littoral zone in the upper loch beyond Bonawe is less than 1 m at many sites. The tidal range within the loch is reduced by around one-third by the shallow sills at Connel and Bonawe. Low-pressure systems combined with strong westerly winds can also push water up the loch and effectively prevent the tide from falling for several days.

In the upper loch, steep to gradual boulder and bedrock shores are prevalent, backed by grassy slopes. The shores are impoverished and become more so further into the loch. The River Etive flows into the loch at its head and here wide, flat shores of cobbles and boulders are present. These are almost devoid of species, with only gammarid amphipods underneath the rocks and freshwater angiosperms between the rocks. Shores between the head of the loch and Bonawe are all strongly influenced by freshwater. Where this influence is not too great, the usual zonation of furoid algae, including *Pelvetia canaliculata*, *Fucus vesiculosus* and *Ascophyllum nodosum*, can be made out (Pel, FvesX, Asc.VS, Asc.Asc, Fcer). At sites heavily influenced by freshwater, such as Inverliever Bay and near the head at Ru Doire Sgriodan, *Fucus ceranoides*, a species tolerant of brackish conditions, predominates (FcerX) and becomes increasingly common on shores further up the loch. Barnacles, littorinid molluscs, limpets and echinoderms are all absent from shores in the upper loch. In contrast, the amphipod *Echinogammarus obtusatus* is common under boulders.

Shores in the middle section of the loch between Ardachy and the western end of Bonawe Narrows are also subject to lowered salinities, but not the extremes experienced in the upper loch. Consequently there is a slightly wider variety and a greater abundance of furoid algae on these mixed substrata shores. Narrow bands of *P. canaliculata*, *Fucus spiralis*, *F. vesiculosus* with *A. nodosum* and *Fucus serratus* are present on the shores in an almost normal zonation (FX, Pel, Fspi, Fves, Asc.VS, Fserr.VS). *F. ceranoides* is also present at some sites. The fauna remains rather impoverished, with low numbers of two littorinid molluscs *Littorina littorea* and *Littorina saxatilis* plus some barnacles *Semibalanus balanoides*. Mussels *Mytilus edulis* are present in crevices and under boulders.

Steep bedrock and boulder shores are present in the tide-swept narrows between Connel Bridge and Kilmaronag Point to the east. These shores are backed by woodland and grassland which merge into the lichen-covered rocks in the supralittoral zone. Dense furoid algae cover most of the littoral zone, mainly *A. nodosum* with lesser amounts of *F. vesiculosus* (Asc.Asc). Zones of *P. canaliculata* and *F. spiralis* are present at higher levels in the upper eulittoral zone. On the lower shore, where the rocks are washed by strong tidal streams, the fauna is relatively rich compared to sites further into the loch. *A. nodosum* and *F. serratus* fronds provide a substratum for epiphytic bryozoans and hydroids such as *Flustrellidra hispida*, *Electra pilosa* and *Dynamina pumila* (Asc.T). There is also an understorey of algae, such as *Audouinella* sp. and *Cladophora* sp., grazed by small numbers of limpets *Patella vulgata*. Areas of steeper rock have reasonable numbers of barnacles *S. balanoides*.

Sublittoral

Sublittoral rock

Sublittoral rock occurs throughout the loch, but unusually the most extensive slopes are found in the upper loch where, at some sites, sheer cliff faces descend to at least 40 m depth. The loch is subject to variable salinities, especially in shallower areas and in the upper loch.

Kelp forests of *Laminaria saccharina* are present on silted boulder slopes and bedrock outcrops throughout the middle basin and as far as half-way up the inner basin. These kelp forests are impoverished, with relatively sparse and sometimes stunted kelp and an understorey characterised by red algae *Phyllophora* spp. and filamentous green algae (LsacRS.Phy). Understorey and epiphytic fauna include the tubeworm *Pomatoceros triqueter*, the barnacle *Balanus crenatus*, the ascidians *Corella parallelogramma* and *Asciidiella scabra* and small amounts of the sponge *Halichondria bowerbanki*, the bryozoans *Alcyonidium diaphanum* and *E. pilosa* and the hydroid *D. pumila*. The density and diversity of the understorey and faunal species falls with distance further into the loch and is higher in the middle basin as compared to the upper basin. In the sublittoral fringe and upper infralittoral of the upper loch, where salinities may be very reduced, kelp may be sparse and the bedrock or boulders are carpeted by filamentous green algae and by mussels *M. edulis* (LsacRS.Phy). Towards the head of the loch, from around Rubha Barr northwards, kelp is virtually absent. Sublittoral fringe and upper infralittoral rock above about 6 m depth is subject to very low salinity water and is almost bare. Below this freshwater layer, *F. serratus* and *F. vesiculosus* can be found growing sublittorally on bedrock, boulders or cobbles on sand, with their fronds covered in ascidians *A. scabra* and *Ciona intestinalis* (FChoG).

Steep circalittoral bedrock is only present in the upper basin, extending down below the infralittoral kelp forest. The best example is on the west coast at 'Mackinley's Cliff' on the headland north of Eilean Duirinnis. Here a cliff face drops vertically from near the surface to around 40 m depth, where it meets with a steep slope of angular boulders which continue down to meet the sediment at about 45 m depth. The sparse infralittoral community of mussels and filamentous green algae (LsacRS.Phy) finishes at about 10 m depth and is followed by a circalittoral community characterised by the brachiopod *Neocrania anomala* and solitary ascidians, especially *Dendrodoa grossularia* (NeoPro.Den); the latter formed 100% cover in some areas. At deeper depths, where the salinity is less variable, the fauna associated with this biotope

is greater in both diversity and abundance. While Mackinley's Cliff is well known to divers and provides perhaps the best example of this community, essentially the same biotope is present on steep bedrock and boulder slopes at least as far north as Inbharguisachan, about 5 km from the head of the loch. Elements of this biotope are also found on the deeper parts of circalittoral boulder slopes in the middle basin. However, many of the circalittoral rock communities within the middle basin are affected by tidal currents.

Tide-swept communities

Tide-swept infralittoral and circalittoral communities are present in the entrance to the loch, in the Falls of Lora, the Kilmaronag Narrows which follow and in the Bonawe Narrows. Tidal streams run through the Falls of Lora at speeds of up to 8 knots. These are extreme conditions and the biotopes and communities found here and throughout the Kilmaronag Narrows are heavily scoured. An extensive series of bedrock ridges and gullies runs through the Falls of Lora, reaching a maximum depth of about 14 m. The shallow bedrock on the tops of the ridges supports a forest of short, stocky kelp *Laminaria hyperborea* with an understorey of red algae and hydroids (Lsac.T). This biotope is also present on tide-swept boulders at the north-east end of the Kilmaronag Narrows and probably extends throughout this area wherever stable rock is present. The gully walls are heavily scoured and dominated by barnacles *B. crenatus* along with the hydroids *Tubularia indivisa* and *Sertularia argentea* and the bryozoan *Alcyonidium diaphanum* (BalHpan). Above and below the Falls of Lora, the tidal stream speeds are reduced slightly, allowing a thick sponge and hydroid turf to develop. The sponges *Halichondria panicea* and *H. bowerbanki* and the bryozoan *A. diaphanum* cover much of the substratum, along with *S. argentea* and various solitary ascidians (BalHpan). A tide-swept bedrock plain lies on the seaward side of the Falls of Lora and *A. diaphanum* is also predominant on circalittoral rock here, with frequent patches of the bryozoan *Flustra foliacea* (BalHpan). A very rare nudibranch *Aldisa zetlandica* was recorded here by the 1990 MNCR survey, feeding on *Alcyonidium*. In Achnachreemore Bay, incoming tidal streams from the Kilmaronag Narrows circulate in a clockwise direction. On the east side, pebbles and coarse stone gravel form a moderately steep slope down to around 30 m depth. In spite of the currents, these pebbly slopes support only a few animals, including the hydroid *Eudendrium arbusculum*, barnacles *B. crenatus* and tubeworms *P. triqueter*, an impoverished form of the barnacle and sponge biotope characteristic of the rapids area (BalHpan). The lower species diversity results from the reduction in salinity already evident in this part of the loch.

The Bonawe Narrows are subject to tidal currents of between 1.5 to 2.5 knots. The channel bed consists mainly of coarse sand, patches of cobbles and shell debris, with bedrock on the headland of Eilean Duirinnis at the western end and around Eilean nan Meann at the eastern end. The bedrock is characterised by dense growths of the sponge *H. bowerbanki*, the bryozoan *Eucratea loricata*, and the hydroid *E. arbusculum* (HbowEud), with another hydroid *Abietinaria abietina* in the deepest, sand-scoured areas. Areas of cobbles and boulders within the main channel support these same species in smaller numbers and are dominated by barnacles. This biotope is also present on boulder slopes and areas of sandy mud with shell-gravel and scattered cobbles and boulders around the edges of the middle basin between the two sets of narrows. For example, on the north coast, near the hamlet of Inion, boulders support a thick turf of *H. bowerbanki* and thick growths of *E. loricata* and *E. arbusculum* along with the red algae *Phyllophora* sp. and barnacles (HbowEud). This particular tide-swept biotope has so far only been found in Loch Etive under these particular conditions of reduced salinity combined with strong tidal streams.

Dense beds of mussels *M. edulis* are present in tide-exposed shallows in the Bonawe Narrows. Around Eilean nan Meann the beds occur in the sublittoral fringe between 1 to 3 m depth, along with *F. serratus* (MytT). Off the west end of Eilean Duirinnis such beds can be found tucked away behind bedrock ridges out of the very strong currents, between 8 to 10 m depth.

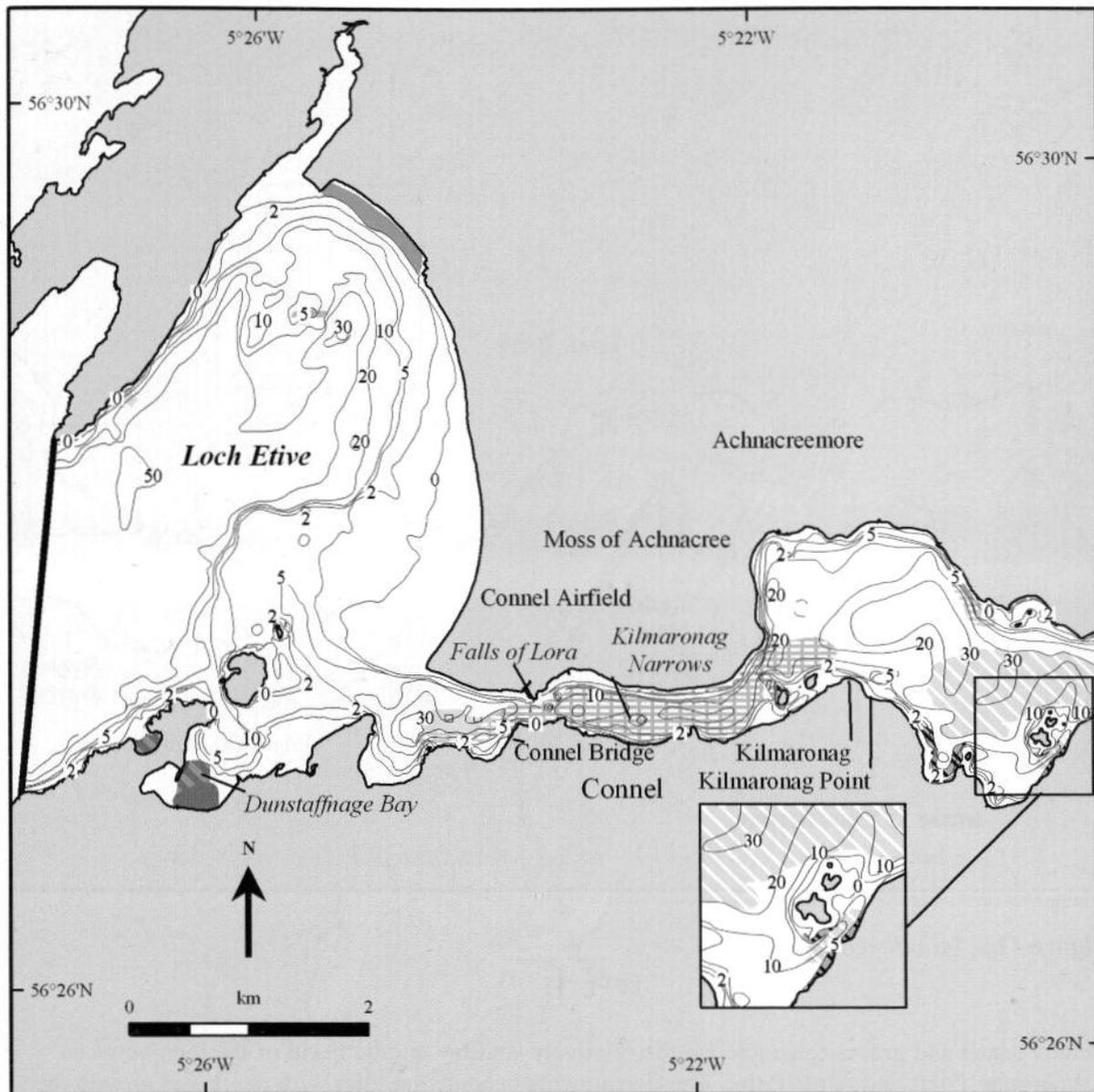


Figure 11.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 11.1, cited literature and additional field observations).

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Sublittoral sediments

The whole of Loch Etive can be described as 'sheltered to very sheltered' from wave action and thus wave action has a negligible effect on the distribution of sediment types. Instead, sediment distribution reflects the differing rates of tidal water movement. The coarsest sediments of sand and shell are found in the entrance to the loch on the seaward side of the Falls of Lora, where tidal currents remain strong. The central parts of this entrance basin are floored by very coarse, mobile shell-sand with very dense populations of the sand mason worm *Lanice conchilega* (Lcon) but very few other species. Coarse sediment is also present in the central channel of the Bonawe Narrows, as extensive patches of rippled coarse sand and areas of empty mussel shells *Modiolus modiolus* and *M. edulis*. The sediment is interspersed with areas of cobble and boulders with tufts of hydroids and bryozoans on them (HbowEud).

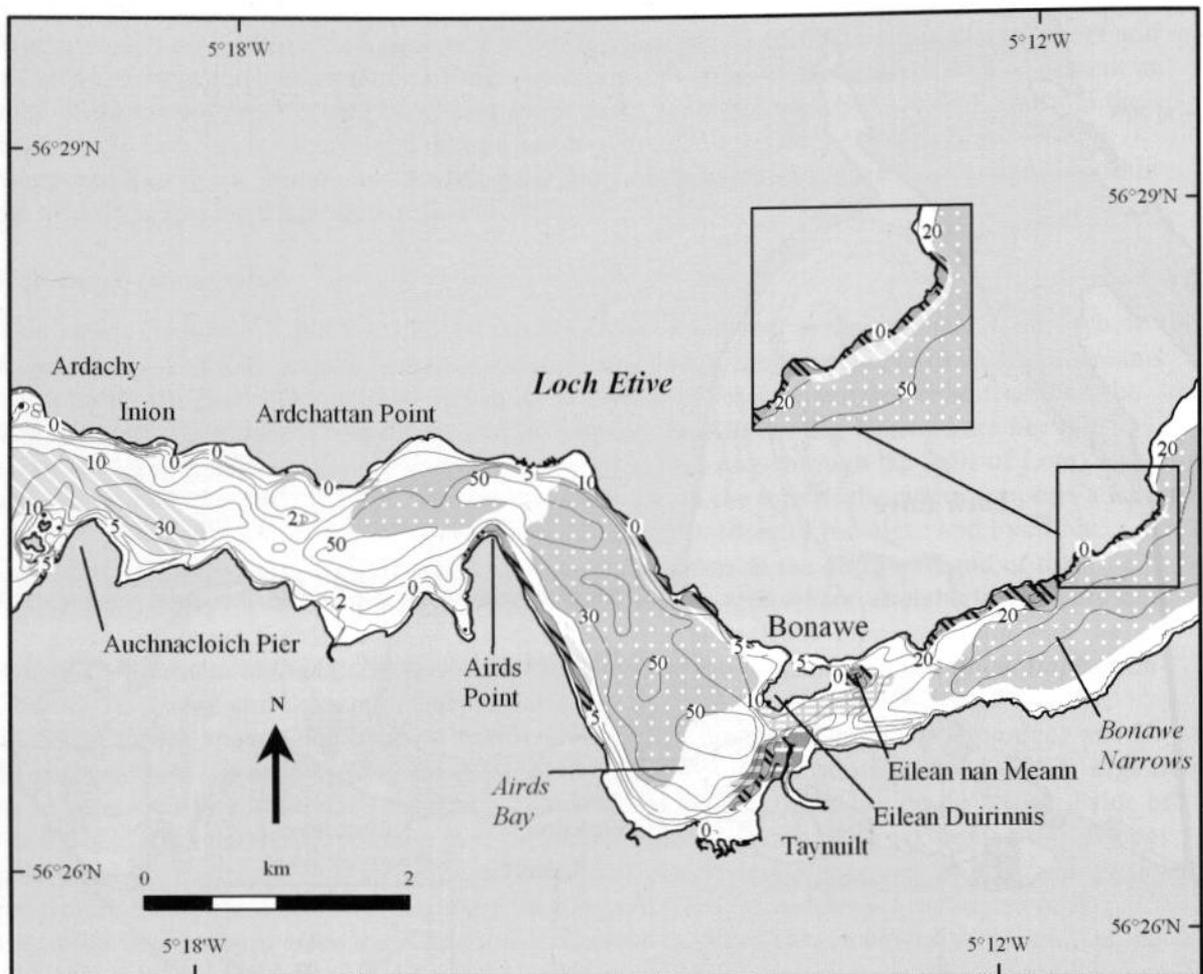


Figure 11.2 (continued)

Muddy sands and gravels characterise the relatively shallow middle basin of the loch between Kilmaronag Point and Airds Point. These sediments become muddier with depth and around the edges of the basin may be mixed in with cobbles, boulders and bedrock outcrops. These hard substrata are exposed to some water movement in the shallows and support sponges and hydroids as described above (BalHpan). Plains of muddy sand in the deeper areas support a variety of common and widespread species, including the anemone *Cerianthus lloydii*, the sand mason worm *L. conchilega*, brittle stars *Amphiura* spp. and *Ophiura* spp. and occasional sea-pens *Virgularia mirabilis* (VirOph). Similar gravelly mud, but with considerable amounts of shell and pebble colonised by ascidians, sponges and hydroids, slopes down below infralittoral boulders along the north coast of Airds Bay (VirOph.HAs). In the upper basin similar circalittoral sediment is also present, sandwiched between infralittoral sediments (FChoG) and deeper soft mud (SpMeg). Deep soft mud communities also include *Maxmuelleria lankesteri* and there are dense beds of the polychaete *Spiochaetopterus typicus* at below 100m depth (Hughes 2002, pers. obs.). At Rubha Bharr this sediment supports large numbers of the bivalve *Arctica islandica*, the empty shells of which provide a substratum for ascidians and hydroids (VirOph.HAs).

Soft mud forms extensive plains in the eastern end of the middle basin and throughout the upper basin. Between Ardchattan Point and the Bonawe Narrows the mud is characterised by the sea-pen *V. mirabilis*, burrowing brittlestars *Amphiura* spp. and occasional burrowing crustaceans (SpMeg). The density of the sea-pens varies from scattered individuals to dense beds such as those off Ardchattan Point. In the upper basin beyond the Bonawe Narrows the mud is for the most part heavily burrowed by crustaceans, including *Callinassa subterranean* and possibly including

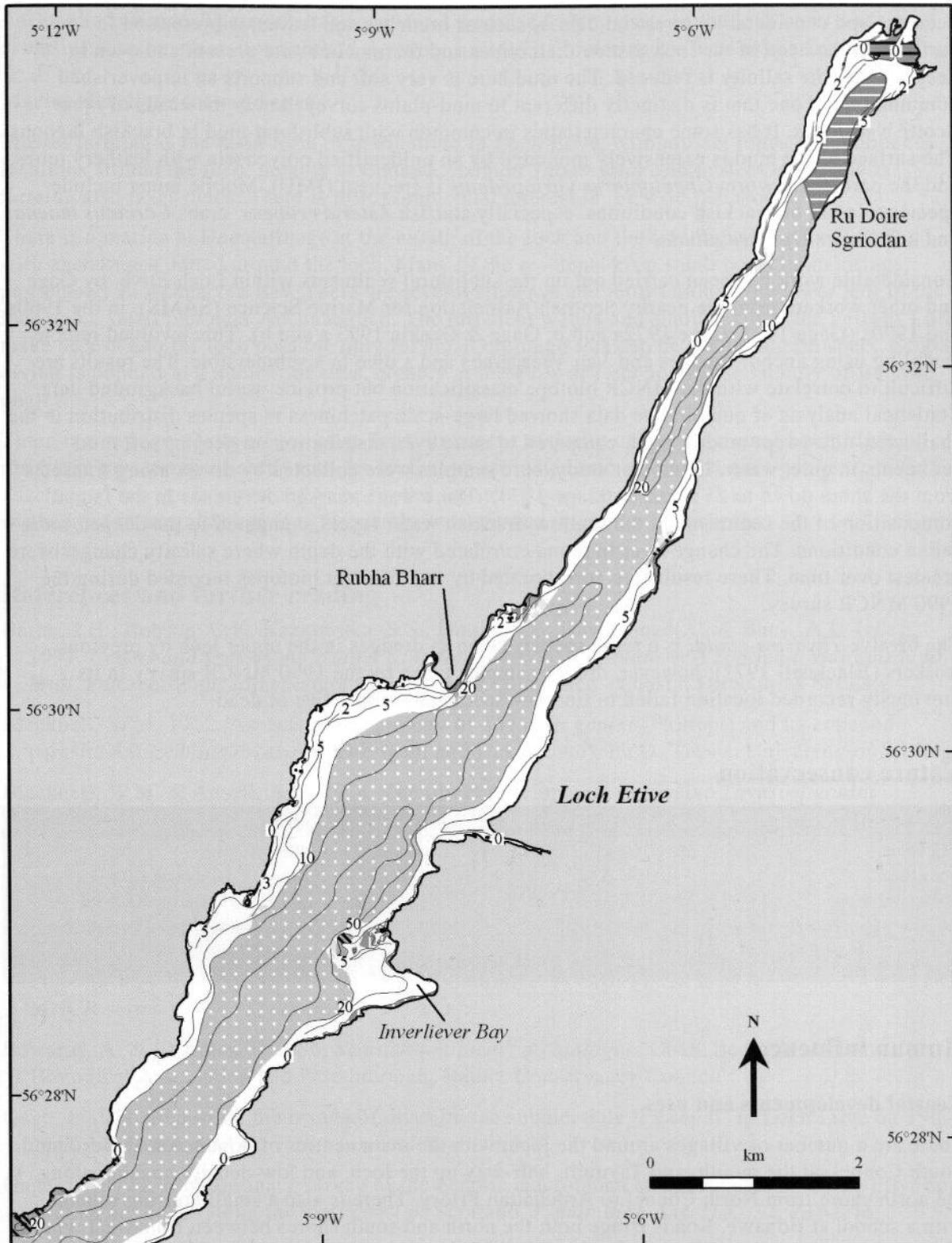


Figure 11.2 (continued)

Nephrops norvegicus. *V. mirabilis* is present at most sites and another sea-pen *Pennatula phosphorea* is abundant in some areas. The deep-water sea-pen *Funiculina quadrangularis* has not been recorded from the loch but the fireworks anemone *Pachycerianthus multiplicatus* is present at some sites. Towards the head of the loch the numbers of sea-pens and burrowing crustaceans

decrease and considerable terrestrial debris, such as branches and leaves, is present on the mud surface. At the head of the loch distinct haloclines and thermoclines are present and even in deeper water the salinity is reduced. The mud here is very soft and supports an impoverished community, but one that is distinctly different to mud-plains surveyed near the heads of other Scottish sealochs. It has some characteristics in common with sublittoral mud in brackish lagoons. The surface of the mud is extensively mounded by an unidentified polychaete with leathery tubes, and the parchment worm *Chaetopterus variopedatus* is frequent (IMU). Mobile fauna include species tolerant of brackish conditions, especially starfish *Asterias rubens*, crabs *Carcinus maenas* and brittlestars *Ophiura albida*.

Considerable work has been carried out on the sublittoral sediments within Loch Etive, by Gage and other workers from the nearby Scottish Association for Marine Science (SAMS), in the 1960s and 1970s (Gage 1971, Gage 1972a and b, Gage & Geekie 1973 a and b). This involved remote sampling using anchor dredges and Van Veen grabs and a dive in a submersible. The results are difficult to correlate with the MNCR biotope classification but provide useful background data. Statistical analysis of quantitative data showed large-scale patchiness in species distribution in the shallower, tide-swept muddy sand, compared to more even distribution on deeper, soft mud sediments in quiet water. In another study, core samples were collected by divers along transects from the shore down to 25 m depth (Gage 1974). There was a marked difference in the faunal composition of the sediments in the shallow brackish water layers, compared to the deeper, more saline conditions. The change-over in fauna correlated with the depth where salinity changes were greatest over time. These results are corroborated by the different biotopes recorded during the 1990 MNCR survey.

The bivalve *Thyasira gouldi* is a relict species taken in dredges in the upper loch by previous workers (Blacknell 1972); however, dredge samples taken by the 1990 MNCR survey in its previously recorded location failed to find any specimens, either live or dead.

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Loch Etive	MCA	NM 000 330	Marine Consultation Area
Loch Etive Woods	SAC	NN 040 360	Woodland backing onto shore
Bonawe – Cadderlie Burn	SSSI, GCR	NN 035 355	Woodland backing onto shore and geological interest
Aird Trilleachan	SSSI	NN 095 425	Woodland backing onto shore

Human influences

Coastal developments and uses

There are a number of villages around the loch, with the main centres of population at North and South Connel, at the mouth, and Taynuilt, half-way up the loch, and low-density housing along the north shore from North Connel to Ardchattan Priory. There is also a small housing scheme with a school at Bonawe. Roads fringe both the north and south shores between Bonawe/Taynuilt, with the main road to Fort William crossing the loch on the Connel Bridge. This carries a considerable volume of traffic, particularly during the summer tourist season. Another road reaches the loch head from Glen Etive and there are tracks alongside the inner basin north-east of Taynuilt, but most of this inner area receives few visitors.

Quarrying for igneous rock takes place at Bonawe (NM 015 335) and for sand and gravel at North Connel (NM 908 363). There is a small airfield on the north shore just west of the Connel Bridge and the Scottish Association for Marine Science is located on Dunstaffnage Bay on the southern

side of the entrance. There are areas of natural woodland along parts of the loch coast and extensive forestry plantations around the inner basin. The hinterland is used primarily for grazing.

Marine developments and uses

Mussel farming is the main form of mariculture in Loch Etive, with mussel ropes at a number of locations around the loch, notably at Bonawe. Salmon *Salmo salar* and oyster *Ostrea edulis* farming also takes place. There is little commercial interest in the wild fish stocks.

There is a marina at Dunstaffnage at the mouth of the loch and the area is popular for yachting, with anchorages dotted around the loch. Many of the residents keep small boats on moorings, particularly in Achnacree Bay. There are several slipways and jetties around the lower half of the loch and a small pier near Auchnacloich. The turbulent waters and shallow sill at the Falls of Lora make access into the loch possible only for small craft and this can be a daunting prospect. Scuba-diving is popular at a number of sites, notably at the Falls of Lora and in the vicinity of Bonawe quarry.

There is a sewage treatment works at Taynuilt but the majority of houses around Loch Etive discharge raw sewage directly into the loch at an estimated rate of 2,117 tonnes per year. Discharged sewage is presumed to be broken up as it passes through the Falls of Lora and then washed out to sea, although it is frequently seen washed up on the loch shores.

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Sites surveyed

Survey 32: 1990 UMBSM Loch Etive survey (Holt 1991).

Survey 296: 1969 Gage Lochs Etive, Creran and Lochnell Bay sublittoral survey (Gage 1974).

Survey 624: 1995 MNCR Firth and Lynn of Lorn training survey.

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
32	3	Below Black Crofts, Loch Etive	NM 920 346	56°27.4'N 05°22.5'W	YG, Ver.Ver, Fspi, Asc.T, Asc.VS, Pel
32	4	Dunfuinary, Loch Etive	NM 925 344	56°27.3'N 05°22.0'W	YG, Ver.Ver, Fspi, Asc.T, Pel
32	9	Bay, SW of Ardachy, Loch Etive	NM 952 353	56°27.9'N 05°19.4'W	FX
32	14	Shore W of Airds Point, Loch Etive	NM 987 343	56°27.4'N 05°16.0'W	Ver.Ver, Fves, Asc.VS, Fserr.VS, Pel
32	21	W of Eilean Duirinnis, Bonawe, Loch Etive	NM 999 329	56°26.8'N 05°14.7'W	YG, Ver.Ver, Fspi, Asc.VS, Fserr.VS, Pel
32	32	Rocks off Ardnellan Point, Loch Etive	NN 064 365	56°28.8'N 05°08.6'W	YG, Ver.Ver, Asc.Asc, Pel
32	33	Inverliever Bay, Loch Etive	NN 069 379	56°29.6'N 05°08.2'W	Ver.Ver, FcerX
32	34	Shore of E of Rhubha Bharr, Loch Etive	NN 071 390	56°30.2'N 05°08.0'W	FvesX, Ver.Ver
32	36	N of Barrs, Loch Etive	NN 080 398	56°30.6'N 05°07.2'W	Ver.Ver, Fcer, Asc.VS, Pel
32	41	Ru Doire Sgriodan, Loch Etive	NN 110 440	56°33.0'N 05°04.5'W	YG, Ver.Ver, Fcer
32	43	Gualachulain, Loch Etive	NN 113 452	56°33.6'N 05°04.2'W	FX
296	1	W of Ardchattan Priory, Loch Etive	NM 967 348	56°27.6'N 05°18.0'W	HedMac.Pyg, LMS, SS, HedMac
296	2	E of Airds Bay House, Loch Etive	NM 999 323	56°26.4'N 05°14.7'W	MacAre, HedMac.Pyg, LMS, MacAre.Mare, HedMac.Mare
296	3	E of Airds Bay, Loch Etive	NN 006 323	56°26.4'N 05°14.1'W	MacAre, HedMac.Are, LMS, HedOl, HedMac
296	4	Ardmaddy Bay, Loch Etive	NN 075 377	56°29.5'N 05°07.6'W	MacAre, HedMac.Pyg, LMS, HedMac
296	5	Head of Loch Etive	NN 113 446	56°33.3'N 05°04.2'W	HedMac.Pyg, LMS, HedOl

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
32	1	NW of Rubha Riabhach, Loch Etive	NM 902 344	56°27.3'N 05°24.3'W	Lcon, BalHpan
32	2	Falls of Lora, Loch Etive	NM 910 345	56°27.3'N 05°23.4'W	Lsac.T, BalHpan
32	5	NE end of Kilmaronag Narrows to Achnaba, Loch Etive	NM 933 349	56°27.7'N 05°21.3'W	Lsac.T, BalHpan, LsacRS.Phy
32	6	W of Eilean Traighe, Loch Etive	NM 945 341	56°27.3'N 05°20.1'W	LsacRS.Phy

Sublittoral sites

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
32	7	SE of Achnaba, Lower Loch Etive	NM 947 353	56°27.9'N 05°19.9'W	BalHpan
32	8	NW of Abbot's Isle, Loch Etive	NM 949 345	56°27.5'N 05°19.7'W	VirOph.HAS
32	10	Channel SE of Abbot's Isle, Loch Etive	NM 954 341	56°27.3'N 05°19.2'W	VirOph, LsacRS.Phy
32	11	S of Inion, Loch Etive	NM 959 348	56°27.7'N 05°18.7'W	HbowEud
32	12	E of Rubha Chairn Bhig, Loch Etive	NM 962 344	56°27.4'N 05°18.4'W	VirOph
32	13	SE of Ardchattan Point, Loch Etive	NM 977 346	56°27.6'N 05°16.9'W	SpMeg, HbowEud
32	15	NW of Airds Point, Loch Etive	NM 987 343	56°27.5'N 05°15.9'W	NeoPro.Den, ModHo, LsacRS.Phy
32	16	SW of Kennacraig, Loch Etive	NM 983 348	56°27.7'N 05°16.4'W	SpMeg, VirOph.HAS, LsacRS.Phy
32	17	SE of Kennacraig, Loch Etive	NM 998 342	56°27.4'N 05°14.9'W	SpMeg, VirOph.HAS, LsacRS.Phy
32	18	SSE of Airds Point, Loch Etive	NM 993 333	56°27.0'N 05°15.3'W	SpMeg, HbowEud, NeoPro.Den
32	19	Bonawe School, Loch Etive	NM 994 339	56°27.2'N 05°15.3'W	SpMeg, VirOph.HAS, LsacRS.Phy
32	20	W of Eilean Duirinnis, Loch Etive	NN 006 332	56°26.9'N 05°14.1'W	SpMeg
32	22	Airds Bay, Loch Etive	NN 003 329	56°26.8'N 05°14.3'W	ModHo, MytX, LsacRS.Phy
32	23	S of Eilean Duirinnis, Loch Etive	NN 010 328	56°26.7'N 05°13.7'W	NeoPro.Den, HbowEud, MytT
32	24	Central Bonawe Narrows, Loch Etive	NN 012 329	56°26.8'N 05°13.5'W	HbowEud
32	25	Eilean nan Meann, Loch Etive	NN 007 331	56°26.9'N 05°14.0'W	HbowEud, LsacRS.Phy, MytT
32	26	Port na Mine, Loch Etive	NN 032 332	56°26.9'N 05°11.6'W	SpMeg
32	27	W of Sgeirlag Choan, Loch Etive	NN 031 338	56°27.3'N 05°11.7'W	LsacRS.Phy
32	28	Mackinley's Cliff, Loch Etive	NN 010 333	56°27.0'N 05°13.7'W	NeoPro.Den, LsacRS.Phy
32	29	Off Gleann Rudha Alltan, Loch Etive	NN 036 337	56°27.3'N 05°11.2'W	SpMeg, HbowEud
32	30	SE of Eilean Uisneachan, Loch Etive	NN 052 368	56°28.9'N 05°09.8'W	SpMeg, NeoPro.Den
32	31	Rocks W of Ardnellan Point, Loch Etive	NN 061 365	56°28.8'N 05°08.9'W	NeoPro.Den, LsacRS.Phy
32	35	Rubha Bharr, Loch Etive	NN 073 389	56°30.1'N 05°07.8'W	SpMeg, VirOph.HAS, FChoG
32	37	E of Sgeir na Beolarach, Loch Etive	NN 079 397	56°30.6'N 05°07.3'W	NeoPro.Den, HbowEud, FChoG
32	38	N Ru-inbhir ghuithasan, Loch Etive	NN 099 422	56°32.0'N 05°05.5'W	SpMeg, HbowEud, IMU, NeoPro.Den, LsacRS.Phy
32	39	Ru aird Trileadhan, Loch Etive	NN 103 432	56°32.5'N 05°05.1'W	SpMeg, CMX
32	40	NE of Ru aird Trileadhan, Loch Etive	NN 104 433	56°32.6'N 05°05.0'W	SpMeg
32	42	N of Aird Trilleachan, Loch Etive	NN 110 443	56°33.1'N 05°04.5'W	IMU
624	2	Dunstaffnage, Lynn of Lorn	NM 878 346	56°27.3'N 05°26.6'W	LsacX, FaMx, CMX, Lsac.Ft

12

Loch Creran

Location

Position (centre)	NM 957 430	56°31.5'N 5°21.4'W
Administrative area	Argyll and Bute	
Conservation agency/area	Scottish Natural Heritage	West Areas (Argyll and Stirling)

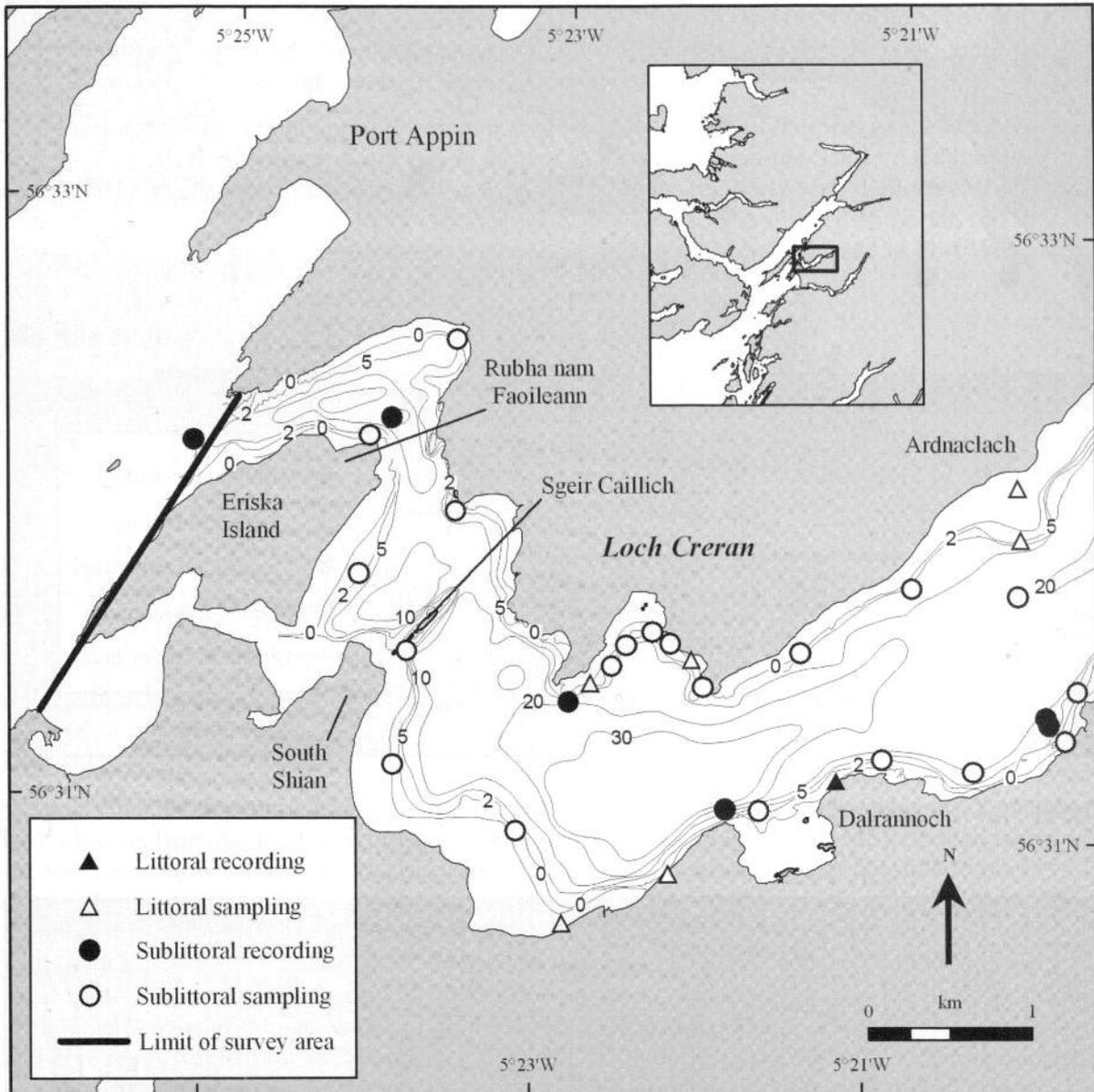


Figure 12.1 Main features of the area, showing sites surveyed.

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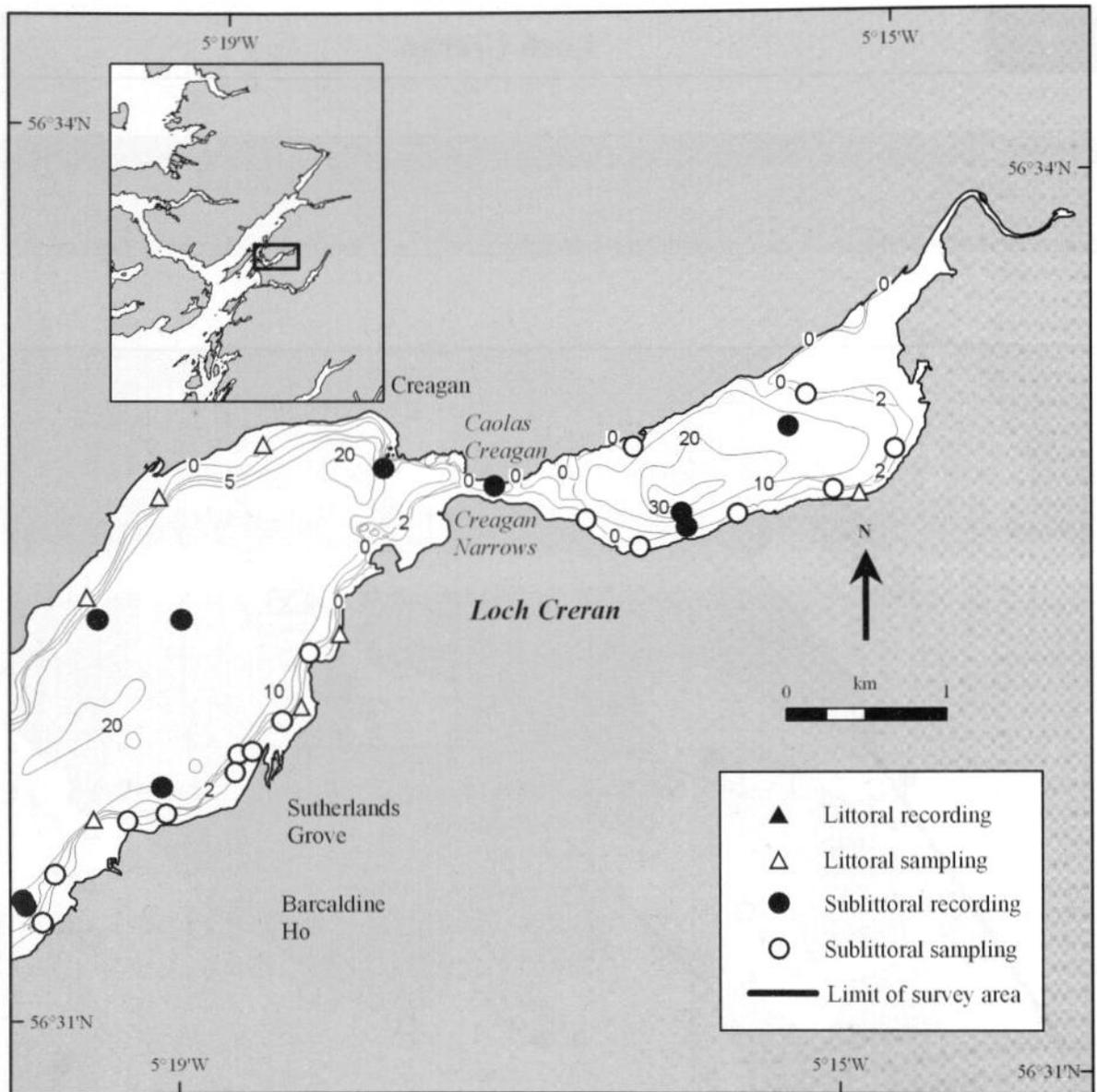


Figure 12.1 (continued)

Physical features

<i>Physiographic type</i>	Fjord with four sills
<i>Length of coast</i>	35.7 km
<i>Length of inlet</i>	12.8 km
<i>Area of inlet</i>	15.1 km ² (HW); 13.3 km ² (LW)
<i>Bathymetry</i>	49.0 m (max)
<i>Wave exposure</i>	Very sheltered to extremely sheltered
<i>Tidal streams</i>	Vary from 5 knots at Caolas Creagan to negligible in less restricted parts of loch
<i>Tidal range</i>	Springs: 4 m at outer side of entrance, 3.3 m at head; neaps: 1.2 m (Loch Creran head)
<i>Salinity</i>	Marine at mouth; great salinity reduction in upper basin from freshwater runoff

Introduction

Loch Creran lies on the eastern shore of Loch Linnhe, not far north of the town of Oban. It is a fjordic sealoch divided into three basins by four shallow sills, with the outermost sill forming a

narrow, winding channel through which a tidal stream of up to 4 knots flows. The innermost sill at the Creagan Narrows is only a few metres deep and has tidal currents of up to 5 knots. High mountains surround and shelter the inner part of the loch, while the entrance lies in lower ground. The convoluted shape of the entrance areas, however, means that the entire loch is sheltered from wave action. The loch is fully marine at the entrance, although there is a considerable salinity reduction in the surface waters of the inner basin where the River Creran enters the loch.

Loch Creran is highly rated for its extensive biogenic reefs of the serpulid worm *Serpula vermicularis*, a biotope known from only one other location in Britain (from where it may have disappeared). The calcareous tubes of this worm form aggregations up to 3 m in width and 75 cm in height in shallow water around the edges of the loch, providing a substratum for the shelter and attachment of other species. The loch supports a range of other biotopes, including beds of the eelgrass *Zostera marina* and the horse mussel *Modiolus modiolus*. The loch has now gained Special Area of Conservation status.

There is a considerable amount of development around the loch, with housing scattered all around the shores, a (disused) seaweed processing factory at Barcaldine and the Sea Life Centre at Dalrannoch, which attracts a large number of visitors. Yachts regularly visit the loch and there are a number of moorings concentrated to the east of Eriska Island. The disused Victorian rail bridge across the Creagan Narrows has recently been upgraded to carry the main road to Fort William.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording	1	Apr 1988–June 1989	Connor (1990)
	Semiquantitative	2	Mar–Aug 1969	Gage (1974)
	Recording (epibiota)	11	Nov–Dec 1994	Moore (1996)
Sublittoral	Recording (epibiota)	46	Nov–Dec 1994	Moore (1996)
	Recording (epibiota, ROV)	4	February 1995	SNH survey 730
	Recording (epibiota)	10	June 1989	Connor (1990)
	Recording (epibiota)	2	1969	Gage (1974)

Littoral

While a considerable amount of work has been carried out on the shores in Loch Creran, mainly by biologists from the nearby Scottish Association for Marine Science (SAMS) at Oban, most of the work has not been reported in a site-specific manner. Therefore it is not possible to map accurately the distribution of littoral biotopes. The shores are predominantly a mixture of fucoid-dominated rocky shores and mixed shores of stones and sediment. The shore to the north of Dalrannoch (site 72 of Connor 1990) consists of large boulders and bedrock dominated by fucoid algae, with *Fucus vesiculosus* and *Ascophyllum nodosum* on the mid-shore (Fves, Asc.Asc) along with large clumps of the mussel *Mytilus edulis*. There is also a rich fauna of sponges, ascidians and bryozoans beneath the fucoid canopy. Lower shore muddy sediments here are also quite rich and support large numbers of worms, including *Arenicola marina*, *Nephtys hombergii* and *Marphysa bellii* (LMX).

There are a number of extensive sedimentary shores around the loch, including large expanses of muddy sand and muddy gravel on either side of Eriska Island and at the head of the loch. Gage (1972a) recorded an exceptionally wide variety of species from these shores, including the bivalve *Venerupis senegalensis*, the cockle *Cerastoderma edule* with the lugworm *A. marina* and the burrowing urchin *Echinocardium cordatum*. There may therefore be a mixed community structure on these shores or the biotopes may be extremely patchy. *E. cordatum* is normally restricted to the

lower shore and so there may be a gradation from *E. cordatum* communities into *A. marina* and *V. senegalensis* communities higher up.

Areas of fringing saltmarsh in Loch Creran are described in Polderman and Polderman-Hall (1980).

Sublittoral

Sublittoral rock

Loch Creran is an extremely sheltered and relatively shallow loch with little in the way of steep or extensive sublittoral rock areas. Where stable bedrock or boulder and cobble slopes are present, such as on the point at Creagan and other headlands, a thick kelp forest of *Laminaria saccharina* covers the rock to a depth of between 1 and 5 m (Lsac.Ft). The red alga *Phycodrys rubens* grows as a dense, narrow band below the kelp at some sites, while the sea urchin *Psammechinus miliaris* is present in considerable numbers in places, especially around Caolas Creagan and the upper loch (LsacRS.Psa), where there is some freshwater influence. Around the rest of the loch, the mixed muddy sediment, shell-gravel and cobble/pebble shores extend down into the sublittoral, where dense stands of the bootlace weed *Chorda filum* and *L. saccharina* are common (LsacX).

By far the most important feature of the loch is the extensive growth of the tubeworm *Serpula vermicularis* (Ser). This species is normally solitary or grows in small clumps, but in Loch Creran it forms dense aggregations that can justifiably be called reefs. Individual clumps can grow up to 1 m in width and may then coalesce with nearby clumps. The worms initially attach themselves to bedrock, boulders, stones and especially to bivalve mollusc shells such as the horse mussel *Modiolus modiolus*. The latter is quite common in the loch and the abundance of old shells of this and other species has allowed extensive development of reefs on muddy sand and mixed sediments around the edges of the loch. While the reefs fringe most of the periphery of the loch, they are best developed along the southern shore of the main basin to the west of Barcaldine. Particularly dense and extensive reefs occur to the south of South Shian and to the east of the Sea Life Centre near Dalrannoch Bay, east to Barcaldine. There is a break in the reef along a 1 km stretch of the southern coast at Barcaldine, where an algininate factory used to be active. The northern coastline of the main basin supports reefs along most of its length, but these are in general rather poorly developed. The upper basin beyond the narrows of Caolas Creagan is also fringed with reefs, but again these are not as well developed as along the southern shore of the main basin. There are no reefs in the outer section of the loch seaward of the narrows at Sgeir Caillich. This outer section forms a narrow, winding channel and is subject to considerable tidal flow, and conditions here appear to be unfavourable for reef development.

The serpulid reefs provide a hard substrate and living space for hundreds of taxa (Chapman 2007, pers. comm.), supporting a rich community of animals unlike those on and in the surrounding sediment. Reef development is restricted to a depth ranging from 0 to 14 m, with the best development between 6 to 10 m depth. The shallower reef area above 6 m may be covered in red seaweeds, mainly *P. rubens*. Below this, sponges, hydroids and ascidians grow over and between the worm tubes. The orange sponge *Amphilectus fucorum* and the colonial ascidian *Diplosoma listerianum* are also present, while brittlestars and terebellid worms entwine their arms around the tubes. When the worms are feeding they display their bright crimson crown of tentacles, adding to the colourful nature of these reefs. The reefs also support a number of unusual or uncommon species, including the fanworms *Chone infundibulum* and *Megalomma vesiculosum* and the solitary ascidian *Pyura microcosmus*.

Tide-swept rocky sublittoral communities are found in the channel at the entrance to the loch and at Caolas Creagan between the two basins. The entrance channel is floored by a mixture of large and small boulders, pebbles, cobbles and gravel. *Laminaria hyperborea* grows on the stable rock with a variety of foliose algae and epiphytic hydroids (Lsac.T). The less stable cobbles and pebbles support many hydroids, red algae and the barnacle *Balanus crenatus*. In the deeper, circalittoral areas off Rubha nam Faileann, the rarely recorded anemone *Edwardsia timida* occurs

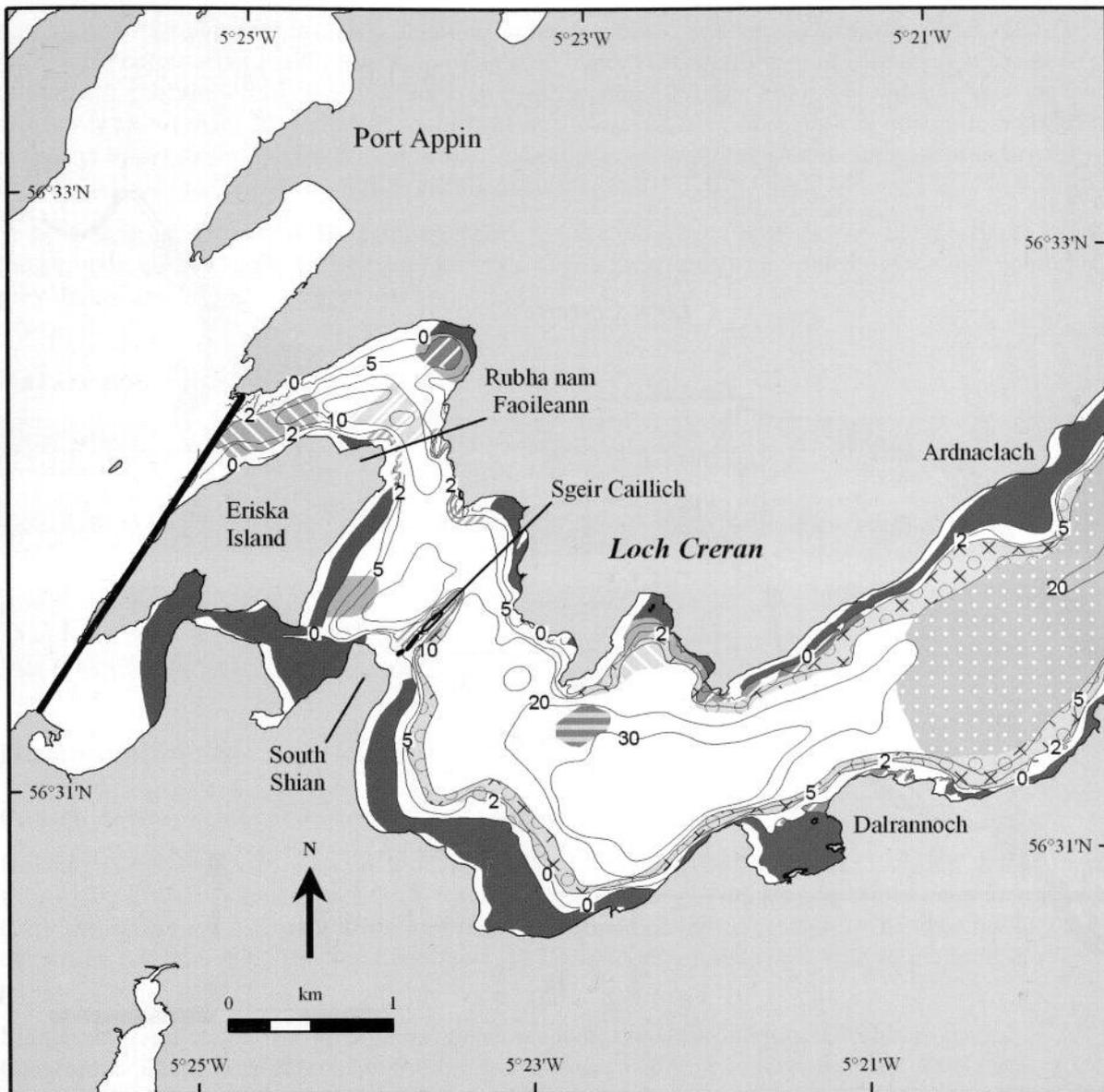


Figure 12.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 12.1, cited literature and additional field observations).

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in reasonable numbers in areas of gravel between the pebbles and cobbles (HalEdw). The narrows of Caolas Creagan support a dense bed of the horse mussel *M. modiolus* between 1 to 5 m depth on both sides (ModT). The mussels provide a foothold for large kelp plants, both *L. hyperborea* and *L. saccharina*, and for the red alga *P. rubens* and the ascidians *Ciona intestinalis* and *D. listerianum*. Small pebbles, stones and gravel in the sublittoral fringe along the edges of the narrows are covered by the tubeworm *Pomatoceros triqueter*, the hydroid *Eudendrium arbusculum*, and the brown alga *Desmarestia aculeata*. The urchin *Psammechinus miliaris* is common and any boulders present are covered by kelp (LsacRS.Psa). While the Admiralty Chart marks a maximum depth of only 3.4 m in these narrows, they actually extend to around 15 m depth. In these deeper cobble and pebble areas, the horse mussels are largely replaced by brittlestars, the soft coral *Alcyonium digitatum* and hydroids (Oph). Horse mussel beds are also present along the south side of the upper basin from around 7 to 20 m depth. Here they lie on a

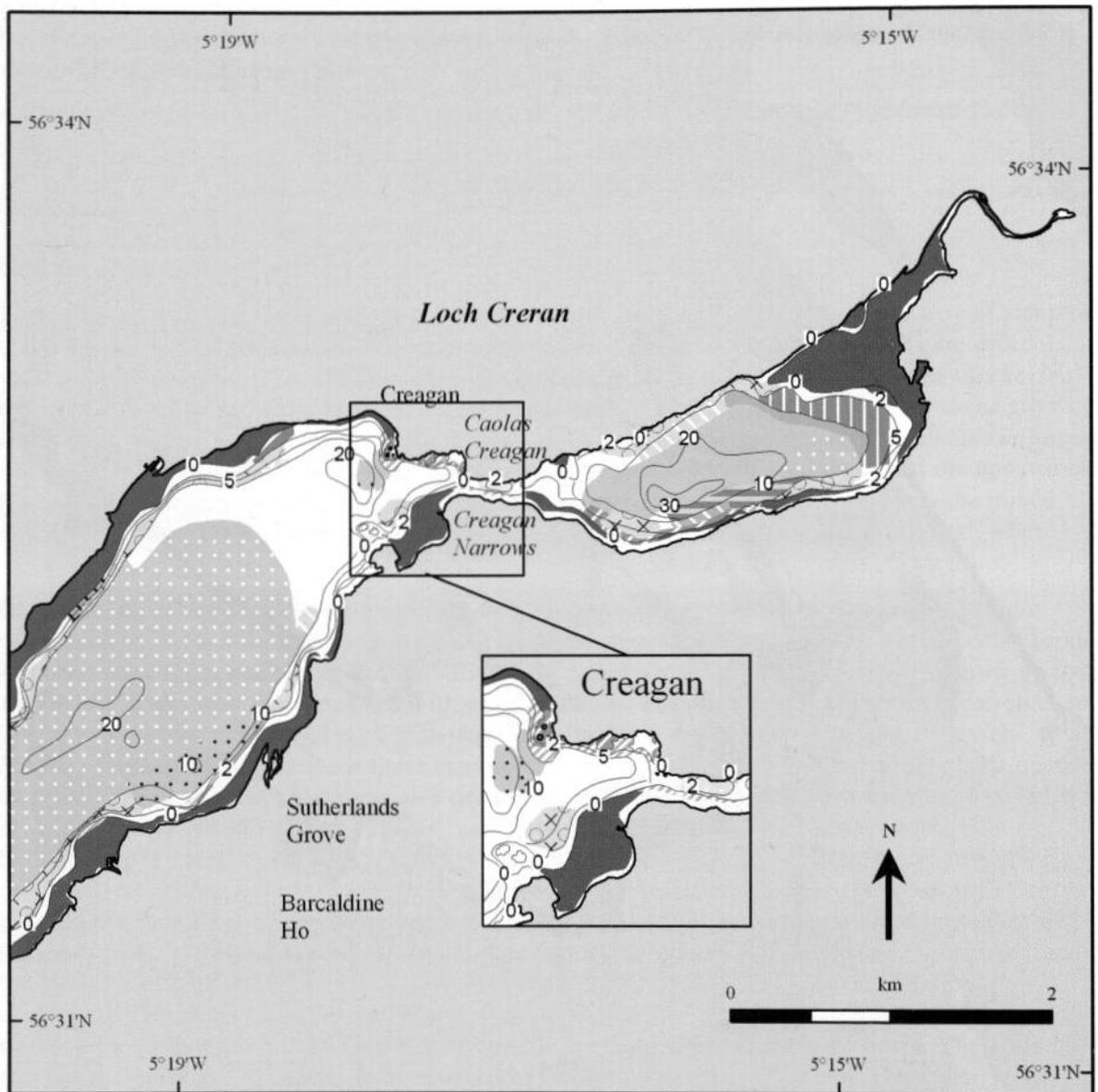


Figure 12.2 (continued)

bed of mud and dead shell and support a wide variety of ascidians, with a smaller number of sponges, tubeworms and brittlestars (ModHAs). Recent studies by Heriot-Watt University have shown that these beds support a diverse community of fauna and flora.

Sublittoral sediments

Sediments throughout the loch are predominantly muddy with a large amount of shell material. Finer sandy sediments are restricted to the edges of the loch. A dense bed of eelgrass *Zostera marina* is present at about 1 m depth on the north shore just east of Ardnaclach. In other areas these shallow sandy sediments support the sabellid worm *C. infundibulum*, the sand mason worm *Lanice conchilega* and shrimps *Crangon crangon*. Stones and shells provide a foothold for *L. saccharina* and *C. filum* (EcorEns, LsacX).

Deeper circalittoral sediments throughout the loch have not been looked at in detail but consist either of moderately firm mud, with abundant sea-pens *Virgularia mirabilis* and brittlestars

Amphiura filiformis, or soft mud with *V. mirabilis*, *Nephrops norvegicus* and sometimes the burrowing holothurian *Psolus phantapus* (SpMeg). Very soft, shallow mud is present at the head of the loch and supports *V. mirabilis* and the opisthobranch *Philine aperta*, a common biotope in shallow areas of many sheltered sealochs (PhiVir). *Maxmuelleria lankesteri* is common in both the main and upper basin. *Pachycerianthus multiplicatus* and *Goneplax rhomboides* are also present in both basins, the former in small numbers only.

Sediments in the vicinity of Barcaldine appear to have once been impacted by the discharge from the alginate factory (now disused) and the mud over a large area used to be covered by a white or grey mat of the bacterium *Beggiatoa* spp. (Beg).

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Loch Creran	MCA	NM 957 430	Serpula reefs and Modiolus beds
Loch Creran	SAC	NM 957 430	Serpula reefs and Modiolus beds
Glasdrum Woods	NNR	NN 000 460	Deciduous woodland backing onto shore
South Shian and Balure	SSSI, GCR	NM 909 422 NM 896 420	Woodland backing onto shore, geological
Shian Wood	SWT Reserve	NM 907 418	Woodland backing onto shore
Lynn of Lorn	NSA	NM 930 450	Includes the Port Appin area

Human influences

Coastal developments and uses

Housing is scattered all round the loch, with the main road to Fort William following the southern shore. The disused Victorian rail bridge across the Creagan Narrows has recently been upgraded to carry the main road to Fort William and thus the volume of traffic around the head of the loch has decreased considerably. The Sea Life Centre at Dalrannoch on the south side of the loch is a popular tourist site.

Significant land claim of saltmarsh has taken place in this area and much of this is grazed. Coniferous plantation borders most of the south-eastern shore and there are extensive areas of deciduous woodland, particularly to the east of Port Appin on the northern shore.

Marine developments and uses

Jetties and piers are to be found on the south side of Loch Creran and there are a number of moorings in the loch, particularly to the east of Eriska. The loch is popular with visiting yachts and, to lesser extent, scuba-divers. It is likely that the loch is also used for wind-surfing and canoeing.

The loch has been used as a marine biological study site by Heriot-Watt University and Scottish Association for Marine Science for many years, and a variety of projects have been carried out.

Salmon *Salmo salar* and shellfish farming, mainly oysters (Pacific and native) and mussels, takes place throughout the loch. There is a salmon processing plant and service base at South Shian which possesses a discharge consent from the Scottish Environment Protection Agency. There is also some potting for crustaceans, particularly around the rocky entrance areas.

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Sites surveyed

- Survey 6: 1988–89 MNCR Loch Linnhe survey (Connor 1990).
- Survey 296: 1969 Gage Lochs Etive, Creran and Lochnell Bay sublittoral survey (Gage 1974).
- Survey 730: 1995 SNH Loch Creran ROV survey.
- Survey 811: 1995 Heriot-Watt University Loch Creran serpulid reef survey (Moore 1996).

Littoral sites

<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
6	72	Dalrannoch, Loch Creran	NM 937 414	56°31.1'N 05°21.2'W	LMX, Fves, Fspi, Asc.Asc, Lsac.Ft, PelB, Fserr
296	7	S of Ardnaclach, Loch Creran	NM 949 432	56°32.1'N 05°20.1'W	AP, LMS, FabMag, IMS
296	8	W of Druimavuic, Loch Creran	NN 002 443	56°32.8'N 05°15.0'W	HedMac.Pyg, LMS, IMS
811	5	Loch Creran	NM 954 422	56°31.6'N 05°19.5'W	Ser, Lsac
811	10	Loch Creran	NM 964 446	56°32.9'N 05°18.6'W	Ser, Oph, LsacX
811	11	Loch Creran	NM 958 442	56°32.7'N 05°19.2'W	FX, Ser
811	12	Loch Creran	NM 953 436	56°32.4'N 05°19.7'W	SpMeg, FX, Oph
811	13	Loch Creran	NM 948 428	56°31.9'N 05°20.2'W	Ser
811	20	Loch Creran	NM 926 408	56°30.8'N 05°22.2'W	Ser
811	21	Loch Creran	NM 920 405	56°30.6'N 05°22.8'W	Ser, LsacX
811	22	Loch Creran	NM 921 420	56°31.4'N 05°22.7'W	Ser
811	38	Loch Creran	NM 967 429	56°32.0'N 05°18.3'W	SpMeg, Ser
811	39	Loch Creran	NM 969 434	56°32.3'N 05°18.1'W	VirOph, FserX

Sublittoral sites

<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
6	68	Entrance to loch, Loch Creran	NM 897 435	56°32.2'N 05°25.1'W	Lsac.T
6	69	Rubha nam Faoileann, Loch Creran	NM 909 436	56°32.3'N 05°24.0'W	HalEdw, ModT, FaMx, ScupHyd
6	70	S of Rubha Riabhach, Loch Creran	NM 920 418	56°31.3'N 05°22.8'W	CMX, ModHAS
6	71	Rubha Garbh, Loch Creran	NM 930 412	56°31.0'N 05°21.9'W	Lsac.Ft, Ser
6	73	SW Rubha Dearg, Loch Creran	NM 949 417	56°31.4'N 05°20.0'W	SpMeg, Ser
6	74	E of Ardnaclach, Loch Creran	NM 954 436	56°32.4'N 05°19.6'W	SpMeg, Zmar, EcorEns
6	75	Point at Cregan, Loch Creran	NM 972 444	56°32.9'N 05°17.9'W	Ser, ModHAS, LsacRS.Psa, Beg
6	76	Caolas Cregan, Loch Creran	NM 979 443	56°32.8'N 05°17.2'W	ModT, Oph, LsacRS.Psa
6	77	E of Dallachulish, Loch Creran	NM 991 440	56°32.7'N 05°16.0'W	Ser, EcorEns, ModHAS, LsacRS.Psa
6	78	W of Druimavuic, Loch Creran	NM 997 447	56°33.1'N 05°15.5'W	PhiVir
296	7	S of Ardnaclach, Loch Creran	NM 949 432	56°32.1'N 05°20.1'W	AP, LMS, FabMag, IMS
296	8	W of Druimavuic, Loch Creran	NN 002 443	56°32.8'N 05°15.0'W	HedMac.Pyg, LMS, IMS
730	1	By Sealife Centre, Loch Creran	NM 950 417	56°31.3'N 05°19.9'W	Ser
730	2	Barcaldine, Loch Creran	NM 958 424	56°31.8'N 05°19.1'W	Beg
730	3	Loch centre, Loch Creran	NM 959 435	56°32.3'N 05°19.1'W	SpMeg
730	4	North-west of upper basin centre, Loch Creran	NM 990 441	56°32.8'N 05°16.1'W	IR/CR, SS, ModHAS
811	1	Loch Creran	NM 951 416	56°31.3'N 05°19.8'W	Ser
811	2	Loch Creran	NM 945 414	56°31.2'N 05°20.4'W	SpMeg, VirOph.HAS, Ser
811	3	Loch Creran	NM 939 415	56°31.2'N 05°20.9'W	IMS, Ser
811	4	Loch Creran	NM 932 412	56°31.0'N 05°21.7'W	Ser
811	5	Loch Creran	NM 954 422	56°31.6'N 05°19.5'W	Ser, Lsac
811	6	Loch Creran	NM 963 426	56°31.9'N 05°18.7'W	Beg
811	7	Loch Creran	NM 967 433	56°32.2'N 05°18.3'W	Ser
811	10	Loch Creran	NM 964 446	56°32.9'N 05°18.6'W	Ser, Oph, LsacX
811	11	Loch Creran	NM 958 442	56°32.7'N 05°19.2'W	FX, Ser
811	12	Loch Creran	NM 953 436	56°32.4'N 05°19.7'W	SpMeg, FX, Oph
811	13	Loch Creran	NM 948 428	56°31.9'N 05°20.2'W	Ser
811	14	Loch Creran	NM 941 425	56°31.8'N 05°20.8'W	Ser
811	15	Loch Creran	NM 934 421	56°31.5'N 05°21.4'W	Ser, LsacX
811	16	Loch Creran	NM 928 419	56°31.4'N 05°22.0'W	Ser, Lsac
811	17	Loch Creran	NM 908 435	56°32.2'N 05°24.1'W	Lsac
811	18	Loch Creran	NM 913 441	56°32.5'N 05°23.6'W	LsacX
811	19	Loch Creran	NM 951 419	56°31.4'N 05°19.8'W	VirOph, Ser
811	20	Loch Creran	NM 926 408	56°30.8'N 05°22.2'W	Ser

Sublittoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
811	21	Loch Creran	NM 920 405	56°30.6'N 05°22.8'W	Ser, LsacX
811	22	Loch Creran	NM 921 420	56°31.4'N 05°22.7'W	Ser
811	23	Loch Creran	NM 925 423	56°31.6'N 05°22.3'W	VirOph, Ser
811	24	Loch Creran	NM 913 430	56°32.0'N 05°23.6'W	LsacX
811	25	Loch Creran	NM 907 426	56°31.7'N 05°24.1'W	IMS, Beg
811	26	Loch Creran	NM 909 415	56°31.1'N 05°23.9'W	Ser
811	27	Loch Creran	NM 917 411	56°30.9'N 05°23.1'W	Ser
811	28	Loch Creran	NM 910 422	56°31.5'N 05°23.8'W	Ser
811	29	Loch Creran	NM 998 449	56°33.2'N 05°15.4'W	VirOph, Ser
811	30	Loch Creran	NN 004 445	56°33.0'N 05°14.8'W	SpMeg, IMU
811	31	Loch Creran	NM 984 441	56°32.7'N 05°16.7'W	Ser
811	32	Loch Creran	NM 987 445	56°33.0'N 05°16.4'W	VirOph, Ser
811	33	Loch Creran	NM 985 447	56°33.1'N 05°16.7'W	VirOph, Ser
811	34	Loch Creran	NM 988 439	56°32.6'N 05°16.3'W	IMX, Ser
811	35	Loch Creran	NM 963 425	56°31.8'N 05°18.7'W	Beg
811	36	Loch Creran	NM 964 427	56°31.9'N 05°18.6'W	Beg
811	37	Loch Creran	NM 965 428	56°32.0'N 05°18.4'W	Ser
811	38	Loch Creran	NM 967 429	56°32.0'N 05°18.3'W	SpMeg, Ser
811	39	Loch Creran	NM 969 434	56°32.3'N 05°18.1'W	VirOph, FserX
811	40	Loch Creran	NM 948 425	56°31.8'N 05°20.2'W	Beg
811	41	Loch Creran	NM 958 423	56°31.7'N 05°19.1'W	LsacRS.Psa, Beg
811	42	Loch Creran	NM 956 422	56°31.6'N 05°19.3'W	F, Ser
811	43	Loch Creran	NM 994 441	56°32.8'N 05°15.7'W	ModHAs
811	44	Loch Creran	NN 000 443	56°32.9'N 05°15.2'W	SpMeg, Ser
811	45	Loch Creran	NM 926 422	56°31.5'N 05°22.2'W	PhiVir, Ser
811	46	Loch Creran	NM 923 421	56°31.5'N 05°22.6'W	IMS, Ser
811	47	Loch Creran	NM 924 422	56°31.5'N 05°22.5'W	VirOph, IMS
811	48	Loch Creran	NM 928 421	56°31.5'N 05°22.1'W	PhiVir, Ser, LsacX

13

Lower Loch Linnhe

Location

Position (centre)	NM 900 500	56°33.9'N 5°30'W
Administrative area	Highland (Lochaber)	
Conservation agency/area	Scottish Natural Heritage	West Areas (West Highland, Argyll and Stirling)

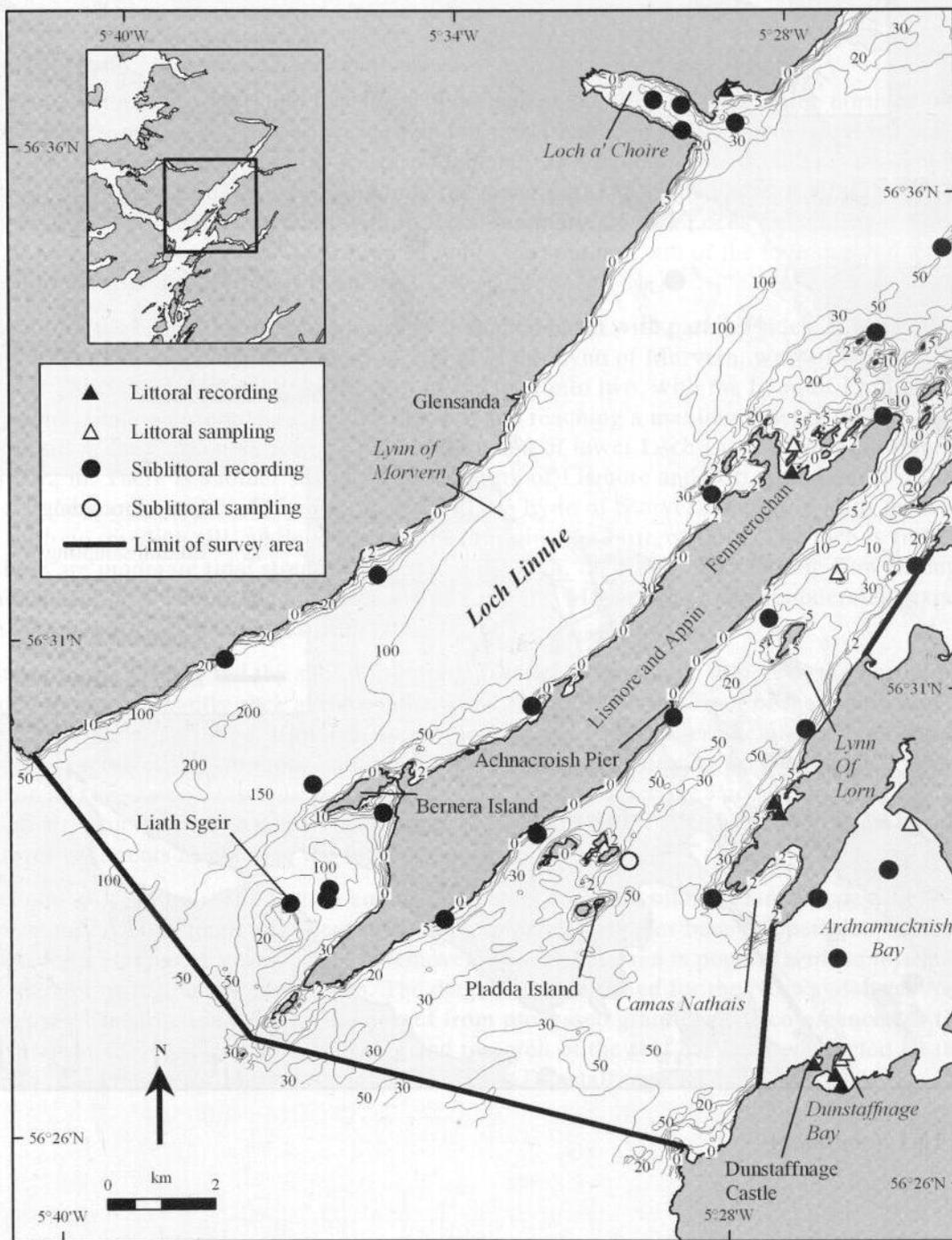


Figure 13.1 Main features of the area, showing sites surveyed.

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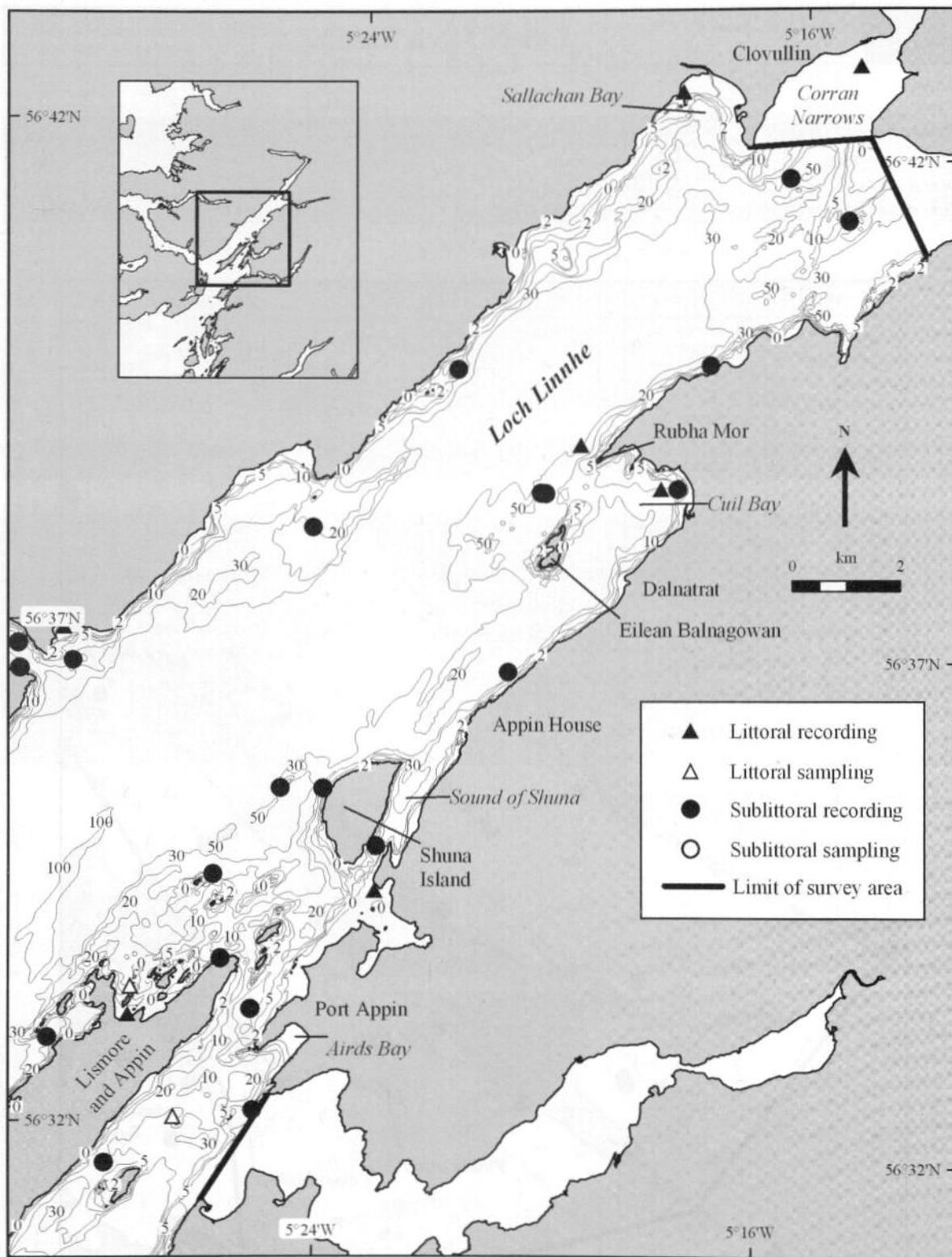


Figure 13.1 (continue)

Physical features

<i>Physiographic type</i>	Fjord
<i>Length of coast</i>	175.92 km
<i>Length of inlet</i>	
<i>Area of inlet</i>	
<i>Bathymetry</i>	200 m approx
<i>Wave exposure</i>	Moderately exposed along most of shore
<i>Tidal streams</i>	These vary from 3 knots at southern tip of Lismore to negligible in wider, deeper areas
<i>Tidal range</i>	Springs: 3.7m; neaps: 1.6m (Corran)
<i>Salinity</i>	Fully saline

Introduction

The Loch Linnhe sealoch system lies at the upper end of the Firth of Lorn to the north of the town of Oban and forms the submerged western end of the Great Glen Fault, a geological rift which divides the northern from the north-western highlands of Scotland. Loch Linnhe is divided into two sections at the Corran Narrows and only the lower part is included here. Loch Eil and the upper part of Loch Linnhe are dealt with in Area Summary No. 15. Lochs Leven, Etive, Creran and Aline all branch off lower Loch Linnhe, while the southern end of the loch meets the Sound of Mull at the top of the Firth of Lorn.

The loch has the classic shape of a glaciated U-shaped basin with parallel sides. It is mostly over 50 m deep, reaching a maximum depth of 200 m in the Lynn of Morvern, west of the island of Lismore. This island divides the lower part of the loch into two, with the Lynn of Lorn on its eastern side shallower than the Lynn of Morvern and reaching a maximum depth of 70 m. A shallow sill at the Corran Narrows at the northern end of lower Loch Linnhe has a minimum depth of only 12 m. There is another sill between the north of Lismore and Port Appin and a third between the southern end of Lismore and Mull. The Lynn of Morvern therefore joins the Sound of Mull with no dividing sill, while the Lynn of Lorn joins the Firth of Lorn. The loch is fully marine and there are moderate tidal streams in much of the loch, the result of the strong flow through the Sound of Mull and around the southern end of Lismore. Most of the loch is moderately exposed to wave action, with localised areas of greater shelter.

Substrata in the littoral and the sublittoral grade from predominantly shingle at the northern end of the loch to predominantly rock at the southern end, with the central floor of the loch below about 50 m consisting of soft mud. Biotopes present include those characteristic of sheltered fjordic lochs, with sponges, brachiopods and the anemone *Protanthea simplex* on steep sublittoral rock, and beds of the sea-pen *Funiculina quadrangularis* and the anemone *Pachycerianthus multiplicatus* on the deeper mud. There are extensive beds of the file shell *Limaria hians* on the shallower sediments in much of the loch.

The island of Lismore at the bottom end of the loch is one of Scotland's largest coastal exposures of limestone. A large quarry at Glensanda on the Morvern side has been in operation, extracting granite, for a number of years. Stone is removed by sea. The area is popular with sailors and there are a number of fish farms on the loch. The deep muds are fished for the Norway lobster *Nephrops norvegicus*. Construction of an artificial reef from processed granite waste commenced to the east of Lismore in 2001. Scientific monitoring and research of the reef has been conducted by the Scottish Association for Marine Science (SAMS) at Dunstaffnage.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
<i>Littoral</i>	Recording (epibiota)	8	May 1988, June 1989	Connor (1990)
	*Recording (epibiota)	1	May 1980	Smith (1981)
	Recording (epibiota)	4	July 1978	Smith (1978)
	Recording (epibiota)	6	1975–1977	ISU database
	Recording (epibiota)	1	1969	Gage (1974)
<i>Sublittoral</i>	Recording (epibiota)	1	May 1995	MNCr survey 624
	Recording (epibiota)	41	June 1989	Connor (1990)
	Recording (epibiota)	1	June 1983	Bishop (1984)
	Infaunal sampling	1	Mar–Aug 1969	Gage (1974)
	*Infaunal sampling	7	1980	CRPB (1980)

*The results of this study were used to prepare the biotope map but the data are not stored on the MNCr database and not shown on the map of site surveyed.

Littoral

Littoral rock

Relatively narrow rocky shores of bedrock and boulders predominate in the outer half of Lower Loch Linnhe, within the Lynn of Morvern and around the long island of Lismore. Many of these shores are backed by steep cliffs. Steep rocky shores in the outer part of the loch are moderately exposed and probably barnacle-dominated, but none have been surveyed in detail. Sheltered rocky headlands that face into the prevailing south-westerly winds, such as Rubha Mor adjacent to Cuil Bay on the north-east coast, have only a broken cover of seaweeds. The furoid algal cover characteristic of sheltered shores is broken up into a mosaic, with areas of barnacle-covered rock in between. However, zones of furoid algae are still distinct, with *Fucus vesiculosus* in the mid-shore and *Fucus serratus* on the lower shore (Fves, Fser.Fser). *Laminaria digitata* is prevalent in the sublittoral fringe (Ldig.Ldig). The more sheltered shores in this part of the loch have fewer barnacles and are dominated entirely by furoid algae. There is a distinct band of *Ascophyllum nodosum* (Asc.Asc) between the *F. vesiculosus* on the mid-shore (Fves) and the *F. serratus* (Fser) on the lower shore. *Laminaria saccharina* and *L. digitata* both occur in the sublittoral fringe (Lsac.Ldig). Steep, rugged limestone shores off the north end of Lismore are particularly rich in understorey species, with foliose algae, bryozoans, sponges, anemones and ascidians present in moderate numbers on the lower shore.

Bedrock shores are less prevalent further up the loch and much of the inner half of Lower Loch Linnhe has gently sloping shores of mixed cobble and pebble lying on muddy gravel and sand. Where sufficient hard substrata are present, there is an impoverished rocky shore community of sparse furoid algae along with mussels *Mytilus edulis* and barnacles (FserX, BLit). This type of shore is most common in small bays such as the one immediately to the north of Loch a' Choire. The proportion of stones to sediment varies on these shores and there is often more sand on the lower shore; for example in Cuil Bay on the east side of the loch. Clovullin Bay on the west side of the channel leading into the Corran Narrows, has an extensive algal cover at the north end, with *F. serratus* and *Laminaria* spp. on the lower shore (FX). The littoral area of stones, gravel and sediment extends for some distance out into the sublittoral as the very shallow Clovullin Flats. This whole area is influenced by the strong tidal flow through the Corran Narrows.

Littoral sediment

The small bay at Fennaerochan on the north end of Lismore Island faces north and is slightly more sheltered, and the fine sand here has a subsurface black layer. The lower shore supports quite a rich bivalve fauna with many *Angulus tenuis* and *Chamelea gallina*, together with polychaetes, especially *Pygospio elegans* and *Exogone hebes* and some amphipods (MacAre, PCer). Sallachan

Bay, at the north-west end of Lower Loch Linnhe, is about 2 km wide and bounded on the east by Sallachan Point, which is a gravel spit. This bay is also moderately exposed and sandy but has not been examined in detail. The muddier gravel and sand on the western side of the bay supports a variety of bivalves, including *Ensis arcuatus* and *C. gallina*.

Dunstaffnage Bay, near the entrance to Loch Etive, is predominantly sediment but has areas of pebble, cobble, gravel and boulders. Saltmarsh fringes part of the shore. The shore by the jetty south east of Dunstaffnage Castle is predominantly rocky, with some bedrock plus boulders and smaller stones, and is dominated by fucoid algae (*Asc. Asc.*, *Fserr.*). The south end of the bay is similar to Fennaerohan described above with muddy sand, a black layer and many *Arenicola marina* (*MacAre.*). There are also large areas of mussels *M. edulis* here overlying the sediment (*MytX*).

Tralee Sands in Ardnamucknish Bay is moderately exposed to wave action and is possibly the only truly sandy shore in this loch. The lugworm *A. marina*, the sand mason worm *Lanice conchilega*, the amphipod *Bathyporeia* sp. and the small bivalve *A. tenuis* are common in the fine sand (LGS). Fine sand is also found in Airds Bay on the mainland to the east of north Lismore. This bay has an aspect akin to Tralee Sands and supports a similar, but sparse fauna including *A. tenuis*, *Bathyporeia* sp. and the polychaete *P. elegans*. These shores have not been surveyed in a manner that would allow biotopes to be assigned to them.

Sublittoral

Sublittoral rock

In contrast to Upper Loch Linnhe and Loch Eil, there is a considerable amount of sublittoral rock around the edges and islands of Lower Loch Linnhe, especially in the outer loch. At sites along the Morvern Peninsula coast and around Lismore, steep bedrock extends from the shore down to at least 50 m depth before giving way to boulders, cobbles and eventually to sediment plains. The depth of the rock/sediment boundary decreases with distance up the loch, and in the upper parts, sediment extends close inshore, merging into the mixed stone and sediment shores. However, short bedrock slopes are present at some sites almost to the top of the loch.

Infralittoral bedrock and boulders in the outer part of the loch are dominated by *Laminaria hyperborea* kelp forest extending to about 10 m depth and kelp park to around 15 m depth. At the most wave- and current-exposed sites, such as along the southern part of the Morvern Peninsula and offshore islands in the Lynn of Lorn, the forest is dense, consisting of *L. hyperborea* only and with a luxuriant understorey and kelp stipe flora of foliose red algae (*Lhyp.Ft*). The sublittoral fringe is dominated by *L. digitata* (*Ldig.Ldig*). Around Lismore and slightly further into the loch, away from the strong currents and prevailing winds, the *L. hyperborea* occurs as a narrow band above a wider zone of *L. saccharina*, again with an understorey of filamentous and foliose red algae (*LhypLsac.Ft*). In the partial shelter of Ardnamucknish Bay, the cape form of *L. hyperborea* is predominant (*LhypCape*). *L. hyperborea* is present in the kelp forest at least as far north as Shuna Island. In the sheltered inner half of the loch, at sites where bedrock, boulders or large cobbles are present in shallow water, the kelp forest consists entirely of *L. saccharina* (*Lsac.Ft*). Such kelp forests are present, for example, around Eilean Balnagowan off Cuil Bay on the east coast, from chart datum down to about 6 m depth. Rock surfaces under the kelp are covered mostly by encrusting algae, along with some brown filamentous algae, as well as *Chorda filum* and *Desmarestia* spp. At some sites the undergrowth algae are slightly more varied and a number of foliose red species are present.

Circalittoral rocky cliffs and slopes extend down from the infralittoral at most sites in the outer half of the basin. North of Lismore there is little in the way of circalittoral rock apart from mixed areas of cobbles, pebbles and sediment. Strong currents run past the entrance to the loch, and rocky sites in the Firth of Lorn, outside the scope of this area summary, support rich growths of filter-feeding animals. One site within the loch, the small rocky islet of Liath Sgeir south of Bernera Island, is similarly subjected to strong tidal currents. Steep and vertical cliffs with overhangs descend from the surface. The rock is dominated by sponges, especially *Axinella* spp. and *Pachymatisma johnstonia*, dense hydroids, erect bryozoa and anthozoa, including *Alcyonium*

digitatum and featherstars *Antedon bifida* (FaV). Ascidians *Ciona intestinalis* and *Clavelina lepadiformis* cover large areas.

In the outer part of the loch, but away from the strong currents that run past the entrance, steep circalittoral bedrock and large boulders extend down from the kelp-covered infralittoral rock, to between 30 and 50 m depth. These steep rock surfaces are characterised by large numbers of brachiopods *Neocrania anomala* and *Terebratulina retusa*. Associated with these brachiopods are a variety of ascidians, especially *C. intestinalis*, brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, hydroids, sponges and the cup coral *Caryophyllia smithii* (AntAsH, AmenCio, FaAIC). Examples of these biotopes are found along the southern part of the Morvern Peninsula, around Lismore Island, especially the southern part, and around islands in the Lynn of Lorn. Sites around the southern part of Lismore have a higher variety of hydroids, including unusual species such as *Schizotricha frutescens*, *Lytocarpia myriophyllum*, *Thuiaria articulata* and *Lafoea dumosa*. The northern sea-fan *Swiftia pallida* is present along the south-west tip of Lismore on steep sediment-covered bedrock and boulders (ErSSwi). With increasing shelter from wave action further into the loch, the variety of sponges, hydroids and bryozoans on circalittoral rock decreases and species such as the barnacle *Balanus balanus* and the tubeworms *Protula tubularia* and *Sabella pavonina*, typical of very sheltered conditions, increase in numbers. However, biotopes characteristic of very sheltered deep rock with the anemone *Protanthea simplex* (NeoPro) are not present. In some areas where there are noticeable tidal currents, brittlestars predominate over the substratum, forming dense beds (Oph). The densest beds occur on gravel flats in the approaches to the Corran Narrows near the top of Lower Loch Linnhe. Where brittlestars predominate on circalittoral bedrock and boulders throughout the loch, they suppress the growth of hydroids and other erect species, and only brachiopods and other low or encrusting species remain.

In the upper, more tranquil parts of the loch, infralittoral rock or mixed cobble and sediment is followed in many places by mixed areas of circalittoral cobbles, pebbles and sediment. This habitat may form steep slopes, such as off the east coast north of Shuna Island, or relatively flat areas and gentle slopes. The horse mussel *Modiolus modiolus* is characteristically present and a variety of hydroids may colonise both it and the hard substrata. The sediment in between the cobbles and pebbles is colonised by burrowing holothurians, especially *Psolus phantapus*, *Thyone fusus* and *Thyonidium commune*, the red tentacles of which make a striking display amongst the dull-coloured sediment (ModHo, ModHAs). The anemone *Cerianthus lloydi* and brittlestars *Amphiura* spp. are also common in this habitat.

In the shallow, tide-swept stone and shell-gravel channel between Appin on the mainland and the north end of Lismore, there are rich beds of both horse mussels *M. modiolus* (ModT) and the file shell *Limaria hians* (Lim). A bed of *L. hians* is also present off the west coast of Shuna Island on muddy shell-gravel between 6 and 10 m depth. Hydroids and red algae are common and sometimes luxuriant over both these habitats, the *Modiolus* shells providing a hard substratum for attachment and the galleries built from shell and gravel by the *Limaria* providing the same. The brittlestar *O. fragilis* is present in large numbers in patches.

Sublittoral sediments

Infralittoral sediments of coarse muddy sand with shells and stones are present in the upper part of the loch, from the shore downwards, grading into similar circalittoral mixed areas characterised by *M. modiolus* and burrowing holothurians (ModHo). They are also present in sheltered bays such as Camas Nathais in the outer part of the loch. These infralittoral sediments have a variable amount of hard substrata which provide attachment for kelp *L. saccharina* and a variety of fine filamentous red and brown algae, including dense stands of *C. filum* mainly in the upper 5 m (LsacX). Bivalves including *Ensis* spp. and *Mya truncata* are present in the sediment. At some sites, such as in Ardnamucknish Bay and the Sound of Shuna, there are extensive plains of fine sand with only a few rocks and shells supporting seaweeds. The burrowing heart urchin *Echinocardium cordatum* is common in this habitat, along with various bivalves including *Arctica islandica* (EcorEns).

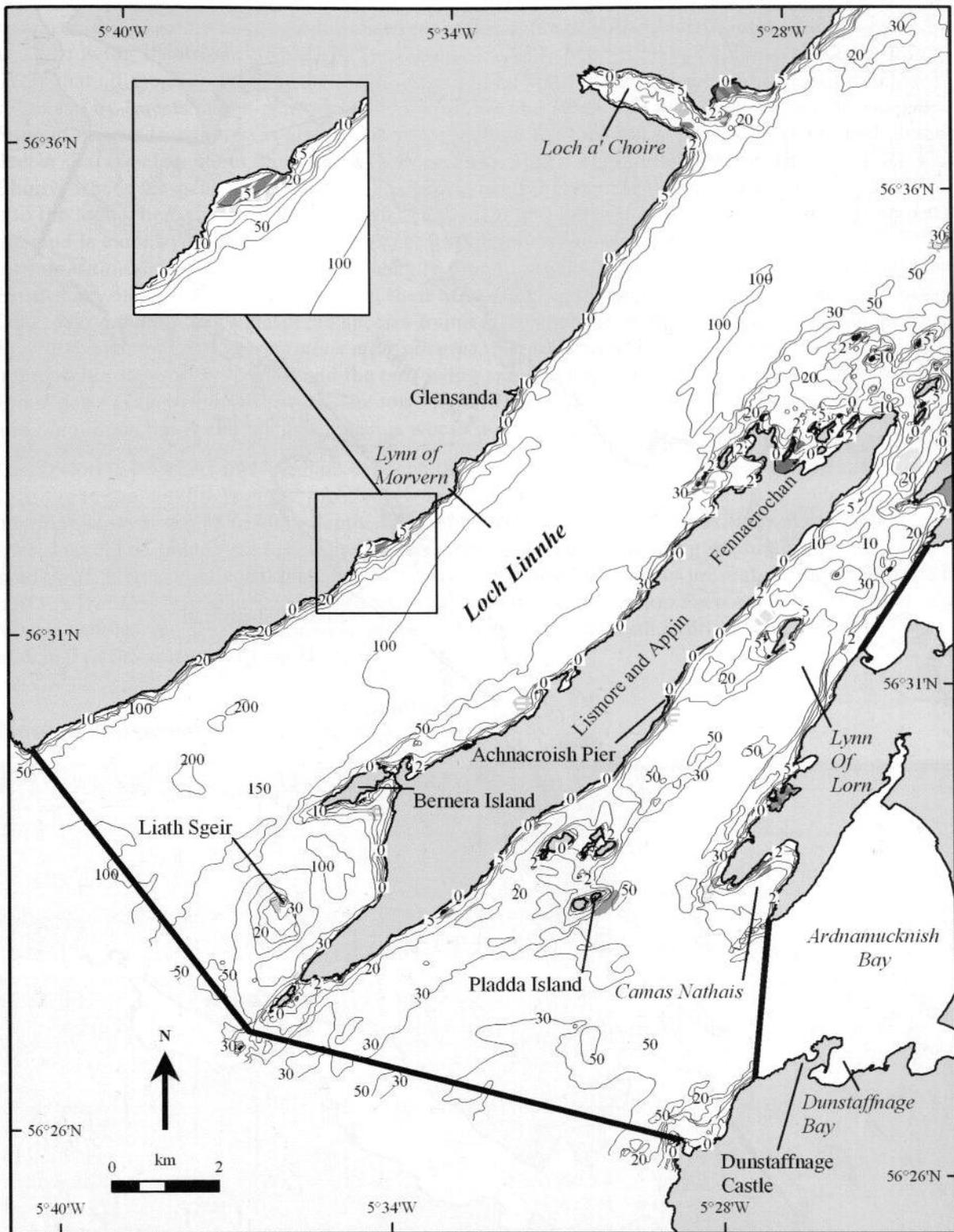


Figure 13.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 13.1, cited literature and additional field observations).

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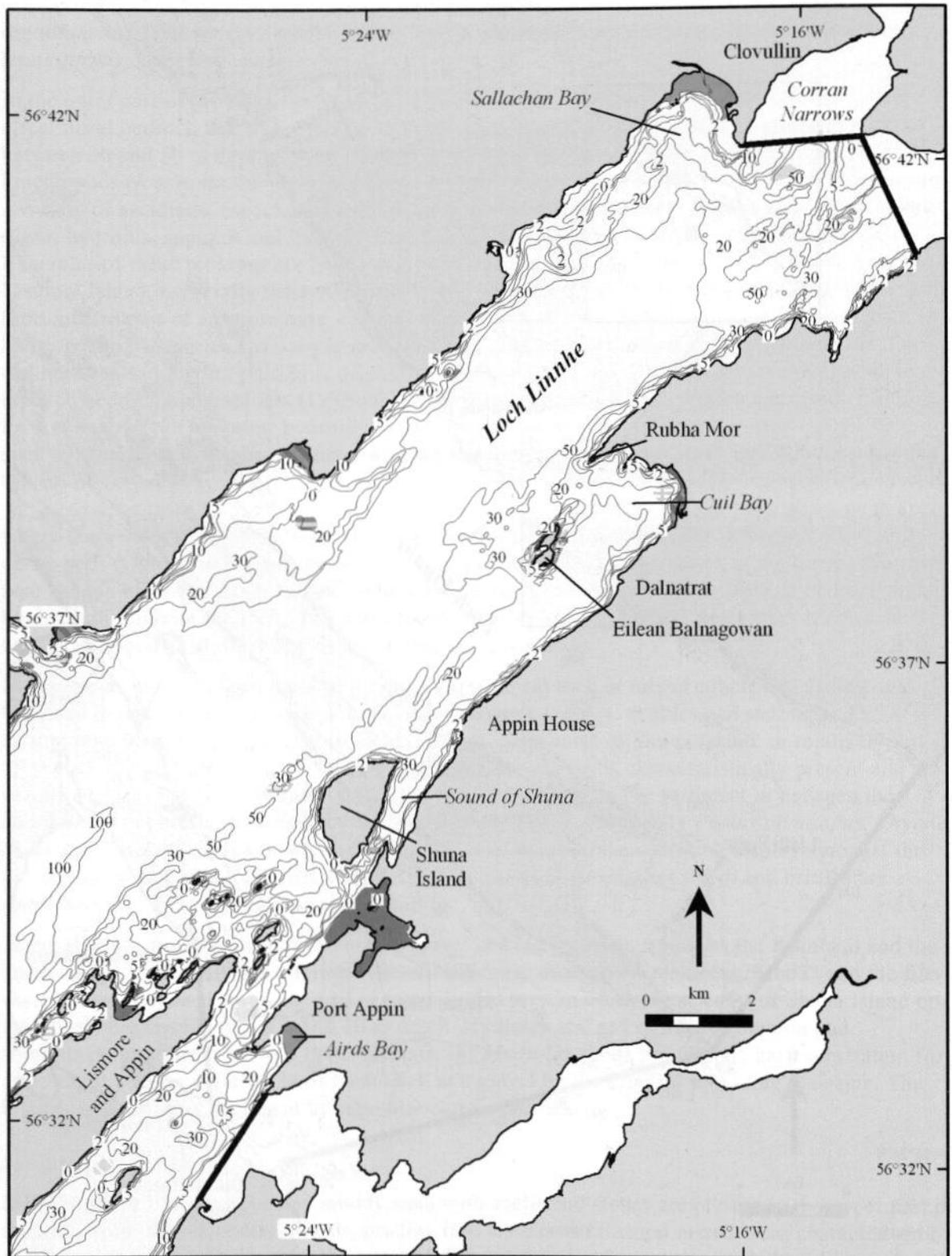


Figure 13.2 (continued)

Coarse circalittoral sediments are present around the edges of the loch between about 10 and 20 m depth, and may extend below this depth in areas of increased tidal flow or wave exposure. Firm sediments of coarse, sandy shell-gravel and pebbles and shells on mud, supporting dense stands of the sand mason worm *L. conchilega* (Lan), are present at some sites in the southern part of the Lynn of Lorn, such as on the east side of Pladda Island.

However, the predominant circalittoral sediment throughout the loch is soft mud with sea-pens and burrowing crustaceans (SpMeg). This habitat has only been surveyed close to shore but it is likely that all the deep areas of the loch are floored by similar mud. These plains of soft mud are colonised by forests of sea-pens *Virgularia mirabilis* and *Pennatula phosphorea*. The tall sea-pen *Funiculina quadrangularis* is also common throughout the loch but is generally only found on the deeper plains below about 25 m depth (SpMeg.Fun). This observation is demonstrated at Loch a' Choire, where sea-pens are present in the deepest central area near the entrance but not further into the loch where the sediment plain rises above 20 m depth. At most of the mud sites surveyed, the mud is extensively burrowed by crustaceans, mainly *Nephrops norvegicus* and the squat lobster *Munida rugosa*, which is more usually found in rocky habitats sheltering beneath boulders. Brittlestars *Amphiura* spp. are common, their arms sticking up out of the sediment like thin twigs. Other less common but widespread species found in this habitat include the large and flamboyant fireworks anemone *Pachycerianthus multiplicatus*, recorded from Loch a' Choire, the burrowing heart urchin *Brissopsis lyrifera* and the burrowing snake blenny *Lumpenus lumpretaeformis* and Fries' goby *Lesueurigobius friesii*. The tower shell *Turritella communis* is present in some areas and not others, but is abundant at the sites where it does occur.

Circalittoral sediments intermediate between these soft muds and coarser sands are present around Lismore in the outer part of the loch, below steep rocky slopes and between rocky outcrops, at anything from about 11 to 40 m depth. The sediment is variable in composition, mostly muddy shell-gravel and muddy sand, and has few characteristic species, grading gradually into the softer muds with increasing depth. The anemone *Cerianthus lloydi* is usually present, along with the sea-pen *V. mirabilis*, brittlestars *Amphiura* spp. and sometimes the scallop *Pecten maximus* (VirOph). Where cobbles and shells are present, species variety increases with hydroids and ascidians attached to the stones (VirOph.HAs).

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Lismore Lochs, Lismore Island	SAC, SSSI SAC	NM 859 424 NM 808 376 NM 829 394 NM 828 396	Hard oligo-mesotrophic waters with benthic vegetation of stoneworts Hara spp. formations//Common seals
Lynn of Lorn Small Islands	SSSI	NM 836 371 NM 831 382 NM 840 383 NM 874 423 NM 883 460 NM 900 465 NM 890 474 NM 888 478 NM 900 478	Ornithological
Clach Tholl	SSSI	NM 899 448	Woodland backing onto shore
Bernera Island	SSSI	NM 795 395	Botanical
Camas Nathais	GCR	NM 873 367	Geological
Ardsheal Hill & Peninsula	GCR	NM 990 565	Geological
Kentallen	GCR	NN 007 574	Geological
Onich Shore section	GCR	NN 025 613	Geological
Onich Dry River Gorge	GCR	NN 033 624	Geological
Rubha Cuil-cheanna	GCR	NN 013 615	Geological
Lynn of Lorn	NSA		Includes Lismore and Appin Island
Argyll Islands	ESA	NM 830 400	Includes Lismore and Appin Island

Human influences

Coastal developments and uses

The town of Oban (pop. c.7000) lies just outside the southern end of Loch Linnhe and there are houses scattered sparsely around much of the coastline. There are a number of small villages on Lismore Island and the mainland coast but the only village of any size on the loch itself is at Ballachulish at the entrance to Loch Leven. The Oban–Fort William road follows much of the south-eastern shore of the loch and there is a road from Corran to Loch a' Choire on the Morvern side. Much of the Morvern peninsula consists of steep and relatively inaccessible mountains with little in the way of habitation.

There is a superquarrying operation at Glensanda on the Lynn of Morvern; the quarry has a deep water jetty and stone is removed by sea. The site processes over one million tonnes of granite aggregate per year and is the largest coastal quarry in Scotland.

The area between Appin House and Dalnatrat and some way inland on the eastern shore of the loch is cited as a 'principal geological interest resource of technical interest for superquarries' (Barne *et al.* 1997a). Much of the south-eastern shore has a wooded fringe with stretches of ancient woodland and there are extensive tracts of coniferous plantation inland. The hinterland is generally mountainous and used for rough grazing, although the south-eastern shore between the island of Shuna and the loch entrance is lower lying. There is grazed saltmarsh and ancient woodland in this area.

Marine developments and uses

The Lynn of Morvern contains submarine exercise areas and a disused explosives dumping ground. A car ferry operates across the Corran Narrows and a ferry from Oban runs to Achnacroish on Lismore. Frequent ferries to Mull, Lochaline and the Hebrides operate from Oban and pass the loch entrance. Cargo ships collect stone from the quarry pier at Glensanda. The loch is also the route for boat traffic to Fort William on Loch Eil. There are a number of piers, slipways and moorings scattered around the loch for local boats.

There is some fish farming in the area with both salmon *Salmo salar* and oysters (Pacific and native) farmed around Lismore Island. Commercial fishing includes creeling for Norway lobsters *N. norvegicus* on the deep mud and for other crustaceans on the rocky inshore areas.

The lower end of the loch around the Lynn of Lorn and where the Firth of Lorn, Sound of Mull and Loch Linnhe meet is an area of high-intensity water-based leisure activities. The area is particularly popular with yachts, and scuba-diving, wind-surfing and canoeing are all carried out.

In 2001, the Scottish Association for Marine Science (SAMS) at Dunstaffnage set up a study on the colonisation of artificial reefs by marine species; establishment of the reef involved the dumping of one and a quarter million concrete blocks onto the seabed.

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- Survey 48: 1983 UCS Mull sublittoral survey (Smith & Gault 1983; Bishop 1984).
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- Survey 296: 1969 Gage Lochs Etive, Creran and Lochnell Bay sublittoral survey (Gage 1974).
- Survey 624: 1995 MNCr Firth and Lynn of Lorn training survey.

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
6	25	Rubha Mor, Greenfield, Lower Loch Linnhe	NM 958 558	56°39.0'N 05°19.8'W	YG, Ver.Ver, Fves, Fspi, Fser.R, Ldig.Ldig, Pel
6	26	Cuil Bay, Lower Loch Linnhe	NM 973 550	56°38.6'N 05°18.2'W	FserX, BLit
6	42	Rocks W of Port Ramsay, Lismore, Lower Loch Linnhe	NM 875 458	56°33.3'N 05°27.4'W	LsacX, YG, Fves, Asc.Asc, Fser.Fser, Lsac.Ldig, Lsac.Ft, PelB, LsacX
6	43	NW of Fennaerochan, Lismore, Lower Loch Linnhe	NM 874 453	56°33.1'N 05°27.4'W	MacAre, PCer

Littoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
6	53	N of Dunbeg, Dunstaffnage Bay, Lower Loch Linnhe	NM 883 338	56°26.9'N 05°26.1'W	MacAre, MytFab
6	54	SW of Dunstaffnage jetty, Lower Loch Linnhe	NM 883 343	56°27.2'N 05°26.1'W	Sm, Pel
6	55	By jetty, SE of Dunstaffnage Castle, Lower Loch Linnhe	NM 884 344	56°27.2'N 05°26.0'W	YG, Ver.Ver, Fves, Fspi, Asc.Asc, Fser.Fser, Pel
6	66	W Branra Rock, Lynn of Lismore, Lower Loch Linnhe	NM 882 434	56°32.1'N 05°26.6'W	Oph, Lhyp.TFt
84	8	Camas na Croise, Loch Linnhe	NM 863 525	56°36.9'N 05°28.9'W	FX
84	9	Sallachan Bay, Loch Linnhe	NM 978 624	56°42.5'N 05°18.2'W	MLR, LGS
84	10	Clovullin Flat, Loch Linnhe	NN 011 628	56°42.9'N 05°15.0'W	FX
84	N	Camas Chil-Mhalieu, Loch Linnhe	NM 898 561	56°39.0'N 05°25.7'W	S
265	17	Camas Rubha na Liathaig, Dunstaffnage, Lower Loch Linnhe	NM 878 342	56°27.1'N 05°26.6'W	SLR
265	26	Dunstaffnage Bay, Connel, Lower Loch Linnhe	NM 882 340	56°27.0'N 05°26.2'W	LGS, LR
265	28	Eilean Riabhach 1, Lower Loch Linnhe	NM 872 389	56°29.6'N 05°27.4'W	SLR
265	29	Eilean Riabhach 2, Lower Loch Linnhe	NM 871 391	56°29.7'N 05°27.5'W	MLR
265	42	Portnacraoish, Appin, Lower Loch Linnhe	NM 920 476	56°34.4'N 05°23.1'W	SLR
265	44	Tralee Sands, Ardnamucknish, Lower Loch Linnhe	NM 896 387	56°29.6'N 05°25.1'W	LGS
296	6	Port Selma Sands, Lochnell Bay, Ardnamucknish, Lower Loch Linnhe	NM 896 387	56°29.6'N 05°25.1'W	AP.P, LMS, IMS

Sublittoral sites					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
6	21	W of Rubha Cuil-Cheanna, Lower Loch Linnhe	NM 897 435	56°32.2'N 05°25.1'W	Oph
6	22	SE of Sallachan Point, Lower Loch Linnhe	NM 998 607	56°41.7'N 05°16.2'W	VirOph.HAS, CMS
6	23	Cuil-Cheanna Spit, Lower Loch Linnhe	NN 008 599	56°41.3'N 05°15.0'W	SpMeg.Fun
6	24	WSW of Ardsheal House, Lower Loch Linnhe	NM 983 573	56°39.8'N 05°17.5'W	ModHo, Lsac.Ft, ModHAS, Lsac.Pk
6	27	NE Cuil Bay, Lower Loch Linnhe	NM 976 550	56°38.6'N 05°18.0'W	SpMeg.Fun
6	28	E side Eilean Balnagowan, Lower Loch Linnhe	NM 951 549	56°38.5'N 05°20.5'W	ModHo, Lsac.Ft, Oph, Lsac.Pk
6	29	W Eilean Balnagowan, Lower Loch Linnhe	NM 952 549	56°38.5'N 05°20.4'W	ModHo, EchBriCC, Lsac
6	30	Skerry N of Sgeirean nan Torran, Lower Loch Linnhe	NM 935 572	56°39.7'N 05°22.1'W	Lsac.Ft, ModHo, FaAIC
6	31	S of Sgeir nan Gillean, Lower Loch Linnhe	NM 908 543	56°38.0'N 05°24.6'W	ModHo
6	32	Caimas na Croise, Lower Loch Linnhe	NM 864 518	56°36.6'N 05°28.8'W	ModHo, LhypGz.Ft, Lsac.Pk, LhypGz.Pk
6	33	Off Ceanna Mòr, Loch a'Choire, Lower Loch Linnhe	NM 854 517	56°36.5'N 05°29.7'W	ModHo, FaAIC
6	34	SW of Camasnacroise, Loch a' Choire, Lower Loch Linnhe	NM 854 522	56°36.7'N 05°29.7'W	SpMeg.Fun, ModHo, AntAsH
6	35	S of Kingairloch, Loch a' Choire, Lower Loch Linnhe	NM 849 523	56°36.8'N 05°30.3'W	SpMeg
6	36	W of Beinn Sgluich, Lower Loch Linnhe	NM 945 516	56°36.7'N 05°20.9'W	SpMeg.Fun, KswMx, ModHo

Sublittoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotores recorded</i>
6	37	Creag an Fhithich, Shuna Island, Lower Loch Linnhe	NM 910 495	56°35.4'N 05°24.2'W	Lim, CR, Lsac.Ft, Ldig.Ldig, Oph, ModHo, Lhyp.Ft
6	38	Pinnacle W of Shuna Island, Lower Loch Linnhe	NM 905 496	56°35.5'N 05°24.7'W	SpMeg.Fun, NeoPro, Oph
6	39	W of Knap Point, Sound of Shuna, Lower Loch Linnhe	NM 920 484	56°34.9'N 05°23.2'W	EcorEns
6	40	Sgeir nan Tom, Lismore, Lower Loch Linnhe	NM 890 479	56°34.5'N 05°26.1'W	Oph, Lsac
6	41	W Rubh' Ard Ghainimh, Lismore, Lower Loch Linnhe	NM 891 463	56°33.7'N 05°25.9'W	VirOph, Lsac.Ft
6	42	Rocks W of Port Ramsay, Lismore, Lower Loch Linnhe	NM 875 458	56°33.3'N 05°27.4'W	LsacX, YG, Fves, Asc.Asc, Fser.Fser, Lsac.Ldig, Lsac.Ft, PelB
6	44	E of Dubh Sgeir, Lismore, Lower Loch Linnhe	NM 859 448	56°32.8'N 05°28.9'W	SpMeg.Fun, AntAsH, Lsac.Pk
6	45	Port an Dreadhain, Lismore, Lower Loch Linnhe	NM 826 409	56°30.6'N 05°32.0'W	SpMeg.Fun
6	46	Camas Eigneig, Lynn of Morvern, Lower Loch Linnhe	NM 797 433	56°31.8'N 05°34.9'W	LsacX, Oph
6	47	SW of Camas Gorm, Lynn of Morvern, Lower Loch Linnhe	NM 769 418	56°30.9'N 05°37.6'W	AntAsH, Lhyp.Ft, CR, CGS
6	49	Berner Bay, Lismore, Lower Loch Linnhe	NM 798 389	56°29.4'N 05°34.6'W	SpMeg.Fun
6	50	W Bâgh Clach an Dobhrain, Lismore, Lower Loch Linnhe	NM 787 373	56°28.5'N 05°35.5'W	AmenCio, VirOph.HAS, Ldig.Ldig, ErSSwi, LhypLsac.Ft
6	51	Rubha Fiart, Lismore, Lower Loch Linnhe	NM 785 394	56°29.7'N 05°35.8'W	AntAsH, VirOph, VirOph.HAS, LhypLsac.Ft, LhypLsac.Pk
6	54	SW of Dunstaffnage jetty, Lower Loch Linnhe	NM 883 343	56°27.2'N 05°26.1'W	Sm, Pel
6	55	By jetty, SE of Dunstaffnage Castle, Lower Loch Linnhe	NM 884 344	56°27.2'N 05°26.0'W	YG, Ver.Ver, Fves, Fspi, Asc.Asc, Fser.Fser, Pel
6	56	SE of St Margaret's Tower, Ardnamucknish Bay, Lower Loch Linnhe	NM 892 378	56°29.1'N 05°25.4'W	FaMx, Lsac.Ft, EcorEns, LsacX, EchBriCC, Lsac
6	57	E of Garbh Ard, Ardnamucknish Bay, Lower Loch Linnhe	NM 878 373	56°28.8'N 05°26.7'W	VirOph.HAS, IMX, FaMX, LhypLsac
6	58	W Camas Nathais, Lynn of Lorn, Lower Loch Linnhe	NM 882 361	56°28.2'N 05°26.3'W	LsacX
6	59	SW Rubha Fion-aird, Lynn of Lorn, Lower Loch Linnhe	NM 859 373	56°28.7'N 05°28.6'W	Oph
6	60	E of Pladda Island, Lismore, Lower Loch Linnhe	NM 788 374	56°28.6'N 05°35.5'W	SpMeg, AntAsH, FaMX, Lcon, Lhyp.Ft
6	61	Sgeir Sgoraig, Lismore, Lower Loch Linnhe	NM 809 369	56°28.4'N 05°33.4'W	CMX, LhypLsac.Pk
6	62	ESE Port Kilcheran, Lismore, Lower Loch Linnhe	NM 827 385	56°29.3'N 05°31.8'W	SpMeg, Lcon
6	63	S of Achnacroish, Lismore, Lower Loch Linnhe	NM 852 406	56°30.5'N 05°29.4'W	SpMeg.Fun
6	64	Channel W of Eilean Dubh, Lismore, Lower Loch Linnhe	NM 870 425	56°31.6'N 05°27.8'W	VirOph.HAS
6	65	E of Eilean Dubh, Lynn of Lorn, Lower Loch Linnhe	NM 876 404	56°30.5'N 05°27.0'W	AntAsH, VirOph.HAS, Ldig.Ldig, Lhyp.Ft, Lhyp.Pk
6	66	W Branra Rock, Lynn of Lismore, Lower Loch Linnhe	NM 882 434	56°32.1'N 05°26.6'W	Oph, Lhyp.TFt
6	67	Narrows N of Appin Rocks, Lynn of Lorn, Lower Loch Linnhe	NM 897 454	56°33.2'N 05°25.3'W	Lim, ModT
48	11	Liath Sgeir, Lower Loch Linnhe	NM 781 372	56°28.4'N 05°36.2'W	FaV, FaSwV

Sublittoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
296	6	Port Selma Sands, Lochnell (Ardnamucknish) Bay, Lower Loch Linnhe	NM 896 387	56°29.6'N 05°25.1'W	AP.P, LMS, IMS
624	3	S side of Pladda Island	NM 844 380	56°29.0'N 05°30.1'W	SpMeg, VirOph, VirOph.HAs

Location

Position (centre)	NN 110 605	56°41.8'N 5°6'W
Administrative area	Highland (Lochaber)	
Conservation agency/area	Scottish Natural Heritage	North Areas (West Highland)

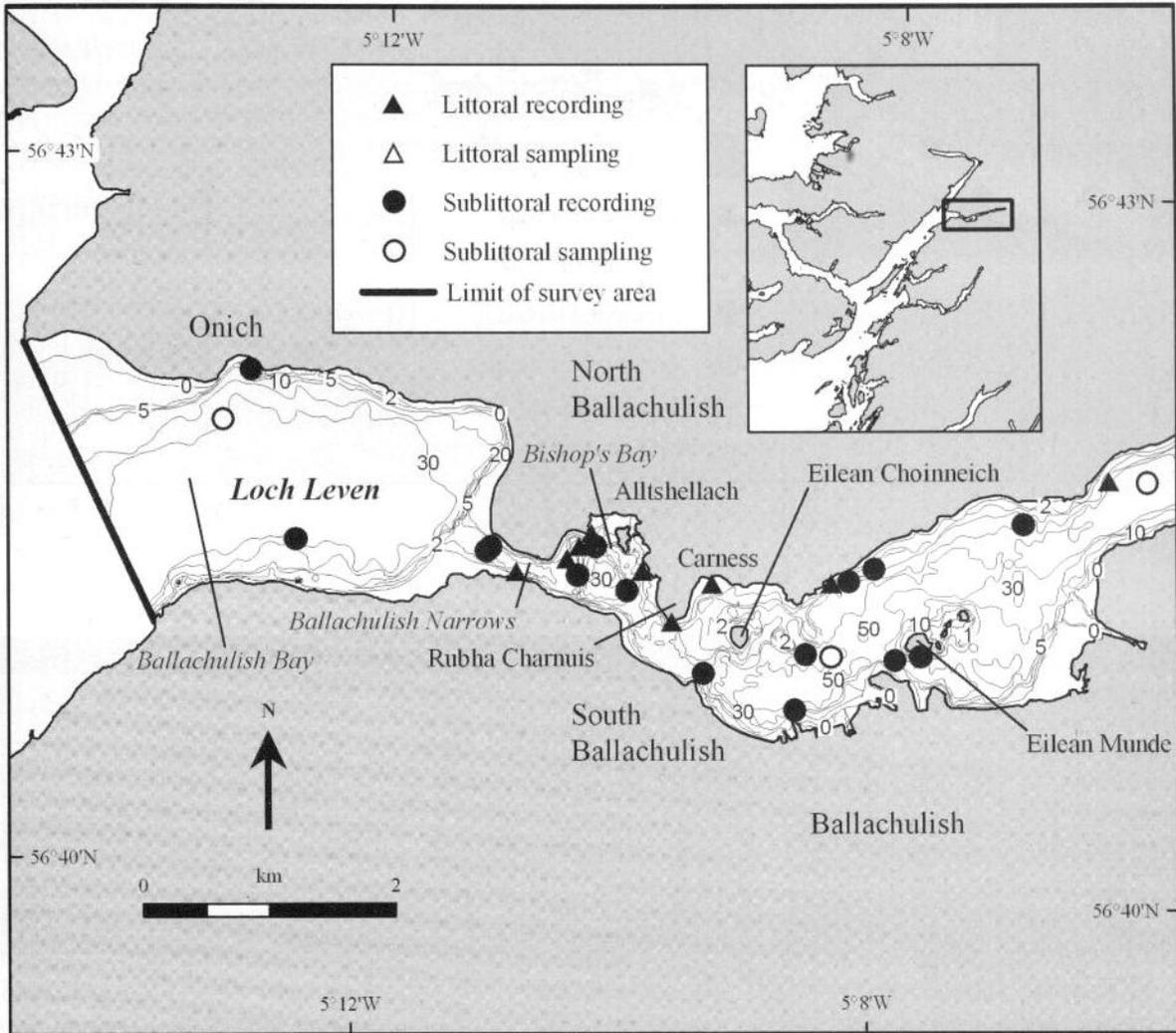


Figure 14.1 Main features of the area, showing sites surveyed.

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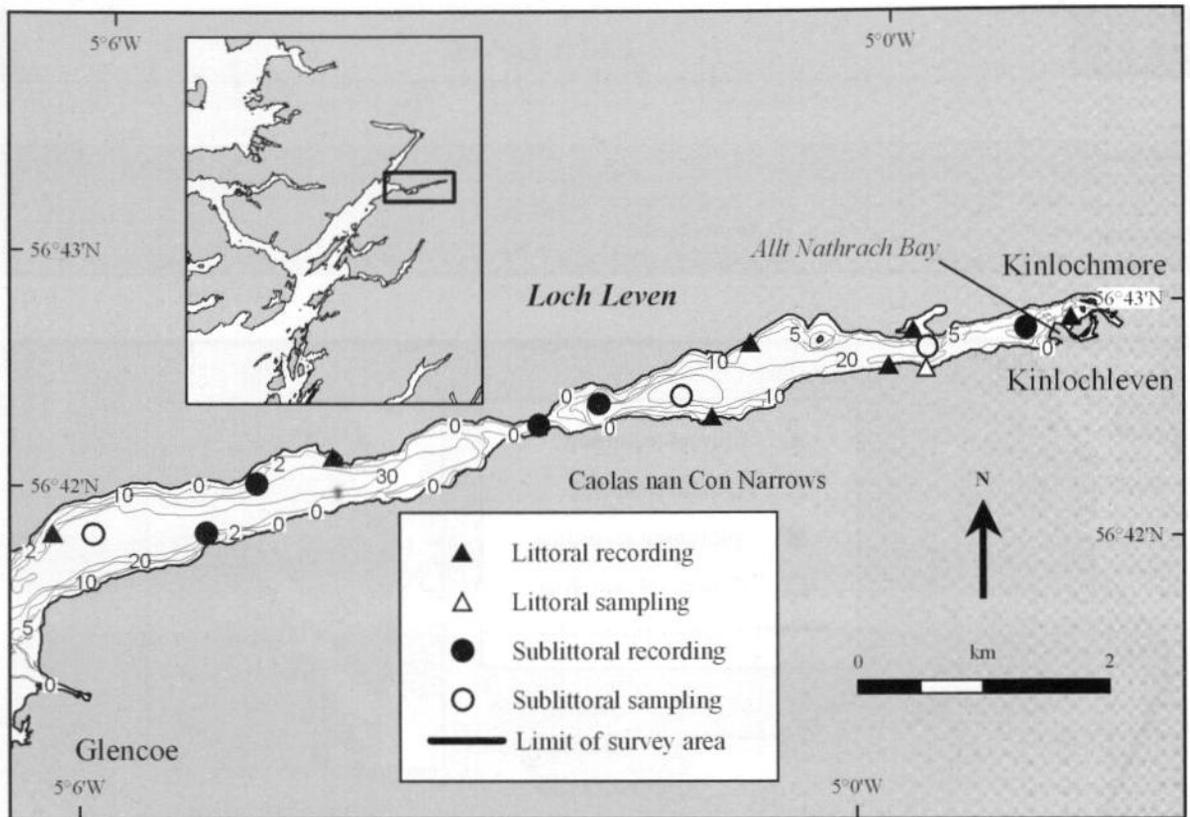


Figure 14.1 (continued)

Physical features	
<i>Physiographic type</i>	Fjord with 5 sills
<i>Length of coast</i>	49.17 km
<i>Length of inlet</i>	13.4 km
<i>Area of inlet</i>	8.6 km ² (HW); 7.5 km ² (LW)
<i>Bathymetry</i>	62.0 m (max)
<i>Wave exposure</i>	Very sheltered
<i>Tidal streams</i>	Up to 6 knots through Ballachulish & Caolas nan Con Narrows; negligible in main basins
<i>Tidal range</i>	3.7 m (springs)
<i>Salinity</i>	Fully marine at mouth to brackish at Glencoe and in upper reaches

Introduction

Loch Leven is a narrow, elongate fjord set amongst some of the highest and most spectacular mountain scenery in Britain. Mamore Forest and Ben Nevis lie to its north, while on the south side is Glen Coe and the knife-edge ridge of Aonach Eagach. A box girder bridge across the Ballachulish Narrows towards the loch entrance carries the main road to Fort William.

The entrance to Loch Leven lies south of the Corran Narrows on the eastern side of Loch Linnhe. The loch runs east-west and, with only a limited fetch at the entrance, the entire loch is very sheltered from wave action. It is divided into a series of deep basins by five sills and reaches a maximum of depth of 62 m; the outer basin is continuous with Loch Linnhe. A sill inside the entrance at the Ballachulish Narrows has a minimum depth of only 6 m and this influences water circulation within the loch. Tidal streams of up to 6 knots flow through both this and the Caolas nan Con Narrows, with a lesser flow across the other sills; streams are negligible in the main basins. The loch entrance is fully marine but salinities in the inner loch are variable and may be brackish.

A narrow fringe of bedrock, boulders and cobbles forms the littoral zone throughout most of the loch, with wider, muddy shingle and gravel shores to the west of Ballachulish and at Glencoe and Kinlochleven where the Rivers Coe and Leven enter. There are some estuarine sediments in these last two areas. In the sublittoral zone the substrata are predominantly sedimentary, with boulders on sediment in the shallows and fine mud in deeper water. Bedrock is found around the rocky islands and headlands, and cobble and boulders floor the narrows. The loch supports a range of biotopes typical of sheltered sealochs and there is a reduction in species richness from the more marine western entrance to the brackish waters at the loch head.

Historically, Ballachulish was the centre of a slate-quarrying industry and there are large quantities of shale waste on the shore and in the sublittoral around Glen Coe and Ballachulish. Nowadays, fish farming, forestry and tourism are the main activities around the loch and there are extensive tracts of coniferous plantation from Glen Coe westwards. The loch lies within the Ben Nevis and Glen Coe National Scenic Area.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	13	April 1990	Davies (1991)
	*Recording (epibiota)	1	May 1980	Smith (1981)
	Recording (epibiota)	3	March 1976	ISU data sheets
Sublittoral	Recording (epibiota)	27	April 1990	Davies (1991)
	Recording	1	Jan-Dec 1970	Dipper (1981, survey 63)

*The results of this study were used to prepare the biotope map but the data are not stored on the MNCr database and not shown on the map of sites surveyed.

Littoral

Shores within Loch Leven are predominantly of mixed substrata, with bedrock largely confined to the upper shore. Almost the entire littoral zone throughout the loch is subject to low and variable salinities and there is a gradient along the loch, with the lowest salinities in the uppermost basin.

Littoral rock

Steep bedrock extending down to the lower shore and into the sublittoral is present around the promontory and small island below Alltshellach House, in the sheltered bay to the north-east of the Ballachulish Narrows. Steeply sloping bedrock areas are dominated by furoid algae (*Asc.VS*, *Fves*, *Fserr.VS*) with some barnacles and limpets *Patella* spp. Very steep and vertical bedrock is dominated by barnacles *Semibalanus balanoides* and limpets *Patella vulgata* with a few clumps of mussels *Mytilus edulis* (BPat.Sem). In the sublittoral fringe the rock surfaces are covered by encrusting coralline algae with *Laminaria digitata* and the sponges *Halichondria panicea* and *Myxilla incrustans* (Ldig.Ldig).

Shores throughout the Ballachulish Narrows through to the headland of Rubha Charnuis are subject to moderate to strong tidal streams and consist predominantly of cobbles with some boulders and pebbles overlying gravel. Zones of the usual furoid algae *Fucus spiralis*, *Fucus vesiculosus* and *Fucus serratus* form dense stands over the shore, with some *Ascophyllum nodosum* in areas sheltered from the main tidal streams (Fspi, FserX, AscX). Some areas of the sublittoral fringe are less exposed and are characterised by the kelps *L. digitata* and *Laminaria hyperborea* with *Laminaria saccharina* (Ldig.T). The sponge *H. panicea* is common on the kelp holdfasts and stipes and on rocks, extending up onto the *F. serratus* in the eulittoral zone. The horse mussel *Modiolus modiolus* is also present in the sublittoral fringe, amongst gravel and cobbles. At the western end of the narrows where they open up into Ballachulish Bay, there are

wide shores of shingle and gravel, swept into drifts by the strong tidal streams and colonised by *F. serratus*. Boulders and cobbles compacted into the gravel on the lower shore within the narrows provide a foothold for a variety of hydroids, sponges and ascidians. Beneath the Ballachulish Bridge the whole shore consists of a steep boulder slope.

Shores within the main basin of the loch from Rubha Charnuis eastwards to the narrows at Caolas nan Con consist mainly of bedrock and boulders, subject to lowered salinities. In general the upper shore is bedrock, extending down from rocky exposures above the shore. Mid and low shore habitats are boulders and cobbles with some coarse sediment on the lower shore. In sheltered bays, such as on the east side of Rubha Charnuis, the shore is wider and gravel and sediment are more extensive, with rocky outcrops. The shores in this part of the loch are dominated by furoid algae with a mixture of *F. vesiculosus* and *A. nodosum* on the mid-shore bedrock and large boulders (Asc.VS, Fserr.VS), and *F. serratus* and *A. nodosum* on the mixed substrata (AscX, FvesX, FserX). At some sites, such as along Rubha Aird Daraich and the bay on the east of Rubha Charnuis, mussels *M. edulis* are common, forming thick beds over the rock surface. Other fauna are generally sparse due to the lowered salinity. The survey in 1990 (Davies 1991) observed that rock waste from the nearby slate quarries had, in the past, been dumped on the shore along the south side of the loch between Ballachulish and Glen Coe. This mobile shale is not easily colonised by algae and the shores appeared rather bare.

Shores in the uppermost basin of the loch to the east of the narrows at Caolas nan Con are extremely sheltered and subject to low salinity. The shores are narrow, generally less than 50 m width. In general, bedrock and boulders make up the upper part of the shore and mixed boulders, cobbles and pebbles the lower shore. These shores have an impoverished fauna and flora due to the many freshwater streams that cross the shores and the layer of freshwater that lies on the loch surface following heavy rainfall. The brackish-water alga *Fucus ceranoides* predominates over the whole littoral area, with large clumps of mussels *M. edulis* on the lower shore (Fcer, FcerX). Other furoid algae, such as *A. nodosum*, *F. vesiculosus* and *F. serratus* are absent or only present in small quantities, but their extent increases at sites approaching the Caolas nan Con Narrows (Asc.VS, Fserr.VS).

Littoral sediment

Allt Nathrach Bay, near the head of the loch, is one of the few sedimentary littoral areas in the loch. This bay and part of the River Leven delta at the very head of the loch consist of pebbles and gravel overlying medium fine sand. The alga *F. ceranoides* forms extensive patches over most of the sediment flats (Fcer). The freshwater influence in Allt Nathrach Bay comes from a small creek that enters at the head of the bay. Within the creek, the sediment is finer with more mud and less gravel and *F. ceranoides*, and supports an abundance of ragworm *Hediste diversicolor* and the bivalves *Macoma balthica* and *Mya arenaria*, species typical of estuarine conditions (LMX).

Small areas of sediment flats are also present in the bay, at the head of the small basin to the north-east of Ballachulish Narrows, and at Carness on the east side of Rubha Charnuis. Here there are beds of the loose-lying form of *Ascophyllum nodosum* ecad *mackaii* overlying stony, sandy mud (AscX.mac).

Sublittoral

Sublittoral rock

Throughout most of the main basin and upper basin of the loch, gently sloping shores give way to an infralittoral zone consisting of cobbles and pebbles embedded in sediment. This habitat is quite variable in the amount of hard substrata present and the depth to which it extends. Mixed substrata are a characteristic feature of this loch and the bedrock areas described below are also mostly surrounded by sediment. In the infralittoral these mixed areas support a small variety of algae that attach to boulders, stones and shells, including *L. saccharina* and various foliose algae, with bivalves such as *Mya truncata* in the sediment (LsacX, LsacRS.Phy). Steep slopes of angular

boulders lead down from the shore on some headlands in the vicinity of Ballachulish slate quarries and off the small islet below Alltshellach House in the bay to the north of the Ballachulish Narrows. These more stable substrata allow the development of a *L. saccharina* kelp forest (Lsac.Ft) but this is an uncommon biotope in this loch. These boulder slopes also extend down into the circalittoral as described below.

Mixed substrata areas in the circalittoral vary from mixed boulders, cobbles and pebbles with muddy fine sand in between, to boulders on mud and muddy areas with a few cobbles. The depth range is between about 10 and 20 m, continuing down from the infralittoral, but can extend to as deep as 30 m. At the head of the loch there is a pebble bank with the horse mussel *M. modiolus* and very little else, at a depth of between 1 and 10 m. Just to the east of the Caolas nan Con Narrows, this habitat consists of rather clean cobbles and gravel, presumably because there is still some tidal current influence here. *M. modiolus* is characteristic of these circalittoral mixed substrata and is present in varying numbers (ModHo, ModHAs). The rocky part of the habitat is encrusted with coralline algae, tubeworms such as *Pomatoceros triqueter*, *Serpula vermicularis* and *Protula Tubularia* and a few hydroids. The sediment in between is characterised by burrowing holothurians, including *Psolus phantapus*.

Sublittoral bedrock within the loch is restricted to small, scattered outcrops in the circalittoral throughout the loch. Steep grazed circalittoral rock is found in the outer basin and the central basin just beyond Rubha Charnuis. The bedrock appears rather bare with a thin cover of encrusting algae, tubeworms *P. triqueter* and occasional barnacles *Balanus balanus* (AmenCio). Off the south of Eilean Choinneich both the tidal current and species richness increases. Dead man's fingers *Alcyonium digitatum* is common (AlcC). Sublittoral bedrock and boulder outcrops, with species typical of deep sheltered conditions including the brachiopod *Neocrania anomala*, the saddle oyster *Pododesmus patelliformis*, ascidians *Ascidia mentula* and the large barnacle *Balanus crenatus*, are present throughout the main basin of the loch (NeoPro, AntAsH). Small shallow vertical bedrock walls in the uppermost basin are extremely poor in species, with only *B. balanus* thriving in the lowered salinities (FaV). As described above, steep boulder slopes extend down from the shore at a few sites off headlands in the main basin. Below the kelp forest, boulders in the circalittoral are fairly bare, with the keel worm *P. triqueter*, encrusting coralline algae and *A. mentula* (AmenCio) between about 10 and 18 m depth, and the brachiopod *Neocrania anomala* and the peacock worm *Sabella pavonina* (NeoPro) from about 20 to 30 m depth.

Communities characteristic of strong tidal streams are found between the east end of the Ballachulish Narrows (Caolas Mhic Phadruig) and Eilean Choinneich. Dense beds of horse mussels *M. modiolus* are present on circalittoral cobbles and pebbles, with *A. digitatum*, tubeworms *P. triqueter* and hydroids such as *Sertularia argentea* attached to the mussels and the stones (ModT). However, while this habitat is amongst the richest in the loch, these *Modiolus* beds are not as rich as those found in the narrows between Upper Loch Linnhe and Loch Eil, probably as a result of the reduced salinities in Loch Leven. The extensive shallow channel that forms the main narrows is floored mainly by boulders and cobbles. Kelp *L. hyperborea* is able to gain a foothold on the larger boulders, along with foliose red algae. The smaller rocks are mobile and colonised only by encrusting algae and tubeworms *P. triqueter* (.XKT). The Caolas nan Con Narrows at the entrance to the uppermost basin are only 3 m deep, floored with cobbles and subject to low salinity. The kelp *L. digitata* and sparse foliose algae are attached to the larger stones (Ldig.T).

Sublittoral sediment

Sediment throughout Loch Leven is to a large extent mixed in with hard substrata as described above. Extensive sediment areas are present in the outer basin, Ballachulish Bay, but this area has not been fully surveyed. On the north side of the bay, fine sand is present in shallow water from 2 to around 10 m depth. The sand is rippled at the shallowest depths and slightly muddy at the deeper depths. The bivalves *M. truncata* and *Arctica islandica*, the lugworm *Arenicola marina* and the sand mason worm *Lanice conchilega* are present in the sand (EcorEns). At the time of the

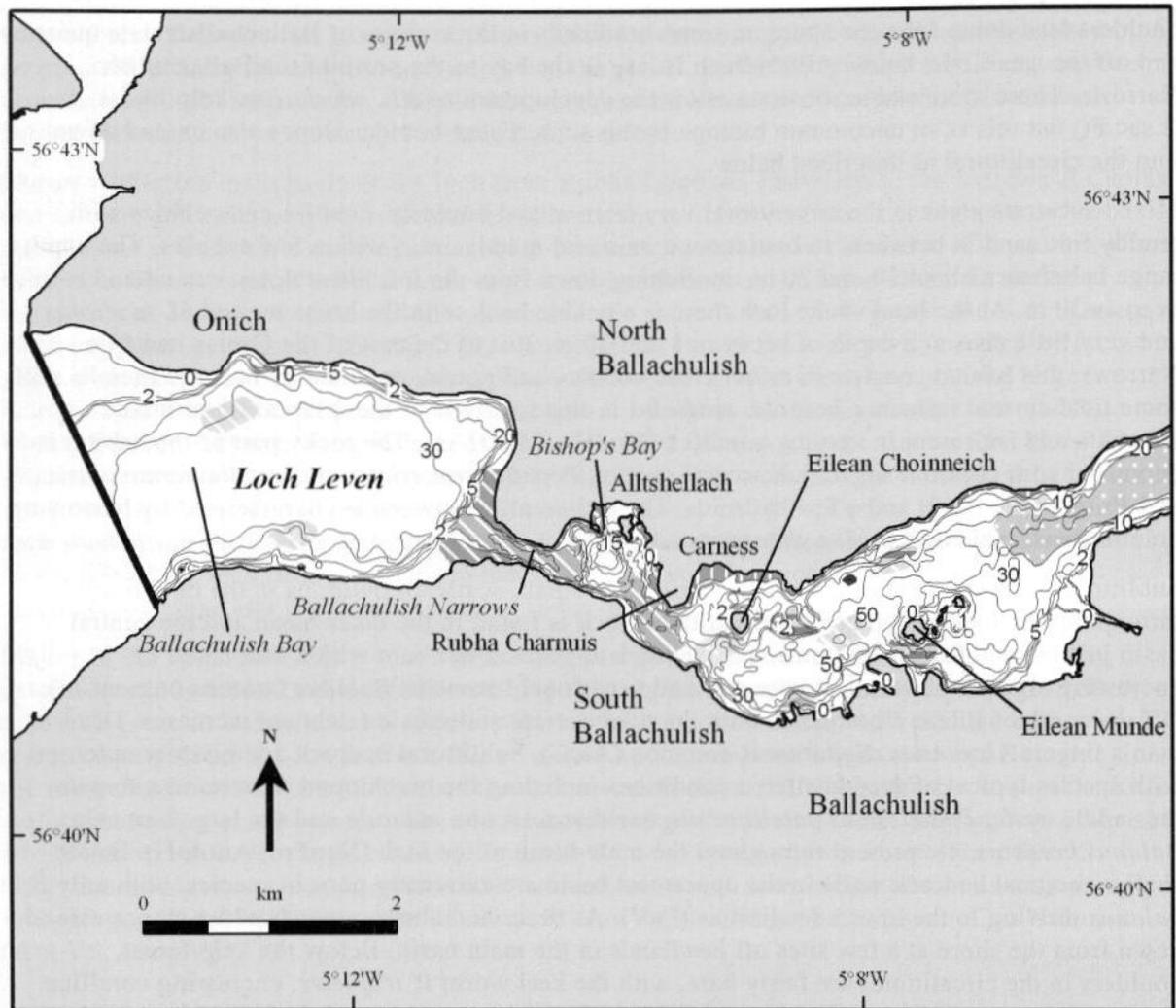


Figure 14.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 14.1, cited literature and additional field observations).
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1990 survey (Davies 1991), large numbers of recently dead bivalves *A. islandica* and *Ensis* spp. shells were found.

Soft circalittoral mud predominates in deep water below about 25 m depth in the central and inner basins of the loch. This mud is characterised by sea-pens *Virgularia mirabilis* and *Pennatula phosphorea* and is pock-marked by the burrows of various crustaceans, including the Norway lobster *Nephrops norvegicus* and *Calocaris macandreae* (SpMeg). Other common species present include the tower shell *Turritella communis*, the bivalve *A. islandica* and brittlestars *Amphiura* spp. Sediments in very deep water, to about 60 m depth to the west of Eilean Munde, do not appear to be soft mud as might be expected. A dredge from this region indicates a mixed, predominantly sandy sediment with mud and gravel. The infauna is numerically dominated by polychaetes, mainly *Owenia fusiformis* and brittlestars, mainly *Amphiura chiajei* with some *Ophiopholis aculeata* and *Ophiothrix fragilis* (VirOph). Various bivalves are also present. The coarseness of the sediment may be the result of some remaining tidal influence from the current-exposed areas to the west.

The remaining sediment in moderate depths of water is predominantly sandy mud, which grades into areas of mixed sediment and rock. This is a rather variable habitat but typically supports the

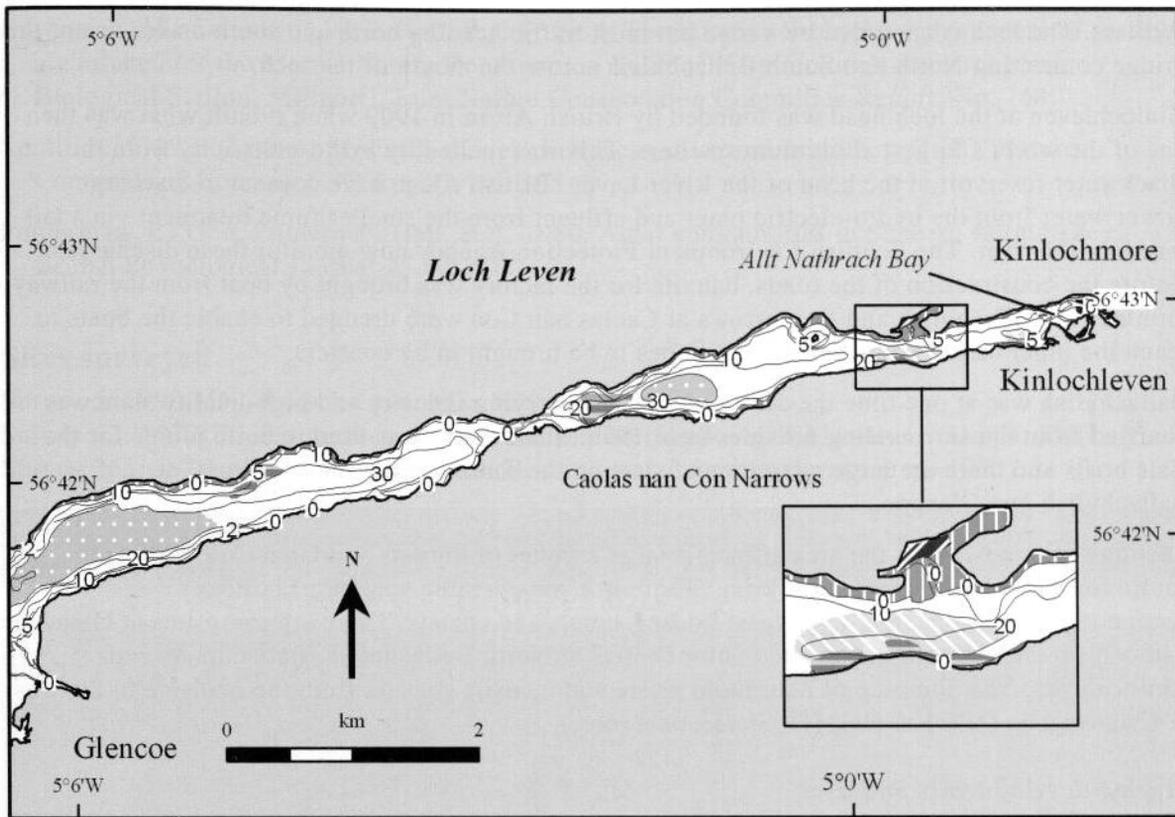


Figure 14.2 (continued)

sea-pen *V. mirabilis*, the burrowing anemone *Cerianthus lloydi*, the tower shell *T. communis* and the piddock *A. islandica* (VirOph, VirOph.HAS). The distinctions between the various grades of sediment and their biotopes is not particularly clear in this loch, especially as the species present are affected by the lowered salinities. Burrowing holothurians are also present at some sites and ascidians where there are stones present. This type of sediment is also present in the outer basin, Ballachulish Bay.

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
St John's Church	SSSI, GCR	NN065587	Geological
Carnach Wood	SSSI	NN098584	Woodland backing onto shore
Leven Valley	SSSI	NN210606	Geological
Callert	SSSI	NN074595	Geological
Ben Nevis and Glencoe	NSA		National Scenic Area including area surrounding loch

Human influences

Coastal developments and uses

The main settlements around the loch are at North Ballachulish, Ballachulish, Glencoe, Kinlochleven, Kinlochmore and Onich, with occasional houses scattered elsewhere. Onich in particular has expanded in recent years as more people choose to commute from here to Fort

William. The loch is encircled by a road but most traffic heading north and south makes use of the bridge connecting North and South Ballachulish across the mouth of the loch.

Kinlochleven at the loch head was founded by British Alcan in 1909 when it built what was then one of the world's largest aluminium smelters. This was fuelled by hydro-electricity from the Blackwater reservoir at the head of the River Leven. British Alcan have consent to discharge power water from the hydro-electric plant and effluent from the smelter fume treatment via a tail-race into the river. The Scottish Environment Protection Agency now monitor these discharges. Before the construction of the roads, bauxite for the factory was brought by boat from the railway terminus at Ballachulish and the narrows at Caolas nan Con were dredged to enable the boats to reach the inner basin. Some bauxite continues to be brought in by coasters.

Ballachulish was at one time the centre of a slate-quarrying industry and high-quality slate was quarried from the surrounding hillsides until 1955. Shale waste was used to build jetties for the slate boats and there are large quantities of slate on the shores and in the sublittoral at Ballachulish and Glencoe.

The high scenic value of the area attracts a large number of tourists and Glen Coe is a major centre for walking, climbing and skiing. There is a considerable amount of holiday accommodation in the area, with guest houses, hotels and chalets. There are campsites at Glencoe, Kinlochleven and Caolasnacon and visitor centres at North Ballachulish, Ballachulish and Kinlochleven. The dumping of household waste and utensils goes on from the roadside to the west of Caolasnacon (NN 125 602) (D. Steele, pers. obs.).

Marine developments and uses

There are salmon *Salmo salar* farms on the loch but no shellfish farms and there appears to be relatively little fishing activity within the loch. There are a number of piers and slipways, mostly associated with the fish farms or the Alcan works. The loch has been dredged at Caolas nan Con (NN 138 613).

There are anchorages and moorings available just inside the loch at Bishop's Bay.

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Sites surveyed

Survey 5: 1990 MNCR Loch Leven (Lochaber) survey.

Survey 63: 1970s Ridley north-west Scotland sublittoral photographic survey (Dipper 1981).

Survey 265: 1970–80 SMBA/MBA Great Britain littoral survey (Harvey *et al.* 1980).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
5	7	Alltshellach, Loch Leven	NN 058 600	56°41.4'N 05°10.2'W	FX, AscX, AscX.mac, YG, Ver.Ver, Fves, Fspi, Asc.Asc, Asc.VS, Fserr.VS, Ldig.Ldig, PelB, BPat.Sem
5	8	NW of Carness, Loch Leven	NN 062 597	56°41.3'N 05°09.8'W	YG, Fspi, Asc.VS, Fserr.VS, Pel
5	10	Rubha Charnuis, Loch Leven	NN 064 593	56°41.1'N 05°09.6'W	Lsac.T, Fspi, Asc.VS, Fserr.VS, Pel
5	11	Carness, Loch Leven	NN 067 596	56°41.2'N 05°09.3'W	LMX, AscX.mac, Pra, Fspi, Asc.VS, Fserr.VS, MytFves, Pel
5	18	Rubh' Aird Daraich shore, Loch Leven	NN 077 596	56°41.3'N 05°08.4'W	Ver.Ver, Fspi, Asc.VS, Fserr.VS, Pel
5	22	SW of Callert Cottage, Loch Leven	NN 099 604	56°41.8'N 05°06.3'W	AscX, FvesX, Fser.Fser, Fserr.VS, Pel
5	26	Camas na h-Eirghe, Loch Leven	NN 121 610	56°42.1'N 05°04.1'W	AscX, YG, Ver.Ver, Fspi, Asc.VS, FserX, Pel
5	29	E of Caolas nan Con, Loch Leven	NN 151 613	56°42.4'N 05°01.2'W	FvesX, L, FcerX, MytX
5	31	Mainland to W of Eilean nam Bàn, Loch Leven	NN 154 619	56°42.7'N 05°00.9'W	YG, Ver.Ver, Fcer, FcerX
5	32	S shore opposite Allt Nathrach Bay, Loch Leven	NN 165 617	56°42.6'N 04°59.9'W	ModHAs, VirOph, FaV, Verticals, Fcer, Asc.VS, Fserr.VS
5	33	Allt Nathrach Bay, Loch Leven	NN 167 620	56°42.8'N 04°59.7'W	LMX, FcerX
5	35	S shore, W of Kinlochleven, Loch Leven	NN 168 617	56°42.6'N 04°59.6'W	Fcer, Asc.VS, Fserr.VS
5	37	River Leven delta, Loch Leven	NN 179 620	56°42.9'N 04°58.4'W	OI, Est, FcerX
265	11	Alltshellach, Loch Leven	NN 057 599	56°41.4'N 05°10.3'W	SLR
265	14	Ballachulish N, Loch Leven	NN 056 598	56°41.3'N 05°10.4'W	SLR
265	15	Ballachulish S, Loch Leven	NN 052 597	56°41.3'N 05°10.8'W	SLR

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
5	1	Off Onich Pier, Loch Leven	NN 031 613	56°42.1'N 05°12.9'W	SpMeg, EcorEns
5	2	S Onich, Loch Leven	NN 028 609	56°41.9'N 05°13.2'W	VirOph
5	3	N of Currachd Liath, Loch Leven	NN 034 599	56°41.4'N 05°12.6'W	AmenCio, VirOph.HAs
5	4	Ballachulish Narrows, Loch Leven	NN 049 598	56°41.4'N 05°11.1'W	XKT
5	5	E Ballchulish Narrows, Loch Leven	NN 056 596	56°41.3'N 05°10.3'W	ModT
5	6	E of Loch Leven Hotel	NN 058 599	56°41.4'N 05°10.2'W	ModT, Verticals, Lsac.Ft, LhypGz.Pk

Sublittoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
5	9	SW of Rubha Charnuis, Loch Leven	NN 060 595	56°41.2'N 05°10.0'W	Lsac.T, LsacX
5	11	Carness, Loch Leven	NN 067 596	56°41.2'N 05°09.3'W	LMX, MytFves, Pel, AscX.mac, Pra, Fspi, Asc.VS, Fserr.VS
5	12	NE of Rubha Poll an t-Sailisdeire, Loch Leven	NN 066 588	56°40.9'N 05°09.3'W	ModT, AlcC
5	13	Rock to E of Eilean Choinneich, Loch Leven	NN 074 590	56°41.0'N 05°08.6'W	ModHAS, ModHo
5	14	N of Ballachulish Quarry, Loch Leven	NN 074 586	56°40.7'N 05°08.6'W	AmenCio, Lsac.Ft, NeoPro
5	15	W of Rubha na Glas-lice, Loch Leven	NN 076 590	56°41.0'N 05°08.4'W	VirOph
5	16	SW of Eilean Munde, Loch Leven	NN 082 589	56°41.0'N 05°07.9'W	ModHo, NeoPro
5	17	S of Eilean Munde, Loch Leven	NN 084 590	56°41.0'N 05°07.7'W	ModHo
5	19	NE Sgeir Dhubh, Loch Leven	NN 078 596	56°41.3'N 05°08.3'W	SpMeg, Beg
5	20	E of Rubh' Aird Daraich, Loch Leven	NN 080 597	56°41.3'N 05°08.0'W	VirOph.HAS, ModHo
5	21	S of Callert House, Loch Leven	NN 092 600	56°41.6'N 05°06.9'W	SpMeg, VirOph, VirOph.HAS
5	23	S Callert Cottage, Loch Leven	NN 102 603	56°41.8'N 05°06.0'W	SpMeg
5	24	NW of Creagan nan Caorach, Loch Leven	NN 111 604	56°41.8'N 05°05.1'W	SS, NeoPro
5	25	W of Camas na h-Eirghe, Loch Leven	NN 115 607	56°42.0'N 05°04.7'W	ModHo, NeoPro, ModHAS, Lsac.Pk
5	27	Narrows, Caolas nan Con, Loch Leven	NN 137 612	56°42.3'N 05°02.6'W	Ldig
5	28	E of Caolas nan Con, Loch Leven	NN 141 614	56°42.4'N 05°02.1'W	ModHo, LsacRS.Phy
5	30	N of mouth of Allt Gleann a Chaolais, Loch Leven	NN 148 614	56°42.5'N 05°01.5'W	SpMeg
5	32	S shore opposite Allt Nathrach Bay, Loch Leven	NN 165 617	56°42.6'N 04°59.9'W	ModHAS, VirOph, FaV, Verticals, Fcer, Asc.VS, Fserr.VS
5	34	S of mouth of Allt Nathrach Bay, Loch Leven	NN 168 618	56°42.7'N 04°59.6'W	SpMeg
5	35	S shore, W of Kinlochleven, Loch Leven	NN 168 617	56°42.6'N 04°59.6'W	Fcer, Asc.VS, Fserr.VS
5	36	Kinlochleven, Loch Leven	NN 175 620	56°42.8'N 04°58.8'W	VirOph, ModHo, FcerX
63	12	Ballachulish, Loch Leven	NN 050 599	56°41.4'N 05°11.0'W	SIR

Compiled by:

F.A. Dipper, C.M. Howson & D. Steele

15

Upper Loch Linnhe and Loch Eil

Location

Position (centre)	NN 095 750	56°49'N 5°7.9'W
Administrative area	Highland (Lochaber)	
Conservation agency/area	Scottish Natural Heritage	North Areas (West Highland)

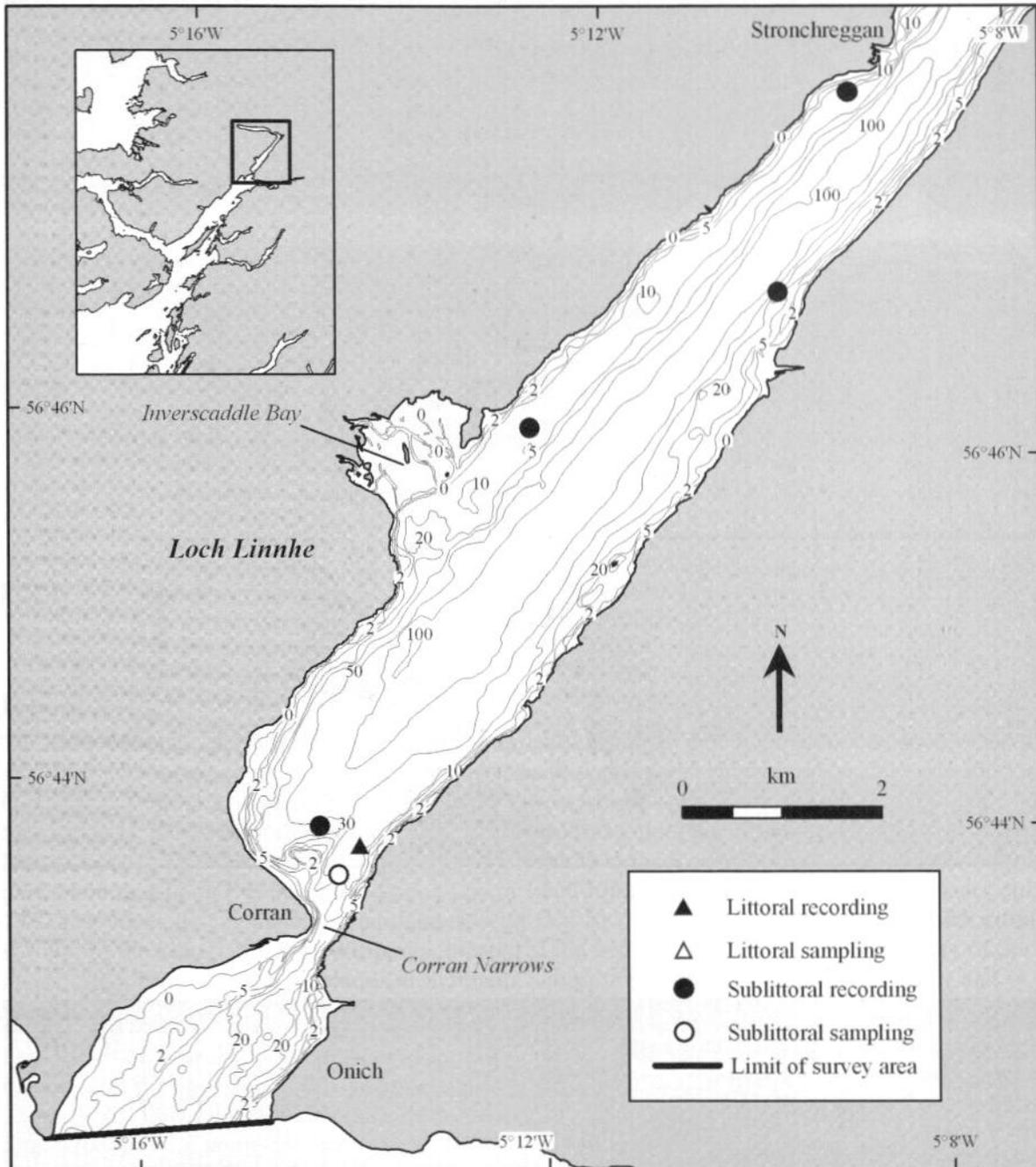


Figure 15.1 Main features of the area, showing sites surveyed.

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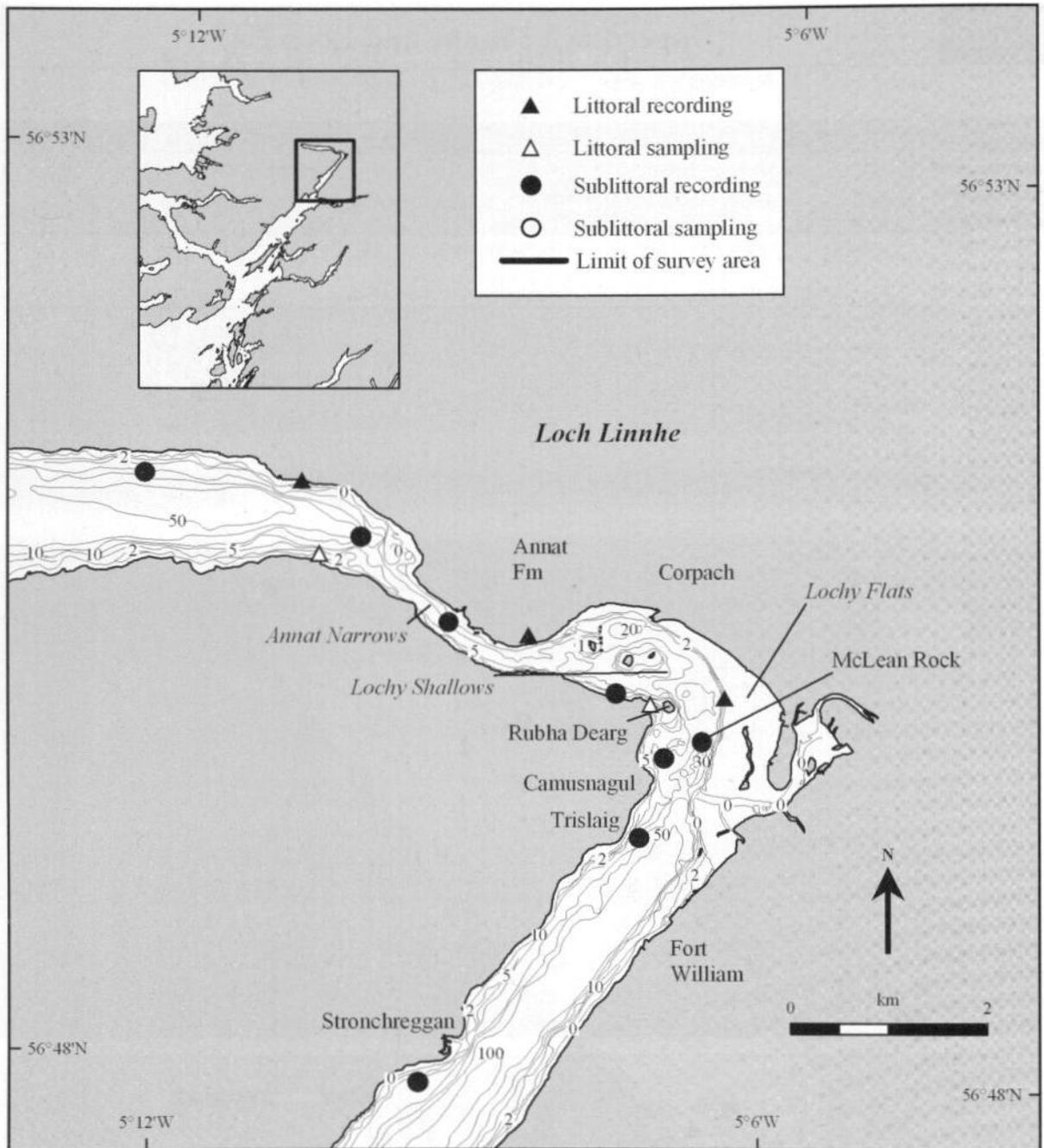


Figure 15.1 (continued)

Physical features

<i>Physiographic type</i>	Fjord with five sills
<i>Length of coast</i>	87.97 km
<i>Length of inlet</i>	29.1 km
<i>Area of inlet</i>	36.4 km ² (HW); 31.7 km ² (LW)
<i>Bathymetry</i>	155.0 m (max)
<i>Wave exposure</i>	Very sheltered to extremely sheltered
<i>Tidal streams</i>	Up to 5 knots through Corran Narrows and Annat Narrows; negligible current in upper loch
<i>Tidal range</i>	3.7 m (springs)
<i>Salinity</i>	Surface: Upper Loch Linnhe varies between 5 & 30 ppt; Loch Eil 20–30 ppt; Bottom: 31–33 ppt in Upper Loch Linnhe; 2 ppt lower in Loch Eil.

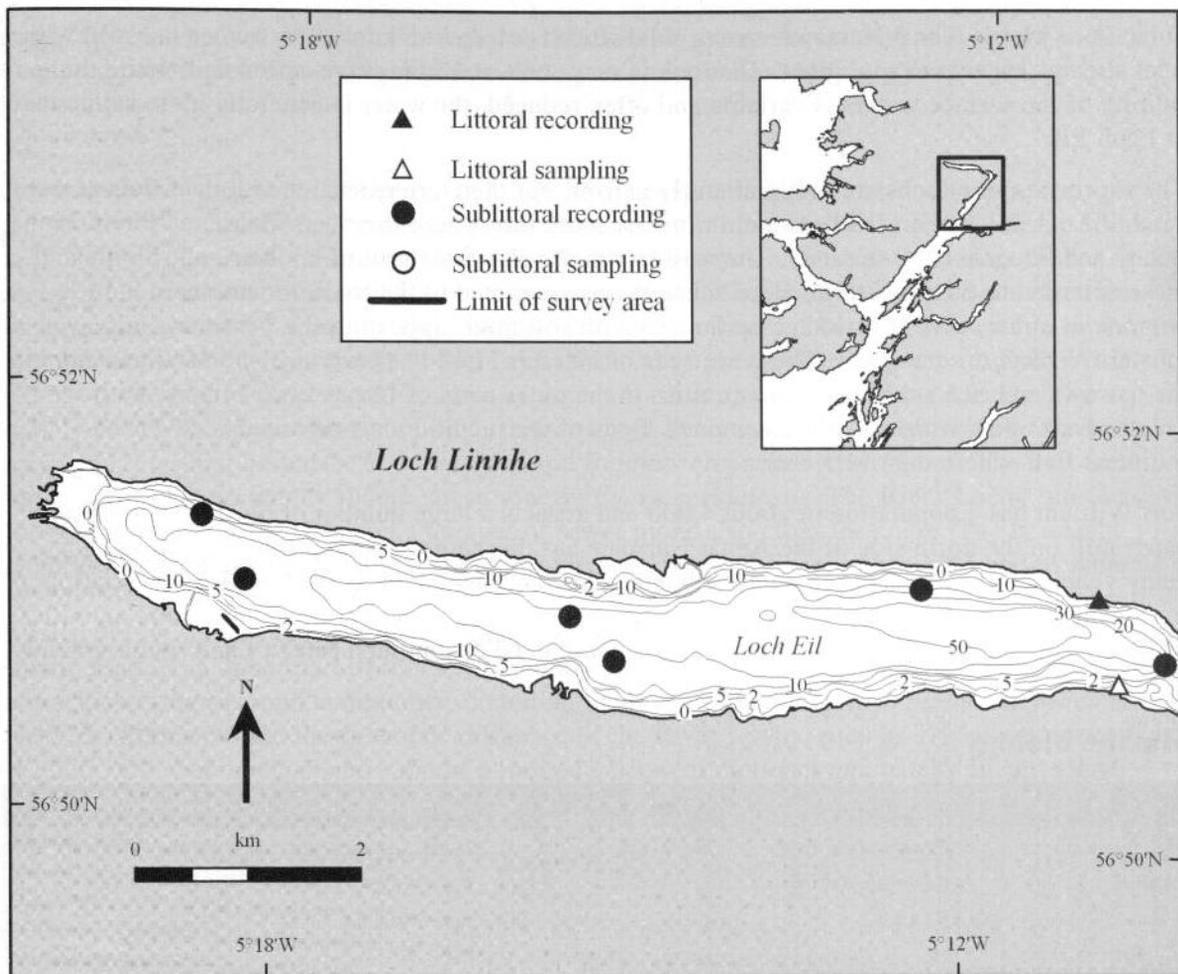


Figure 15.1 (continued)

Introduction

The Loch Linnhe sealoch system lies at the upper end of the Firth of Lorn with the towns of Fort William at its head and Oban at its southern entrance. It forms the submerged western end of the Great Glen Fault, a geological rift which divides the northern from the north-western highlands of Scotland. Loch Eil is an east-west trending arm that joins Upper Loch Linnhe at the Annat Narrows. Loch Linnhe itself is divided into two sections at the Corran Narrows and only the upper part, including Loch Eil, is included here. Lower Loch Linnhe is dealt with in Area Summary No. 13. These lochs lie amongst high mountains, with Ben Nevis, the highest mountain in Great Britain, in the hinterland. Fort William is located at the bend in the loch system and is one of the major urban centres in the highlands of Scotland, supporting both manufacturing industry and tourism.

Loch Eil is effectively an inner basin of Loch Linnhe; its head lies more than 70 km from the Firth of Lorn and the open coast. It is an elongate, U-shaped basin which attains a maximum depth of 71 m. At its seaward end the long, shallow sill at Annat Narrows, which has a minimum depth of 5 m, widens into a complex area of small islets and basins, known as the Lochy Shallows by Corpach and Fort William, before opening into the main basin of Upper Loch Linnhe. Tidal streams run through these narrows at speeds of up to 5 knots but decelerate rapidly either side of the sill; tidal streams within the inner basin are negligible.

Upper Loch Linnhe, itself a deep U-shaped basin of 155 m maximum depth, is separated from the lower loch by the Corran Narrows, a sill which is 12 m deep at its shallowest and most constricted

point. As with the Annat Narrows, strong tidal streams of up to 5 knots flow across this sill, with tidal streams elsewhere negligible. The loch is very sheltered from wave action and, while the salinity of the surface waters is variable and often reduced, the water is generally more saline than in Loch Eil.

The shores in these lochs are predominantly narrow, but there are extensive sediment flats at the head of Loch Eil, at Fort William and in Inverscaddle Bay where the rivers Dubh and Fionn Lìghe, Lochy and Scaddle enter the loch. The majority of the shores consist of boulder and shingle and these extend into the sublittoral. Hard substrata are restricted to the shallows and there is little bedrock in either loch. Both lochs are floored with soft mud supporting sea-pens and Norway lobsters *Nephrops norvegicus*. There are beds of mussels *Modiolus modiolus* and *Mytilus edulis* in the narrows and rich sublittoral communities in the outer parts of Upper Loch Linnhe, with holothurians and a wide range of anemones. Beds of the fucoid *Fucus ceranoides* cover the sediment flats where the rivers enter.

Fort William has a population of about 4,000 and attracts a large number of tourists. A pulp and paper mill on the north side of the Annat Narrows has discharged effluent into the narrows for many years and the effects of this on the benthos have been studied by the Scottish Association for Marine Science (SAMS). The lochs themselves are used for fish farming and leisure activities, while the surrounding hillsides support native woodlands, commercial forestry and rough grazing.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	5	June 1989	Connor (1990)
	Recording	1	Jan 1970–Aug 1978	Smith (1978)
	*Recording (epibiota)	8	May 1980	Smith (1981)
Sublittoral	Recording	1	Jan–Dec 1970	Dipper (1981)
	Recording (epibiota)	17	June 1989	Connor (1990)

*The results of this study were used to prepare the biotope map but the data are not stored on the MNCR database and not shown on the map of sites surveyed.

Littoral

Loch Eil

Most of the shores in Loch Eil are narrow and composed of a mixture of small boulders, cobbles, pebbles and coarse gravelly sediment. Loch Eil is very sheltered from wave action and so in spite of the unstable nature of the substrata, these shores are able to support growths of fucoid algae (AscX, FvesX). The north shore, near to the Annat Narrows, has a greater proportion of small boulders and the knotted wrack *Ascophyllum nodosum* is prevalent on the lower shore (Asc.Asc). At the head of the loch and at points where rivers enter the loch, the shores are wider and composed mainly of gravel flats with narrow and patchy areas of fringing saltmarsh. Smith (1981) recorded the brackish-water winkle *Littorina tenebrosa* in a pool in the saltmarsh where the River Garvan enters the loch.

There is relatively little bedrock in the loch with the exception of the Annat Narrows. This narrow channel is lined by short, very steep or vertical bedrock walls, with dense growths of fucoid algae (Asc.T). Under these conditions of shelter and strong tidal currents, there is often a rich and varied understory of sponges and ascidians. However, the littoral fauna within the narrows is impoverished, and even on the lower shore only the barnacle *Semibalanus balanoides* is common (Fserr.VS), probably as a result of lowered salinity. The sublittoral fringe is characterised by kelps *Laminaria digitata* and *Laminaria hyperborea* in slightly deeper water (Ldig.T). As is the case in

many current-exposed narrows, this replaces the *Laminaria saccharina* normally found in such sheltered conditions. The sponge *Halichondria panicea* occurs abundantly in patches.

Upper Loch Linnhe

As in Loch Eil, the shores of Upper Loch Linnhe are predominantly narrow with a mixed substratum of rocks and sediment. There are a few rocky shores, such as at Rubha Dearg in the approaches to the Annat Narrows. Here steep bedrock supports a community similar to that in the Annat Narrows and dominated by *A. nodosum* (Asc.Asc). Other rocky headlands and stretches occur in the southern half of the loch but have not been surveyed. There are two extensive shingle and sediment areas within the loch. The Lochy Flats, on the east shore adjacent to Fort William, extend for several kilometres and consist of gradually sloping shingle and sand, backed by a cobble ridge. The lower shore supports patchy beds of the mussel *Mytilus edulis* (MytX) with *Fucus serratus* and barnacles *S. balanoides* and *Balanus crenatus* on the stones. The mid and upper shores have a patchy furoid cover, mainly *Fucus vesiculosus*. The River Lochy runs across the southern part of the flats and a number of sewer pipes also cross the shore. The brackish conditions encourage the localised growth of the brackish alga *Fucus ceranoides* and of mussels *M. edulis* and the green alga *Enteromorpha intestinalis* (FcerX). Inverscaddle Bay, on the south-west shore, is another extensive area of brackish sediment flats with a similar furoid cover to the Lochy Flats. The upper part of this bay is muddy and Smith (1981) recorded species indicative of a brackish estuarine mud community, including the bivalves *Scrobicularia plana* and *Macoma balthica*. Shores within the sphere of influence of the River Lochy, such as Trislaig opposite Fort William, are also brackish and support a limited variety of molluscs and patchy furoid algae.

Sublittoral

Loch Eil

Sublittoral areas of Loch Eil are predominantly sedimentary. In general the gently sloping rock and sediment shores continue into the sublittoral, where a mixture of kelp *L. saccharina* and dense stands of bootlace weed *Chorda filum* predominates (LsacX). Filamentous red algae are also common and are found attached to shells and stones. The algae become progressively less common with increasing depth, and by 5 to 15 m depth heavily silted circalittoral boulders and cobbles are colonised mainly by hydroids, especially *Eudendrium* spp., ascidians *Asciidiella aspersa* and small patches of sponges. The muddy sand between the boulders and cobbles supports clumps of the horse mussel *Modiolus modiolus* and terebellid worms (ModHAs, ModHo). Where the sediment component of these shallow mixed areas predominates, the large clam *Arctica islandica* is also very common, along with brittlestars *Amphiura* spp. (ModHo). The substratum becomes progressively muddier with increasing depth and pebbles and cobbles gradually peter out. These deeper muddy sediments, below 15 to 20 m depth, support a community of sea-pens *Virgularia mirabilis* and *Pennatulula phosphorea* and are dotted with the burrows of the Norway lobster *Nephrops norvegicus* and the burrowing goby *Lesueurigobius friesii*, which can be recognised by its beautiful yellow spots (SpMeg). Brittlestars, mainly species of *Ophiura*, are common on the mud and make a dense cover over the surface in some areas. The large anemone *Pachycerianthus multiplicatus* is present at some sites but the tall sea-pen *Funiculina quadrangularis* has not been recorded, although it may be present in the deepest unsurveyed areas of the loch.

As well as the site-specific records described above, a considerable volume of data on the benthos of the sediments exists for this loch and Upper Loch Linnhe. This work was carried out by the Scottish Association for Marine Science (SAMS) at Dunstaffnage between 1963 and 1982 (Pearson 1970, 1971a and b, 1975, 1982; Pearson *et al.* 1986). These studies were centred on the effects of effluent discharge from a pulp and paper mill sited on the northern shore of the Annat Narrows. Changes in the status of benthic communities in the area were studied from three years before effluent discharge started, to two years after the mill closed and discharge stopped. The results are summarised in Connor (1990).

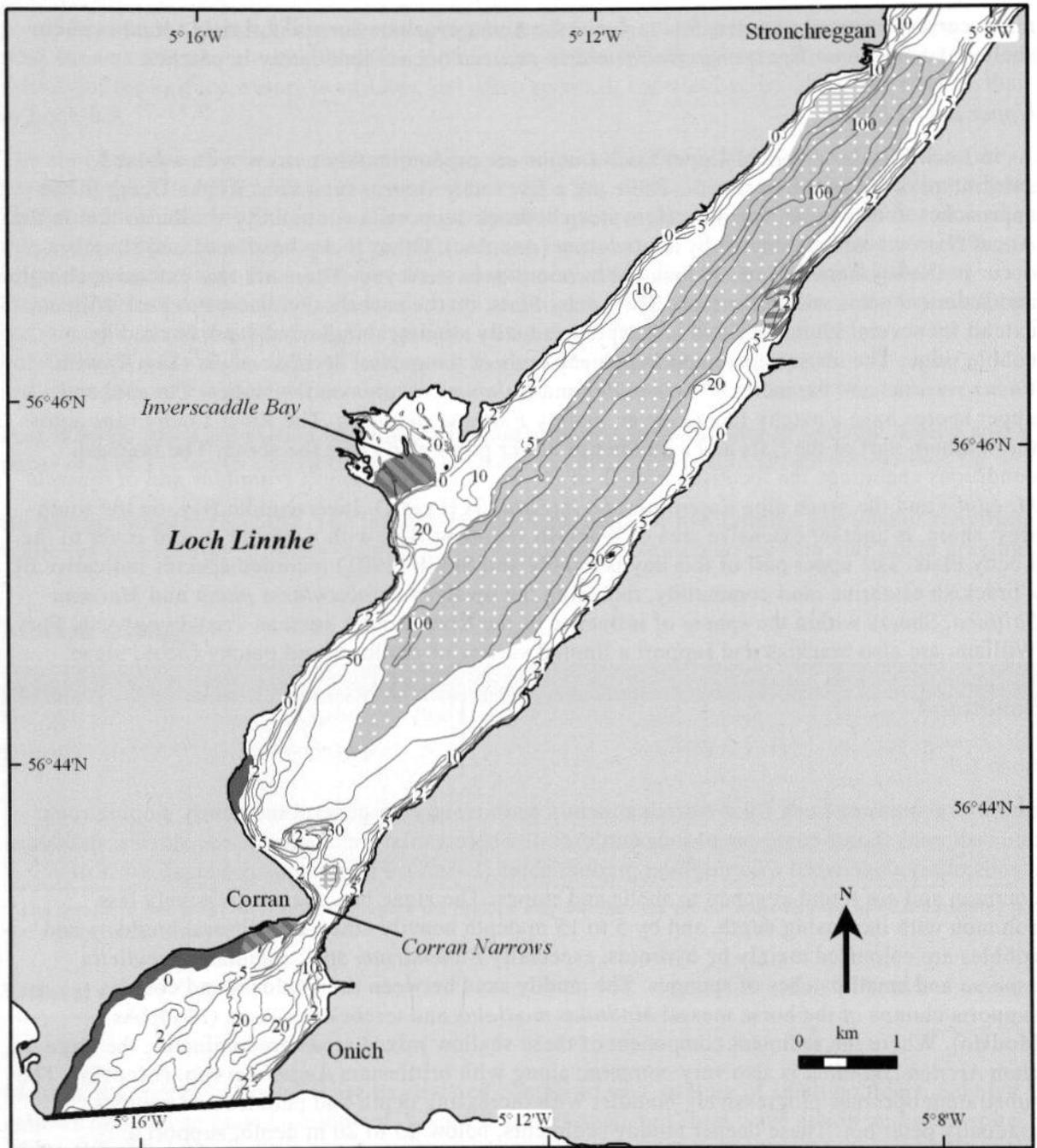


Figure 15.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 15.1, cited literature and additional field observations).

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Circular littoral bedrock is almost completely absent from Loch Eil, with the notable exception of a site off Dorothy Stone on the south shore, in the approaches to the Annat Narrows. An outcrop of bedrock between 16 and 24 m depth provides silty vertical faces where a beautiful community of anemones *Protanthea simplex* and fanworms *Sabella pavonina* thrives (NeoPro). The brachiopod *Neocrania anomala* is also common. Off the north shore, also in the approaches to the narrows, there are strong tidal currents and a dense bed of the horse mussel *M. modiolus* is present amongst boulders and cobbles from about 7 to 15 m depth (ModT). The *Modiolus* beds and the rocks provide a foothold for hydroids, including *Tubularia indivisa* and *Diphasia rosacea*, which thrive

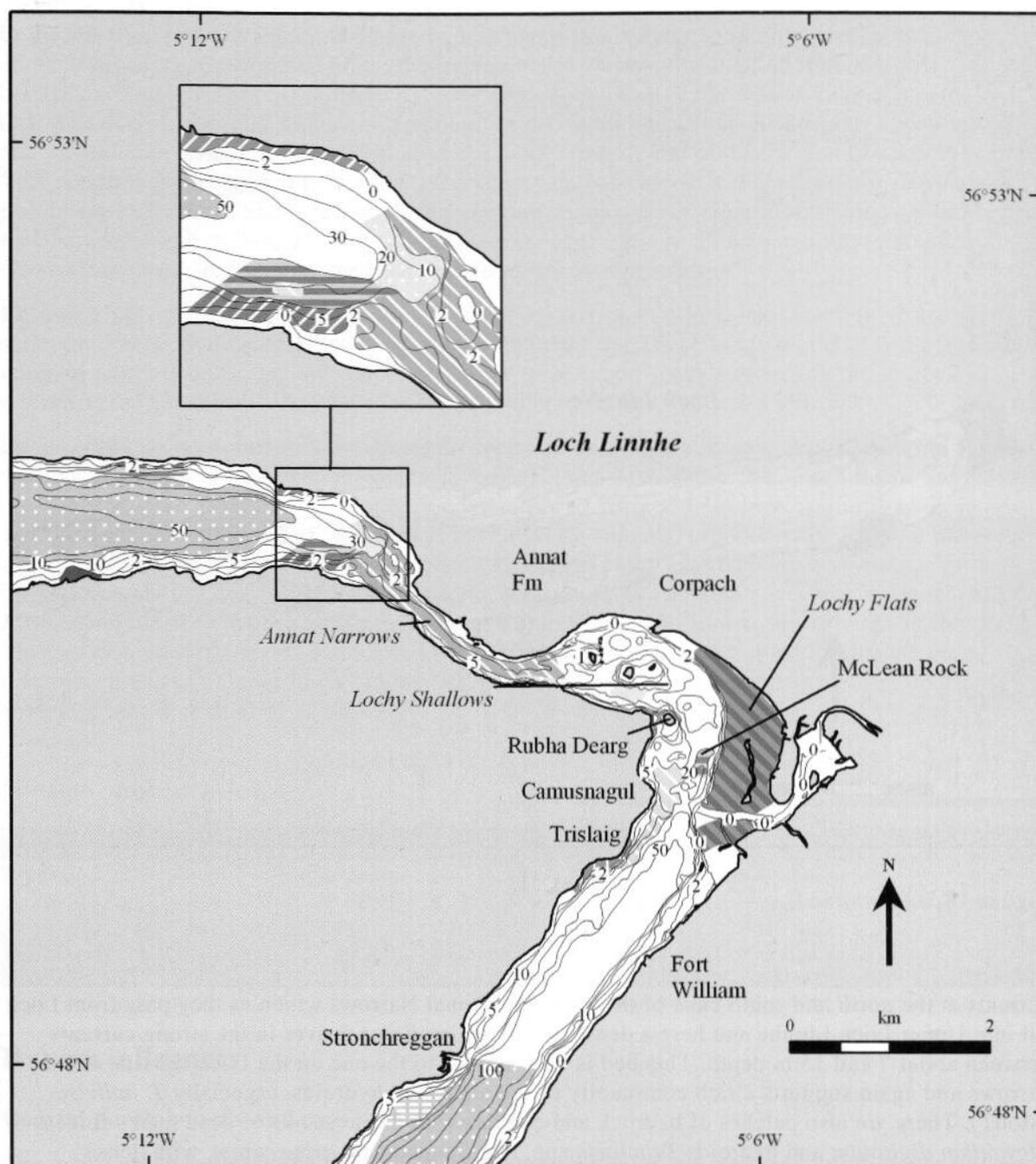


Figure 15.2 (continued)

in the current. In the shallower parts of the habitat, the bed is densely covered by foliose red algae. The sublittoral within the narrowest section of the narrows extends only to around 6 m depth. The bottom is fairly flat, consisting of a mixture of cobbles and boulders. The larger boulders support kelp *L. hyperborea*, while the smaller boulders and cobbles are densely covered by barnacles *B. crenatus* and small mussels *M. edulis* (KTX). This habitat is also present in shallow water above the tide-exposed *Modiolus* beds in the approaches to the narrows.

Upper Loch Linnhe

Although longer and deeper than Loch Eil, Upper Loch Linnhe is similar to it in that there is relatively little hard substratum in the sublittoral. The exceptions are the areas of strong tidal

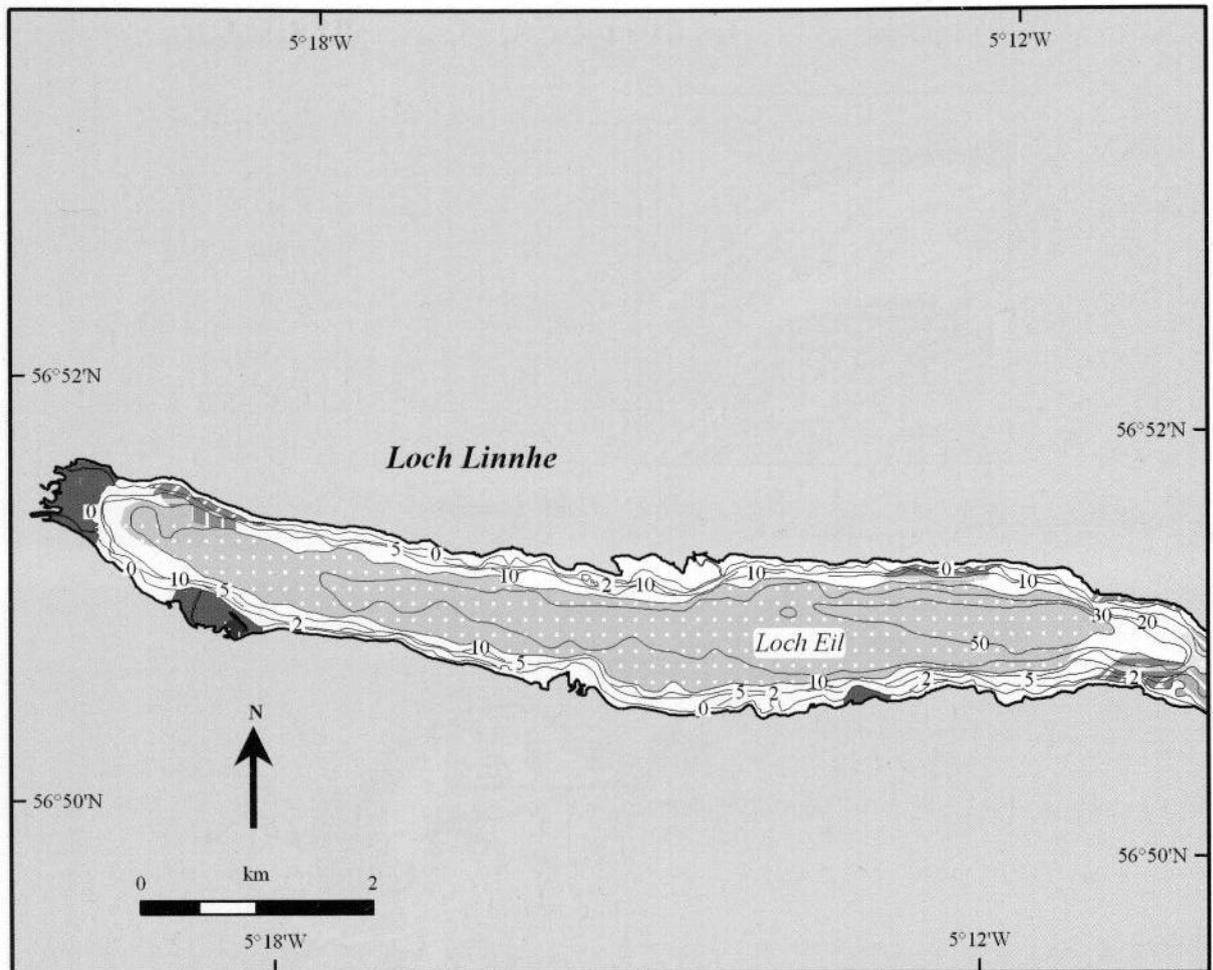


Figure 15.2 (continued)

currents at the north and south ends of the loch. The Annat Narrows widen as they pass from Loch Eil into Upper Loch Linnhe and here a dense bed of *M. modiolus* thrives in the strong currents between about 7 and 15 m depth. This bed is very similar to the one on the Loch Eil side of the narrows and again supports a rich community of red algae and hydroids, especially *T. indivisa* (ModT). There are also patches of bedrock and cobbles with dense stands of dead man's fingers *Alcyonium digitatum* and hydroids *Tubularia* spp. and *Eudendrium arbusculum*, with dense barnacles *B. crenatus* forming an understorey (BalHpan). Small outcrops of circalittoral bedrock are present at around 20 m depth, in the vicinity of McLean Rock off Fort William, where there is still an appreciable current. Unlike the circalittoral rock faces on the Loch Eil side of the Annat Narrows, neither *P. simplex* or *N. anomala* are present. However, the rock supports hydroids similar to those found in the Narrows, the plumose anemone *Metridium senile* and the large barnacle *Balanus balanus* (AmenCio.Met). At the south end of Upper Loch Linnhe, near the Corran Narrows, tidal streams are again strong and kelp *L. hyperborea* is present in the north entrance to the narrows (Lhyp.Ft) and on top of the submerged Corran Shoal. At the latter site the *L. hyperborea* is mixed with *L. saccharina* on scattered boulders and cobbles on shelly sand (K), and in slightly deeper water below 10 m depth, there is a dense brittlestar bed of *Ophiothrix fragilis*, on the inside of this shoal, overlying cobbles and pebbles.

Away from these current-exposed sites there is little in the way of sublittoral rock. Along the edges of the loch, shores of mixed sediment and stones merge gradually into the shallow sublittoral, where the sediments are overlain by stones, and dense growths of *L. saccharina*, *C. filum* and filamentous algae thrive, attached to cobbles and pebbles (LsacX). This is very similar

to the situation in Loch Eil. Also similarly, this algal-dominated community gives way below about 10 m depth to clumps of *M. modiolus*, terebellid worms, the clam *A. islandica* and brittlestars *Amphiura* spp. (ModHo). At many sites throughout the loch, this habitat is also characterised by a variety of burrowing holothurians, including *Psolus phantapus*, *Thyone fusus* and *Thyonidium commune*. These holothurians were rarely found in this habitat in Loch Eil and such populations are known from only a few other Scottish sealochs. This habitat is particularly rich inshore of Corran Shoal, where the uncommon anemones *Aureliania heterocera*, *Sarcodictyon roseum*, *Halcampa chrysanthellum* and *Edwardsia claparedii* are all frequent, the tubeworm *Owenia fusiformis* is common and many molluscs are also present.

In some areas, such as the small bay on the west coast opposite the Lochy Flats, there are shallow sandy sediments that lack the cover of pebbles and cobbles. These sandy plains of firm, fine sandy mud are rather nondescript and support a variety of common species including the sea-pen *V. mirabilis*, the anemone *Cerianthus lloydi* and the large clam *A. islandica* (VirOph).

Deep sediments predominate throughout the loch and consist of soft mud extending up to as shallow as 13 m at some sites, but generally below about 20 m depth. These sediments are typical of deep, sheltered sealochs and support a community of sea-pens *V. mirabilis* and *P. phosphorea* and brittlestars *Amphiura* spp. The mud is burrowed by animals, especially the Norway lobster *N. norvegicus* and the burrowing goby *L. friesii* (SpMeg). These sediments are very similar to the deep sediments in Loch Eil. However, in some areas, notably just south of Stronchreggan, the tall *F. quadrangularis* is the predominant sea-pen, forming beautiful forests in the mud (SpMeg.Fun). This sea-pen does not seem to occur in Loch Eil but may well be widespread in the deeper unsurveyed parts of Upper Loch Linnhe. At Stronchreggan, this biotope is present in unusually shallow water of around 15 m depth.

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Ach an Tobhair	SSSI	NN 092 717	Botanical; woodland backing onto shore
Doire Donn	SSSI, SWT Reserve	NN 054 705	Botanical, entomological; woodland backing onto shore

Human influences

Coastal developments and uses

The major urban centre in the area is Fort William (population c.4,000) and its adjoining villages, including Corpach, and this is one of the largest centres of population in the highlands of Scotland. There is a village at Corran with a car ferry across the loch, and scattered buildings around both lochs, with roads fringing the entire shoreline.

Fort William is a major residential and tourist site and includes an aluminium works, a carbon works, a commercial diver training centre, a distillery and numerous hotels. A pulp mill at Corpach, which was at one time a major employer in the area, was still operational in 2001. Its effluent discharges had a consented daily flow of 19,000 m³ and the effects of this on the marine benthos were the subject of considerable research.

Despite the urbanisation around Fort William, much of the area remains relatively unspoilt and undeveloped and the town is a major stopping-off point for tourists and travellers in the region. There are camp sites at Corran and on the outskirts of Fort William and visitor centres in Fort William. Ben Nevis, the highest mountain in Great Britain, lies behind the town and attracts a large number of walkers and climbers to the area, and on the strength of this the Loch Eil Outward Bound Centre is located to the west of Fort William on the shores of Loch Eil. Large tracts of land

are now forested and Forestry Enterprise is one of the major employers in the area. However, the majority of the high hills remain as open moorland and these are used for rough grazing or managed for game-shooting.

Marine developments and uses

There are a number of salmon *Salmo salar* farms in the area. Some creeling for lobsters *N. norvegicus* takes place on the soft mud and for other crustaceans around the rocky inshore areas.

Corpach lies at the entrance to the Caledonian Canal and is something of a minor port, with facilities for loading and unloading ships off the island of Eilean nan Craobh. Yachting is a very popular activity in the area and wind-surfing and canoeing also take place. The Underwater Centre at Fort William undertakes diver training and has extensive facilities for this, including a large barge moored on the loch which is used as a diving platform. A passenger ferry runs between Fort William and Camusnagaul on the opposite bank, and a car ferry runs across the Corran Narrows. There are a number of small jetties, slipways and moorings for local boats around the loch shores.

The lochs are popular for yachting; there is a yacht harbour at Fort William and a number of anchorages are available in the area. Wildlife cruises are also run from the town.

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Sites surveyed

Survey 6: 1988–89 MNCR Loch Linnhe survey (Connor 1990).

Survey 63: 1970s Ridley north-west Scotland sublittoral photographic survey (Dipper 1981).

Survey 84: 1978 Smith west Inverness-shire & north Argyll littoral survey (Smith 1978).

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
6	6	NE of Dorathy Stone, Loch Eil	NN 060 780	56°51.2'N 05°10.9'W	AscX, FvesX, Pel
6	7	Dorathy Stone, Loch Eil	NN 061 772	56°50.8'N 05°10.7'W	LsacX, ModHo, NeoPro, LsacX
6	9	W end of Annat Narrows, Loch Eil	NN 082 764	56°50.4'N 05°08.6'W	YG, Fspi, Asc.T, Fserr.VS, Ldig.T, Pel
6	12	Rubha Dearg, Upper Loch Linnhe	NN 095 757	56°50.0'N 05°07.3'W	YG, Ver.Ver, Fspi, Asc.Asc, Asc.VS, Pel
6	15	Lochy Flats, Fort William, Upper Loch Linnhe	NN 102 758	56°50.1'N 05°06.6'W	FvesX, FcerX, MytX
84	11	Manse Hole, Loch Linnhe	NN 022 642	56°43.7'N 05°14.0'W	LMU

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
6	1	Kinlocheil, Loch Eil	NM 980 787	56°51.4'N 05°18.7'W	LsacX, ModHAs, PhiVir
6	2	NW of South Garvan, Loch Eil	NM 984 782	56°51.1'N 05°18.3'W	SpMeg
6	3	N of Duiskey, Loch Eil	NN 017 775	56°50.8'N 05°15.1'W	SpMeg
6	4	Central Loch Eil	NN 013 778	56°51.0'N 05°15.5'W	SpMeg
6	5	N shore, W of Outward Bound Centre, Loch Eil	NN 044 781	56°51.2'N 05°12.4'W	SpMeg, FaMx, ModHo, ModHAs, LsacX
6	7	Dorathy Stone, Loch Eil	NN 061 772	56°50.8'N 05°10.7'W	LsacX, ModHo, NeoPro
6	8	NW of Annat Narrows, Loch Eil	NN 066 774	56°50.9'N 05°10.3'W	Lsac.T, ModT, ModHo
6	10	Annat Narrows, Loch Eil	NN 074 765	56°50.4'N 05°09.4'W	Lsac.T
6	11	NW of Rubha Dearg, Upper Loch Linnhe	NN 091 758	56°50.1'N 05°07.6'W	ModT, BalHpan
6	12	Rubha Dearg, Upper Loch Linnhe	NN 095 757	56°50.0'N 05°07.3'W	YG, Ver.Ver, Fspi, Asc.Asc, Asc.VS, Pel
6	13	S of New Rock, Fort William, Upper Loch Linnhe	NN 096 751	56°49.7'N 05°07.1'W	VirOph
6	14	E of McLean Rock, Fort William, Upper Loch Linnhe	NN 100 753	56°49.8'N 05°06.8'W	AmenCio, ModHo
6	16	Rubha Mòr, Trislaig, Upper Loch Linnhe	NN 094 743	56°49.3'N 05°07.4'W	VirOph, Lsac.T
6	17	W of Achadh an Todhair Hill, Upper Loch Linnhe	NN 071 718	56°47.9'N 05°09.5'W	SpMeg.Fun, NeoPro
6	18	N of Callas na Dallaig, Upper Loch Linnhe	NN 064 698	56°46.8'N 05°10.1'W	SpMeg, LsacX, ModHo, FaMx, LsacX
6	19	Victorious Rock, Upper Loch Linnhe	NN 039 684	56°46.0'N 05°12.5'W	SpMeg, ModHo, FaMx

Sublittoral sites – continued

<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotopes recorded</i>
6	20	W Corran Shoal, Upper Loch Linnhe	NN 018 644	56°43.8'N 05°14.4'W	K, Oph, ModHo
63	11	Corran ferry, Upper Loch Linnhe	NN 020 640	56°43.5'N 05°14.1'W	Lhyp.Ft

Compiled by: F.A. Dipper, C.M.Howson and D. Steele

16

Loch Aline

Location

<i>Position (centre)</i>	NM 685 455	56°33'N 5°45.5'W
<i>Administrative area</i>	Highland (Lochaber)	
<i>Conservation agency/area</i>	Scottish Natural Heritage	West Highland Areas

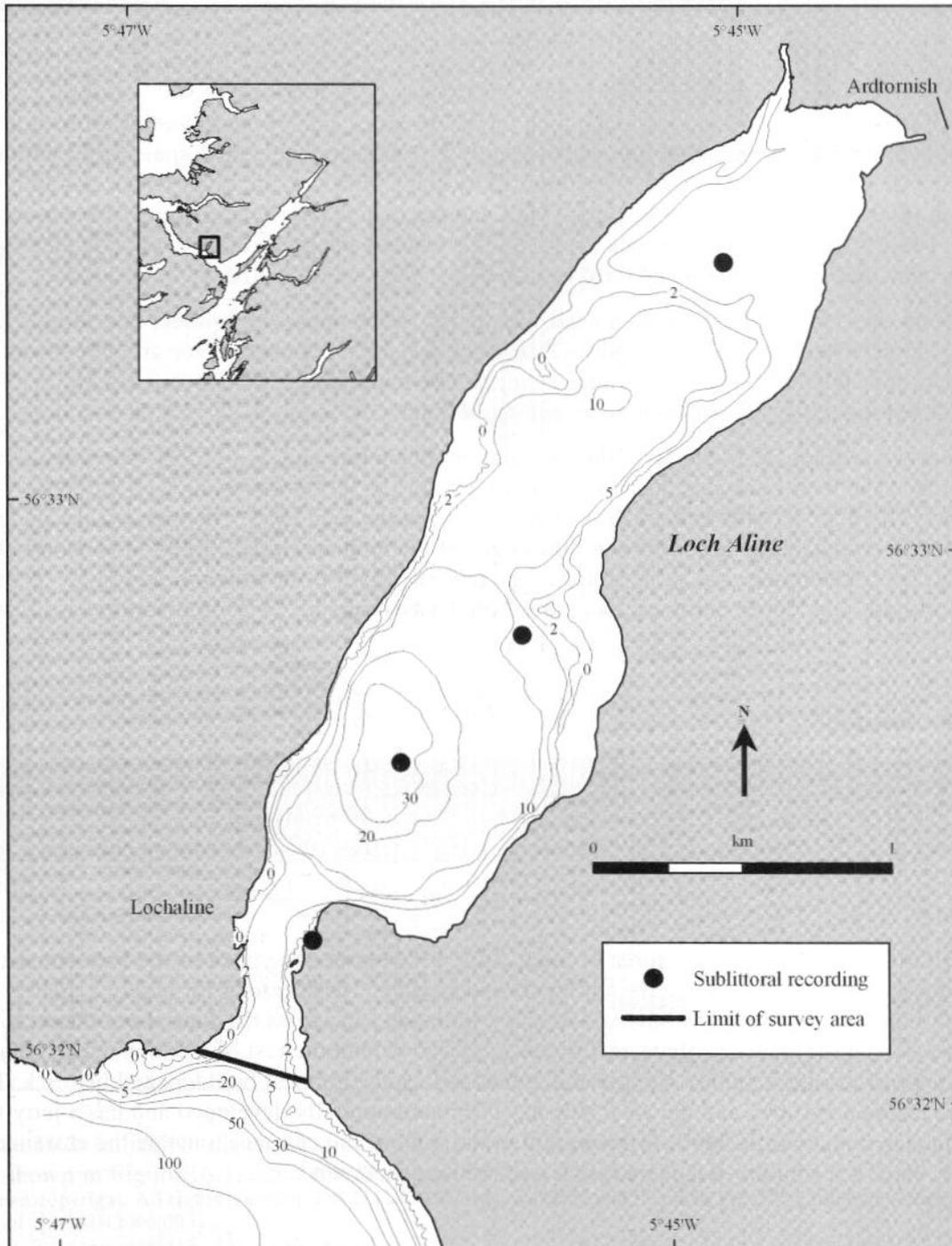


Figure 16.1 Main features of the area, showing sites surveyed.

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Physical features

<i>Physiographic type</i>	Fjord with one sill
<i>Length of coast</i>	10.03 km
<i>Length of inlet</i>	3.5 km
<i>Area of inlet</i>	2.3 km ² (HW); 1.5 km ² (LW)
<i>Bathymetry</i>	42.0 m (max)
<i>Wave exposure</i>	Very sheltered to extremely sheltered
<i>Tidal streams</i>	Moderately strong tides across outer entrance and through the narrows; some residual flow in the main basin
<i>Tidal range</i>	Springs: 3.5 m; neaps: 1.4 m (Loch Aline)
<i>Salinity</i>	Reduced; third most brackish sealoch in Scotland

Introduction

Loch Aline is a small but relatively deep loch on the Morvern side of the Sound of Mull. It is a fjord with a narrow entrance channel, which is only 2–3 m deep, and a deep inner basin with a maximum depth of 42 m. The loch is surrounded by steep hills and, although its narrow entrance faces south, it is sheltered by the Island of Mull and the loch is thus very sheltered from wave action. The Rivers Aline and Rannoch drain into the head of the loch across a wide, muddy shingle bank and Loch Aline is the third most brackish sealoch in Scotland.

Apart from the shingle flat at the loch head, the shores are composed of boulder and shingle slopes. There is steep littoral and sublittoral bedrock outside the loch entrance and tide-swept kelp forest on rock and boulder in the entrance channel. The main basin of the loch is floored with soft mud, supporting sea-pens, sea cucumbers and nudibranchs.

There are two settlements located on the loch shores, Lochaline and Ardtornish. The village of Lochaline at the loch's entrance has a hotel and piers for the ferries to Oban, Mull and the Hebrides. There are a castle and gardens at Ardtornish at the loch head. The loch is surrounded by woodland, with deciduous woods around the edges of the loch and large coniferous plantations in the hinterland. Lochaline sand mine supplies the raw material for the production of high-quality sands for glass-making. In addition, there are shore based 'cage net' washing facilities for fish farms.

Marine biology**Marine biological surveys**

	<i>Survey methods</i>	<i>No. of sites</i>	<i>Date(s) of survey</i>	<i>Source</i>
<i>Sublittoral</i>	Recording (epibiota)	4	June 1988	Connor 1990

Littoral

No detailed information on the shores in Loch Aline is available. The head of the loch consists of very extensive flats of mixed muddy sediments and shingle. These extend for nearly a quarter of the total length of the loch. The Rivers Aline and Rannoch run across the flats along the west side and there is a considerable freshwater influence. Shores around the rest of the loch consist mainly of flat or gently sloping muddy shingle and stones with some areas of boulders and bedrock. The entrance channel is rocky and the west side has been commercially developed and has a jetty from which ferries run across to Mull. Immediately to the west of the entrance, outside the entrance channel, there is a small well-known beach with white quartz sand.

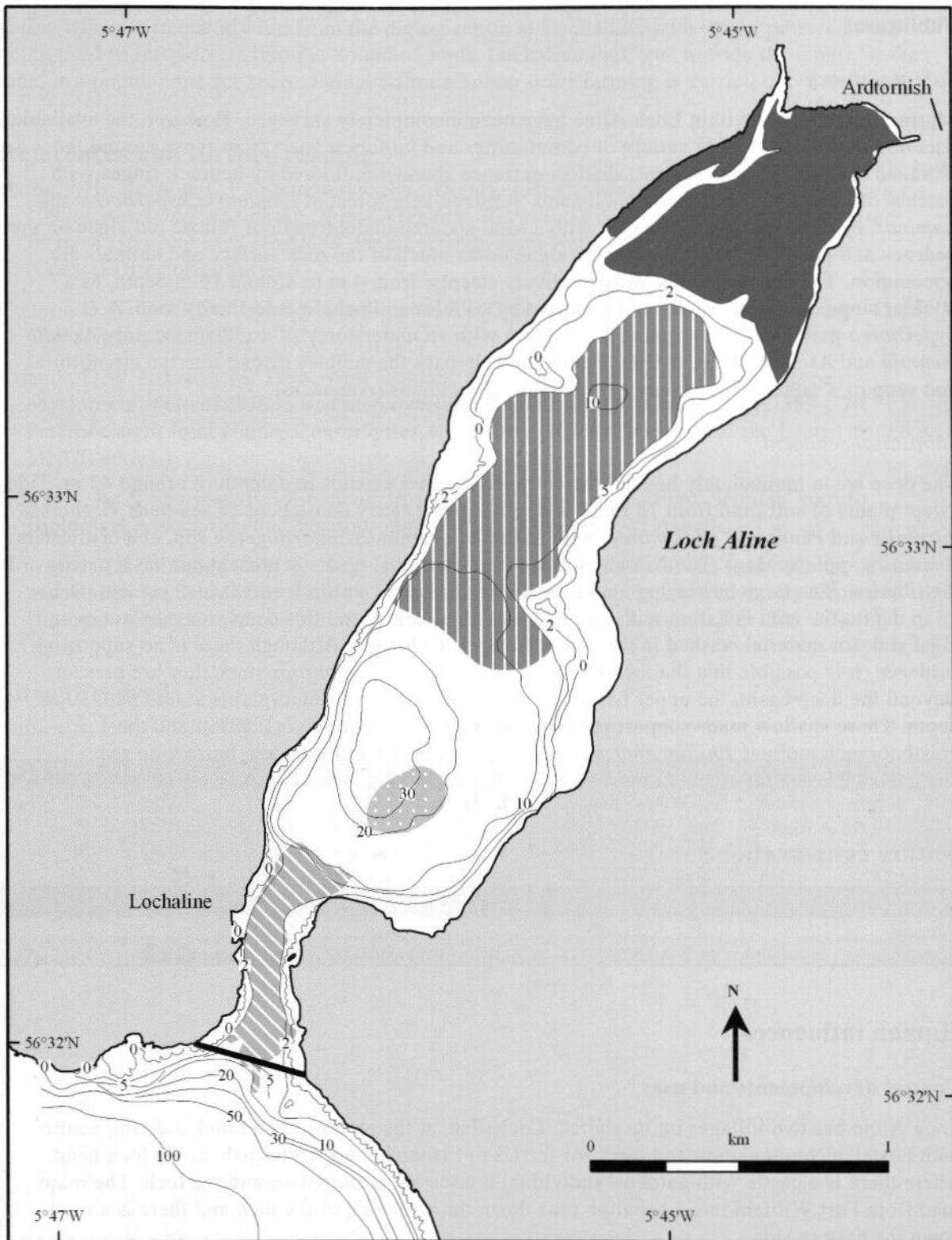


Figure 16.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 16.1, cited literature and additional field observations).

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Sublittoral

Sublittoral rock

Marine communities within Loch Aline have been incompletely surveyed. However, the available data do not indicate a wide variety of communities and biotopes, apart from those around the entrance channel. The tide-swept, shallow entrance channel is floored by bedrock ridges with patches of boulders, cobbles and shell-sand. A mixed kelp forest of *Laminaria hyperborea* and *Laminaria saccharina* predominates, with a sand-scoured undergrowth of foliose red algae on the bedrock and pebbles (MIR). Encrusting algae cover much of the rock surface and animals are uncommon. The channel drops away relatively steeply, from 4 m to around 16 m depth, as a boulder slope on muddy shell-sand followed by cobbles and pebbles and finally mud. A *L. hyperborea* park extends to around 11 m depth with an understorey of ascidians, mainly *Ascidia mentula* and *Ascidiella* spp. (MIR). Below the kelp park the cobbles extend into the circalittoral and support a rather sparse fauna with clumps of ascidians (AmenCio).

Sublittoral sediment

The deep basin immediately beyond the entrance channel extends to a depth of around 42 m. Tide-swept plains of soft mud from 18 to 28 m depth support fairly dense beds of sea-pens *Virgularia mirabilis* and *Pennatula phosphorea*, with scattered anemones *Sagartiogeton* spp. and brittlestars *Amphiura* spp. (SpMeg). The Norway lobster *Nephrops norvegicus* is present but has a patchy distribution. The large burrowing anemone *Pachycerianthus multiplicatus* is also present. Below 28 m depth, the mud is barren with quite a lot of algal debris and this deep area may act as an algal sink for material washed in through the entrance channel. Although there is no supporting evidence, it is possible that the loch may also be dredged for *Nephrops* since they are present. Beyond the deep basin, the upper part of the loch consists of soft mud-plains at less than 10 m depth. These shallow muds support patchy *V. mirabilis* with *Ascidiella aspersa* and the opisthobranch mollusc *Philine aperta* (PhiVir). Near the head of the loch, burrowing sea cucumbers *Thyone fusus* and *Leptopentacta elongata* are common.

Nature conservation

Conservation sites

Site name	Status	Location	Main features
Loch Aline	SSSI	NM 686 448	Botanical, geological

Human influences

Coastal developments and uses

Loch Aline has two villages on its shores: Lochaline, at the mouth, has a hotel, a diving centre with hostel accommodation and piers for ferries to Fishnish; and Ardtornish, at the loch head, where there is a castle with gardens. Individual houses are scattered around the loch. The main road from Fort William into Lochaline runs down the west side of the loch and there is a track down the eastern side.

Silica sand is extracted from the area by Tilcon – Mortar and Special Products.

The loch is surrounded by woodland, with deciduous woods around the edges of the loch and extensive tracts of coniferous plantation in the hinterland.

Marine developments and uses

A ferry runs between the commercial jetty at Loch Aline and Fishnish on Mull. This jetty is also used by leisure craft and there are anchorages available just inside the mouth of the loch. Scuba-

diving trips are frequently run from the diving centre at Lochaline, with small, powered craft being used to ferry divers into the Sound of Mull. Lochaline Pier, just outside the mouth of the loch, is a popular site for shore diving. Salmon *Salmo salar* farming is carried out in the loch.

References and further reading

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- Howson, C.M., Connor, D.W. & Holt, R.H.F. 1994. The Scottish Sealochs – an account of surveys undertaken for the Marine Nature Conservation Review. (Contractor: University Marine Biological Station, Millport). *Joint Nature Conservation Committee Report*, No. 164.

Sites surveyed

Survey 6: 1988–89 MNCR Loch Linnhe survey (Connor 1990).

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
6	79	NW of Kyle Point, Loch Aline	NM 682 447	56°32.2'N 05°46.2'W	AmenCio, Lsac.T
6	80	SW of Sgeir nam Baig, Loch Aline	NM 685 453	56°32.5'N 05°45.9'W	SpMeg
6	81	W of Sgeir nam Baig, Loch Aline	NM 689 457	56°32.8'N 05°45.5'W	PhiVir
6	82	E of Sgeirean nan Ron, Loch Aline	NM 695 469	56°33.5'N 05°45.0'W	PhiVir

17

Loch Sunart and Loch Teacuis

Location

Position (centre)	NM 570 580	56°40'N 05°55'E
Administrative area	Highland	Lochaber
Conservation agency/area	Scottish Natural Heritage	West Highland North Areas (West Highland)

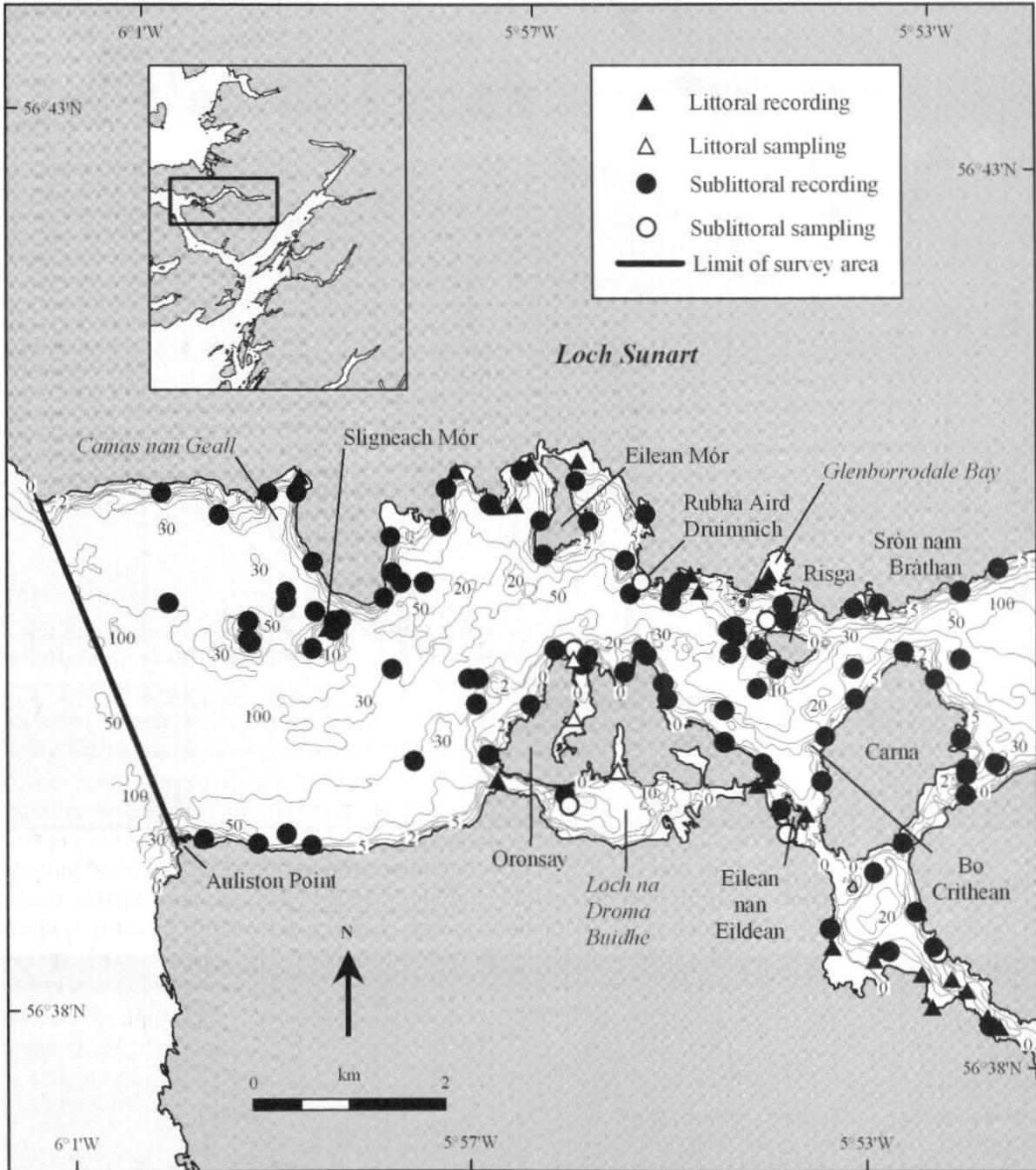


Figure 17.1 Main features of the area, showing sites surveyed.

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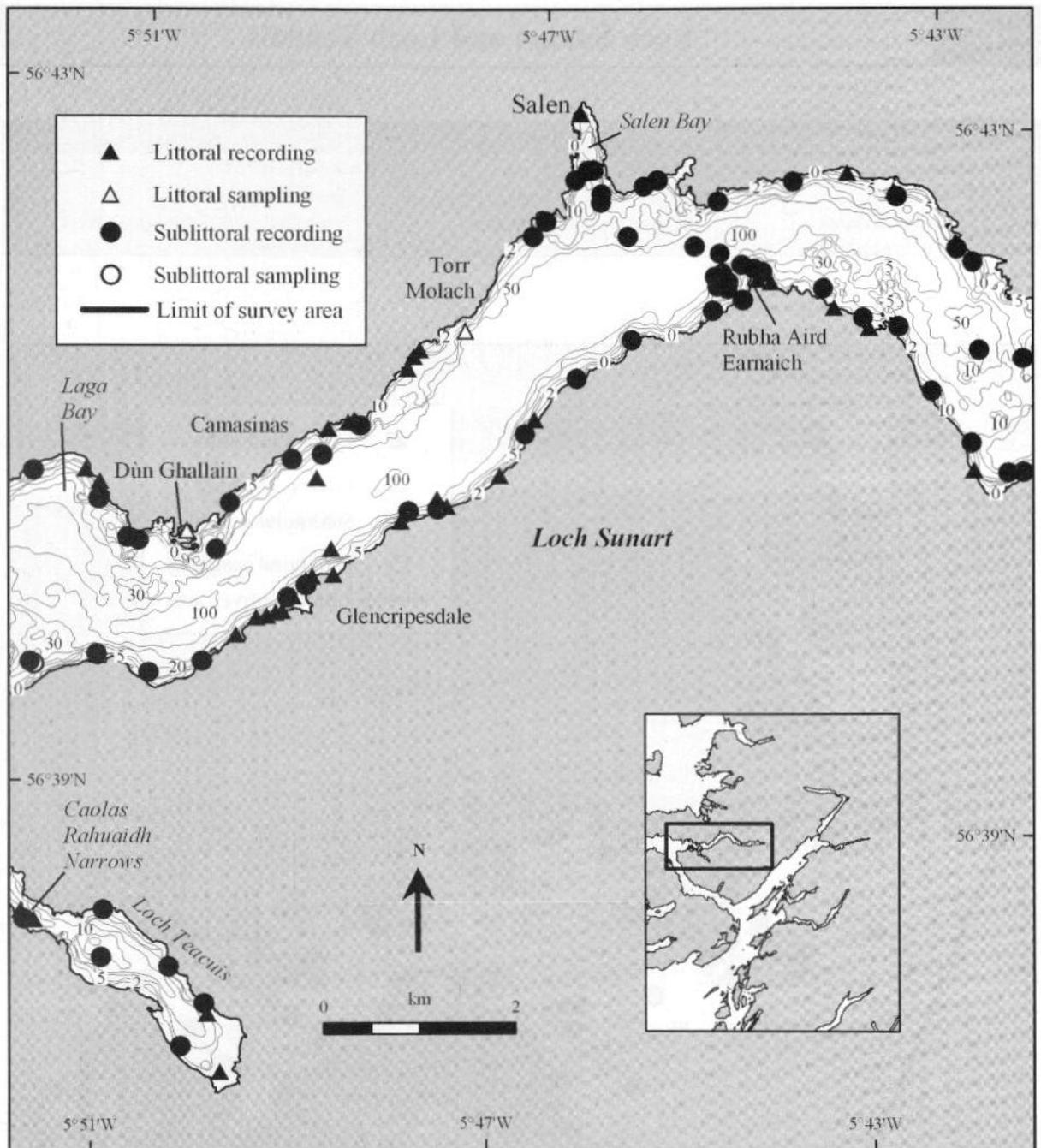


Figure 17.1 (continued)

Physical features		
	<i>Loch Sunart</i>	<i>Loch Teacuis</i>
<i>Physiographic type</i>	Fjordic sealoch	Fjordic sealoch
<i>Length of inlet</i>	37 km (max)	5.8 km
<i>Length of coast</i>	—	—
<i>Area of inlet</i>	54.1 km ² ; 6.8 km ² (intertidal)	3.2 km ² ; 1 km ² (intertidal)
<i>Bathymetry</i>	124 m max. depth	31 m max. depth
<i>Wave exposure</i>	Moderately exposed to extremely sheltered	Extremely sheltered
<i>Tidal streams</i>	Strong to negligible	Moderate to negligible
<i>Tidal range</i>	4.0 m (mean springs); 1.7 m (mean neaps) (Salen)	
<i>Salinity</i>	Fully marine to brackish	

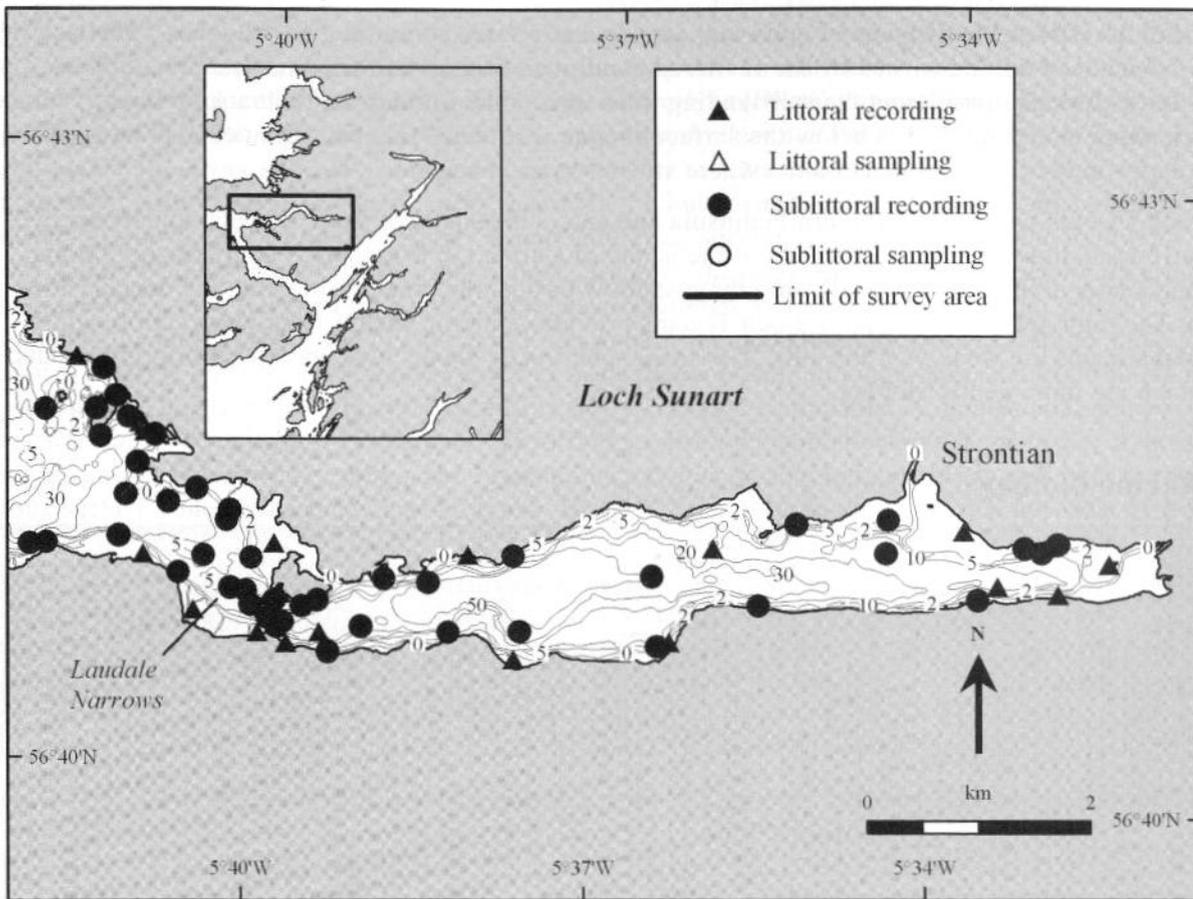


Figure 17.1 (continued)

Introduction

Loch Sunart lies between the Ardnamurchan and Morvern Peninsulas on the west coast of Scotland, and opens into the northern end of the Sound of Mull. It is a narrow fjordic sealoch and, at 31 km (maximum) in length, is the second-longest sealoch in Scotland. This deep, steep-sided loch has a complex bathymetry; a series of five sills divide the loch into six basins, the deepest being the central basin with a maximum depth of 124 m. There is no sill at the mouth of the loch, so water exchange with the Sound of Mull is unrestricted. In geological terms, the whole area is a mixture of igneous and metamorphic rock, and is discussed in more detail in Davies (1990). Steeply-sloping rocky shores give way to shallow sublittoral habitats of predominantly steeply-sloping bedrock and boulders, with sediment in deeper water and in sheltered bays. Sediment plains extend from the rock/sediment interface around the loch to fill the deepest parts of each basin. For the most part this interface occurs at about 20–30 m depth, but often occurs deeper, especially towards the mouth of the loch; occasionally the sediment extends into shallow water and onto the shore in the more sheltered embayments. The most widespread sediment type is a mixture of muddy sands and shelly gravels which give way to plains of fine soft muds in deeper water (between 20 and 30 m or more) and in the very sheltered upper basins of the loch. Coarser sediments of gravels and clean sands tend to be confined to channels subject to enhanced tidal streams.

Wave exposure varies from moderately exposed to extremely sheltered. The outer loch is exposed to the prevailing westerly winds, while the islands of Oronsay and Carna afford some shelter to the eastern part of the loch. Moderate tidal streams occur within narrow sections of the loch between the islands of Carna, Risga and Oronsay, and throughout the Laudale Narrows. The remainder of the loch has only weak or very weak tidal streams. The narrow convoluted shape of

the loch restricts the distance of fetch and consequently wave action in the loch is low. The lack of wind-induced mixing caused by the sheltered conditions of most of the loch system, combined with freshwater runoff from the surrounding hills, allows the formation of a brackish layer extending to several metres below the surface (Payne *et al.* 1989). Local salinities may be further reduced in the littoral zone at points where streams cross the shore.

Loch Teacuis bisects the Morvern Peninsula and enters the southern shore of Loch Sunart via two narrow, shallow channels either side of the island of Carna. Loch Teacuis is approximately 6 km long and is divided by three sills into three shallow basins, the inner basin being the deepest at 31 m. The high ground surrounding Loch Teacuis provides extreme shelter from wave action, and tidal streams are weak over the sills. The steep-sided rocky shores give way to sublittoral habitats which are more gently sloping.

Marine biology

Marine biological surveys				
	Survey methods	No. of sites	Date(s) of survey	Source
Littoral	Recording (epibiota)	20	June 1990	Davies & Connor (1993)
	Recording	59	Jan–Dec 1994	Fuller <i>et al.</i> (1996)
	Recording (epibiota)	3	August 1978	Smith (1978)
	Infaunal sampling (cores + granulometry)	5	June 1990	Davies & Connor (1993)
Sublittoral	Recording (epibiota)	29	June 1989	Davies (1990)
	Recording (semi-quantitative, photography)	2	June–July 1994	Unpublished SNH report (1994)
	Recording (video television)	1	June–July 1994	Unpublished SNH report (1994)
	Recording	114	Sept–Oct 1995	Howson (1996)
	Recording (semi-quantitative)	35	Oct 1997	Survey 762
	Recording (epibiota)	24	October 1987	MacKinnon & Lumb (1988)
	*Recording (ROV video)	5	Sept–Oct 1992	Donnan (1993)
	Infaunal sampling (suction sample + granulometry)	9	June 1990	Davies & Connor (1993)
	*Infaunal sampling (van Veen grab)	6	Sept–Oct 1992	Donnan (1993)

*The results of these studies were used to prepare the biotope map but the data are not stored on the MNCr database and not shown on the map of sites surveyed.

Littoral

Loch Sunart

Shores of bedrock or stable boulder and cobble form by far the most prominent shore type within Loch Sunart, with long stretches of rocky shore separated by small embayments of cobble and sediment. The rocky shores exhibit a typical pattern of zonation from the upper to lower shore. Along with this vertical zonation in community structure, there is a strong horizontal gradient from those shores in the outer parts of the loch which are more exposed to wave action to those shores in the inner parts of the loch which are sheltered from wave action. More local changes in biotope composition occur at some sites as a result of variation in the inclination of the rock, an increase in tidal stream strength or the presence of sediment on the rock surface.

On the more exposed coasts of the loch, rocky shores typically have a band of lichens on the upper shore, which had a lower zone of the black lichen *Verrucaria maura* (Ver) and an upper zone in which yellow and grey lichens (YG) predominate. Below this are relatively narrow bands of the furoid algae *Pelvetia canaliculata* (Pel) and *Fucus spiralis* (Fspi) in which a few barnacles *Chthamalus* spp. are often present. Rockpools at this height on the shore are carpeted with the

green algae *Cladophora rupestris* and *Enteromorpha* sp., growing over a patchy turf of *Corallina officinalis* and coralline-encrusted rock. Below the *F. spiralis* band there is usually a wide mid-shore zone dominated by barnacles *Semibalanus balanoides* (BPat), although local shelter allows patchy growth of the algae *Fucus vesiculosus* and *Ascophyllum nodosum* (Fves; Asc) on some shores. On the lower shore the barnacle zone gives way to a much more diverse fauna and flora associated with bands of *Fucus serratus* (Fserr) in the lower eulittoral. The most diverse examples of this biotope occur on boulder shores where additional species find shelter under the boulders. In Laudale Narrows, stands of the brown algae *Halidrys siliquosa* and *Himanthalia elongata* are also present on the lower shore. On the more wave-sheltered rocky shores of the loch, which includes the larger proportion of shores in Loch Sunart, the wide band of barnacles in the mid-shore (BPat) is replaced by a blanket cover of *A. nodosum* (Asc), although barnacles continue to predominate on steep or vertical faces. *F. vesiculosus* (Fves) accompanies *A. nodosum* at many sites, usually occurring only in patches but forming a discrete band above the *A. nodosum* at sites with some increased wave action. The filamentous red alga *Audouinella* sp. binds sediment to the rock surface beneath the fucoids at Sròn nam Bràthan, Laga Bay. In the channel south-west of Bo Crithean, Carna, enhanced tidal streams increase fauna diversity, especially of hydroids, within this algal zone. At this site the hydroids *Laomedea flexuosa*, *Coryne* sp. and *Tubularia indivisa* occur in addition to the more widespread hydroids *Clava multicornis* and *Dynamena pumila* (Asc.T). Above the mid-shore *A. nodosum* band are lichen (YG; Ver) and algae *P. canaliculata*/*F. spiralis* (Pel; Fspi) zones similar to the more exposed shores in Loch Sunart, except for an absence of the barnacle *Chthamalus* spp. in Fspi. *F. serratus* forms a band on the lower shore below the *A. nodosum* zone (Fserr), again similar in composition to the more wave-exposed sites.

On a shore of mixed sediments near Laudale Narrows, north-west of Eilean Mór, there are relatively few overlying stones and the beach is probably subject to slightly enhanced tidal streams compared to other sediment shores in Loch Sunart. Here the infaunal community is particularly rich, composed chiefly of bivalves (e.g. *Mya truncata*, *Chamelea gallina*), polychaetes (e.g. *Eteone longa*, *Marphysa bellii*) and the amphipod *Corophium volutator*, together with the synaptid holothurians *Labidoplax buskii* and *Leptosynapta inhaerens*.

Elsewhere in Loch Sunart, a small number of pocket beaches, composed variously of muds and muddy fine sands, support a variable range of species, most common of which are the polychaetes *Arenicola marina* and *Heteromastus filiformis*, the shrimp *Crangon crangon* and *C. volutator*. *Macoma balthica* is quite common at one of these beaches, Glenborrodale Bay, towards the mouth of Loch Sunart. The only clean sandy beach surveyed in the loch system is a bay at the mouth of Loch Sunart, at the head of Camas nan Geall, which is exposed to prevailing winds. Here there are no bivalves present, but the sediment supports populations of *A. marina* and the sand mason worm *Lanice conchilega*.

Loch Teacuis

The head of Loch Teacuis is extremely sheltered and supports patches of fucoids on cobbles and boulders. The larger boulders are covered by *A. nodosum* (Asc), and the barnacle-limpet biotope (BPat). On steeper bedrock, at the north-west end of Caolas Rahuaidh Narrows, zonation is similar to the main loch, and typical of sheltered shores, with lichens, fucoids and a wide zone in the mid-eulittoral dominated by barnacles and limpets.

As many of the sediment shores are overlain by scattered, relatively stable rocks, sediment shores are often superficially similar to nearby rocky shores, with algae *F. vesiculosus*, *A. nodosum* and *F. serratus* (Fves; Asc; Fser) giving a variable amount of cover, depending on the density of rocks on the beach. Beneath the rocks, gammarid amphipods and the chiton *Lepidochitona cinereus* are common, while the sediment holds populations of terebellid worms, *A. marina* and *L. conchilega*.

With increased freshwater influence, as is found particularly towards the head of the loch and where streams run across stony beaches, species diversity is reduced and clumps of mussels *Mytilus edulis* are usually present (MytX). Extensive littoral flats at Strontian Beach, at the head of Loch Sunart, contain areas of dense mussel beds. Adjacent to the streams there is often a

growth of the brackish water-tolerant fucoid *Fucus ceranoides* (Fcer), as at Strontian Beach. Populations of the mollusc *M. balthica* and the oligochaete *Tubificoides benedeni* are found in the muddy gravel sediment here.

Sediment shores, as is typical in most sealochs, are much less common than rocky shores. Most are of very mixed gravels and mud overlain by small cobbles and pebbles, with only isolated pocket beaches of purer sediments present. Patches of the loose-lying alga *A. nodosum* ecad *mackaii* lie over many of the sediment areas of these beaches (AscX.mac). It occurs at the head of Loch Teacuis and forms a particularly extensive bed in Salen Harbour.

Sublittoral

Outer basin: Sites to the west of the island of Oronsay are moderately exposed to the prevailing westerly wave action. Sites within this outer basin are subject to strong winds and large swells originating in the Atlantic Ocean. The southern side of this basin receives some shelter from Auliston Point and thus wave exposure is somewhat reduced.

Sublittoral fringe and infralittoral habitats are predominantly steep bedrock (vertical in places) or large boulders dominated by kelp. *Laminaria digitata* is found in the sublittoral fringe on more wave-sheltered shores where enhanced tidal streams occur, and is present on the north-east side of Sligneach Mór (Ldig). *Alaria esculenta*, characteristic of exposed conditions, is only recorded from one site in the sublittoral fringe, east of Auliston Point (Ala).

Laminaria hyperborea, a species favouring more exposed habitats, is the dominant kelp in the infralittoral zone in the outer basin (Lhyp.Pk), while *Laminaria saccharina*, a species favouring more sheltered habitats, occurs in the outer basin but only in a band below *L. hyperborea* (Lsac). Rock surfaces under the kelp canopy and in the lower infralittoral and upper circalittoral habitats are dominated by rich communities of foliose red algae. Water clarity is generally high within the outer basin and good light penetration allows algae to exist in deeper water than further within the loch.

Circalittoral areas of very steep and vertical bedrock and boulder habitats are dominated by erect sponges, solitary ascidians and anthozoans (ErSSwi). Water movement at these sites ensures that these habitats are swept clean of silt. Species found here are more characteristic of open coast sites, for example the sea-fan *Swiftia pallida* (ErSSwi) and the erect sponges *Mycale lingua* and *Axinella dissimilis* (the latter having a predominantly south-western distribution in Britain), and the cup sponge *Phakellia ventilabrum*.

Below these rocky habitats there is a transition to steep sandy mud with shell-gravel slopes characterised on the surface by the sea-pen *Virgularia mirabilis* and the anemone *Cerianthus lloydii* (VirOph). The squat lobster *Munida rugosa* is common amongst scattered boulders. With increasing depth, sandy mud gives way to soft mud biotopes dominated by the sea-pen *Funiculina quadrangularis* (SpMeg), with lower numbers of the sea-pen *Pennatula phosphorea*, the fireworks anemone *Pachycerianthus multiplicatus* and Norway lobster *Nephrops norvegicus*.

Loch na Droma Buidhe, a small basin between Oronsay and the Morvern Peninsula, has a narrow, shallow entrance. It has a steeply sloping bedrock extending to below 20 m depth within the main basin, with scattered boulders and sediment pockets and the rock surfaces have a thin covering of silt. It is more sheltered than the outer basin of Loch Sunart, but the biotopes are more similar to those in the outer basin than those recorded in more sheltered conditions further up the loch. Populations of *V. mirabilis* occur on the sediment plains, while hard substrata are well covered with ascidians, large featherstars *Antedon* sp., *M. rugosa*, the brachiopod *Neocrania anomala*, the keel worm *Pomatoceros triqueter*, and the fanworm *Sabella pavonina*. The velvet swimming crab *Liocarcinus puber* is present amongst boulders, as are foliose algal communities. However, the diversity of the area is reduced in comparison with sites in the outer basin.

Outer narrows between the islands: The islands of Oronsay, Risga and Carna lie across outer Loch Sunart and cause the main channel to narrow and twist. Sites within this area receive shelter

from the prevailing winds but are subject to moderate tidal streams through the channel. Sublittoral habitats within the narrows are subject to similar tidal exposures as habitats in the outer basin. Consequently, the biotopes recorded are similar to those present in the outer basin. *L. digitata* occurs in the sublittoral fringe on the east shore of Eilean nan Eildean. Infralittoral habitats are of steep bedrock and boulders dominated by kelp, mainly *L. hyperborea* (Lhyp). In more sheltered areas away from the tidal streams, *L. saccharina* is more abundant. Rock surfaces under the kelp canopy and in the lower infralittoral are covered with a turf of foliose algae. Species richness and abundance is high – a reflection of the enhanced tidal streams.

Circalittoral zones include predominantly steep or vertical rock leading to sediment substrata in deeper water. Very rich animal communities are recorded from Risga Pinnacle, Ross Rock and Broad Rock. Dense *L. saccharina* and the cape form of *L. hyperborea* dominate the steep infralittoral bedrock on Risga Pinnacle, west of Risga, with very little life on the rock beneath the kelp. In the circalittoral, a diverse assemblage of species occurs: the soft coral *Alcyonium glomeratum* (a south-western species only found in the Sound of Mull/Firth of Lorn on the west coast of Scotland), the uncommon featherstar *Leptometra celtica* in unusually high densities, the sea-fan *S. pallida*, and the anemones *Aureliania heterocera* and *Corynactis viridis*. The hydroid *Aglaophenia tubulifera* is found at sites throughout the central narrows. Broad Rock, a vertical stepped bedrock pinnacle at the entrance to Loch Sunart, is populated by similar communities: dead man's fingers *Alcyonium digitatum*, the large erect sponge *M. lingua* and the cup sponge *P. ventilabrum*, with red algae covering the rock surface. Within the main channel, deep circalittoral rock and sediment habitats are dominated by dense aggregations of the brittlestars *Ophiothrix fragilis* and *Ophiocoma nigrum* with some *N. anomala* (Oph), but the blanket cover of brittlestars excludes most other species. Observations by ROV (remotely-operated vehicle) in the channel between Oronsay and Rubha Aird Druimnich reveal dense aggregations of brittlestars in the circalittoral zone, to a depth of 60 m (Donnan 1993). *O. fragilis* dominates plains of sandy mud and upward-facing rocky outcrops alike, with sponges, ascidians and the anemone *Protanthea simplex* restricted to vertical rock surfaces. Unlike the outer loch there are no erect sponges.

Within the narrows, between the mainland to the north and the island of Risga, is a shallow channel of boulders and cobbles subject to moderately strong tidal streams, with rich animal and algal communities. South-west of Bo Crithean, between Oronsay and Carna, is a flat sediment plain with occasional boulders and cobbles. These mixed substrata often have a higher species richness than either rock or sediment substrata alone. In areas with a higher percentage of sand, the burrowing brittlestars *Amphiura filiformis* and *Amphiura chiajei* and the tower shell *Turritella communis* are present; *T. communis* is unusually abundant south-west of Bo Crithean.

Central Loch Sunart: Sites to the east of the island of Carna are very sheltered from the prevailing winds and wave action, and tidal streams are weak. Sites surveyed east of Dùn Ghallain, and west Rubha Aird Earnaich, are located on headlands which form the inside of the main channel. Sublittoral communities indicate that tidal stream strength may be slightly increased at these sites.

Infralittoral substrata are mainly bedrock and boulders, although these are less steep than in the outer basin. Rock surfaces have a covering of silt, a reflection of the more sheltered conditions and reduced water flow. Infralittoral biotopes are dominated by the kelp *L. saccharina*, while bootlace weed *Chorda filum* is present at the most sheltered sites (Lsac.Ft). Lower infralittoral biotopes are characterised by foliose algae, although species richness is lower than at more exposed sites to the west.

Circalittoral bedrock substrata are characterised by the brachiopod *N. anomala* and the anemone *P. simplex* (NeoPro). At one site south-east of Torr Molach, Salen, the rare calcareous tubeworm *Placostegus tridentatus* is found on bedrock; this species has only been recorded from three other sealochs in Scotland. Boulder habitats are characterised by hydroids, echinoderms and tubeworms. Many species shelter between and under boulders: squat lobsters *M. rugosa*, spider crabs *Hyas araneus* and edible crabs *Cancer pagurus* are often present in these microhabitats. Sediment infaunal species add to the species-richness of these boulder habitats. South-east of Camasinas,

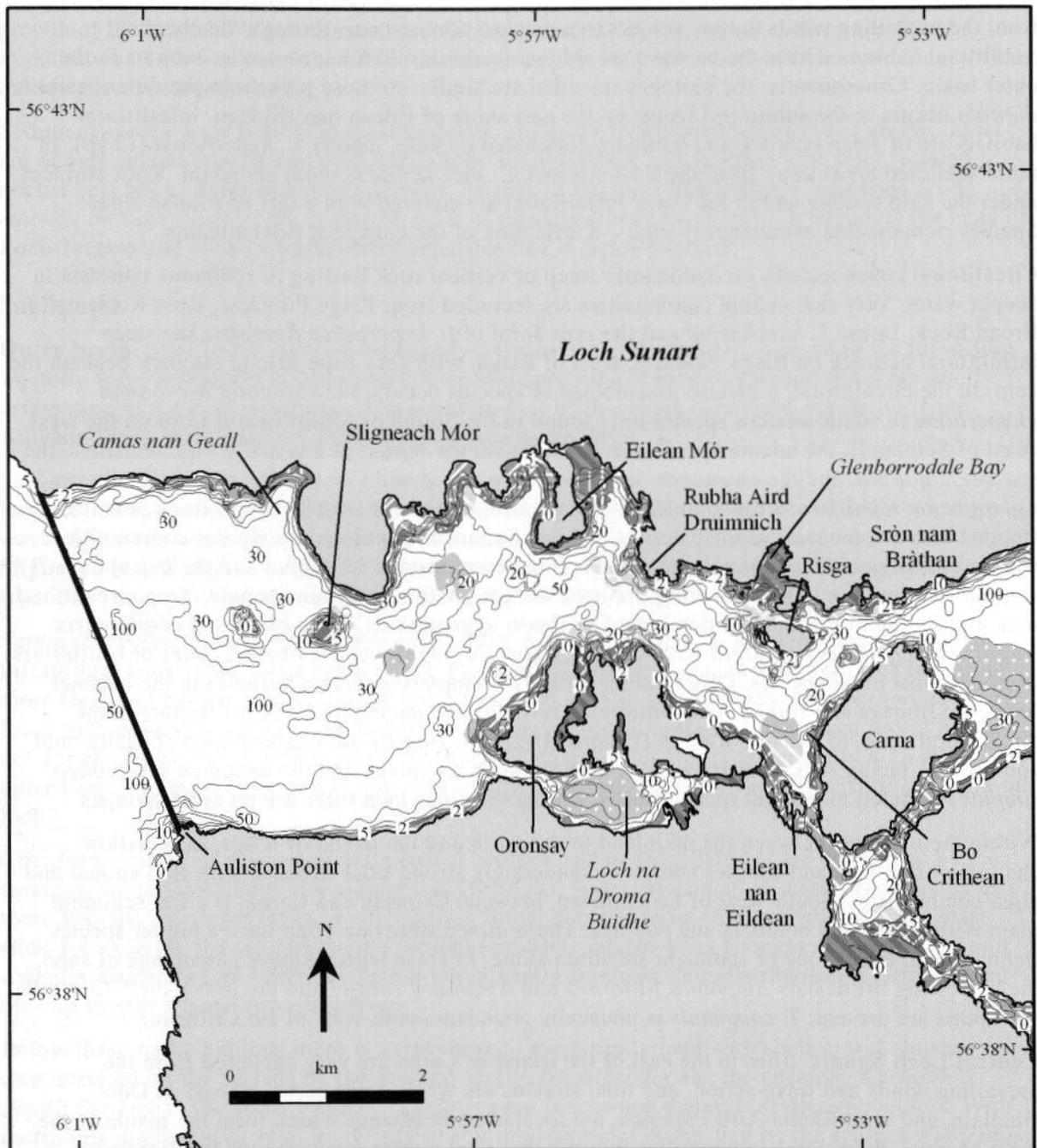


Figure 17.2 Indicative distribution of the main biotopes in the area (based on data from survey sites shown in Figure 17.1, cited literature and additional field observations).

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boulders embedded in a plain of muddy fine sand support a particularly species-rich circalittoral community. Hydroids and ascidians are present on the boulders in low numbers, while the brittlestar *O. fragilis*, the featherstar *L. celtica*, *N. anomala* and *P. simplex* are more abundant; a rich assemblage of pectinid clams, not commonly found together, including large populations of *Aequipecten opercularis* and some *Pseudamussium septemradiatum* and *Palliolium striatum* are present around these boulders. The echiuran worm *Amalosoma eddystonense* is also found here.

Sediments in the western part of the central basin are predominantly sandy muds with pebbles, cobbles and empty shells on the surface. On the south shore near Glencripesdale, hydroids and

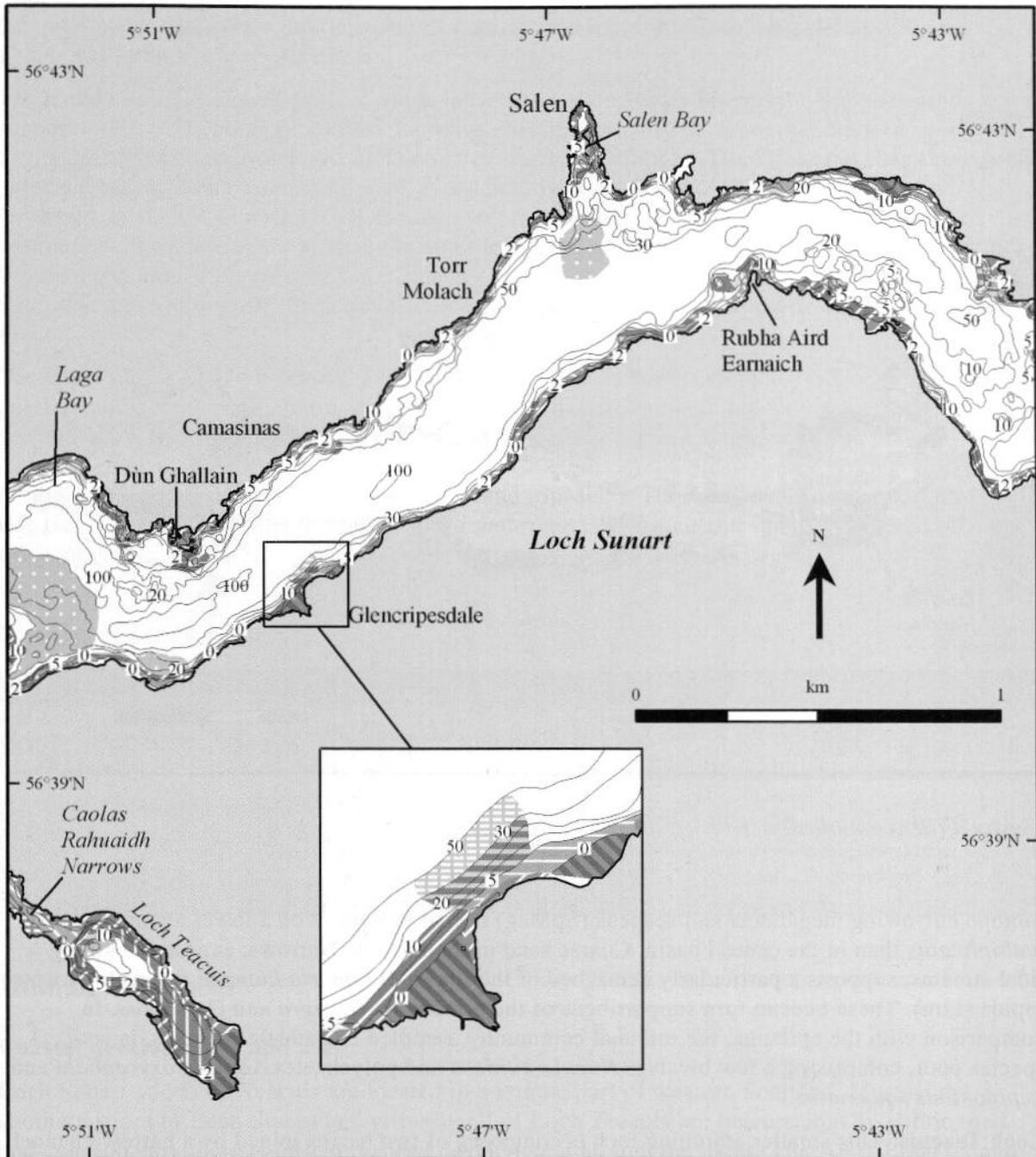


Figure 17.2 (continued)

solitary ascidians dominate hard surfaces, while sea-pens, anemones and burrowing brittlestars dominate the infauna. In the main part of the central loch, sandy muds shallower than 30 m depth are typically covered by *V. mirabilis*, *F. quadrangularis* and the anemone *C. lloydii*, while pebbles and cobbles support the featherstar *L. celtica* (VirOph.HAs). With increasing depth, below 30 m, or increased shelter from wave action, there is a transition from sandy muds and gravels to fine muds, and similar epifauna occur to that in the outer loch, with populations of burrowing megafauna and sea pens.

The fireworks anemone *P. multiplicatus* dominates the mud-plains, present in greater abundance than in the outer loch, while *F. quadrangularis* is less abundant, with the exception of a dense population at the mouth of Salen Bay (SpMeg). Also present in this biotope are the sea-pens *V. mirabilis* and *P. phosphorea*, and Norway lobster *N. norvegicus*. Further east, near Strontian, the

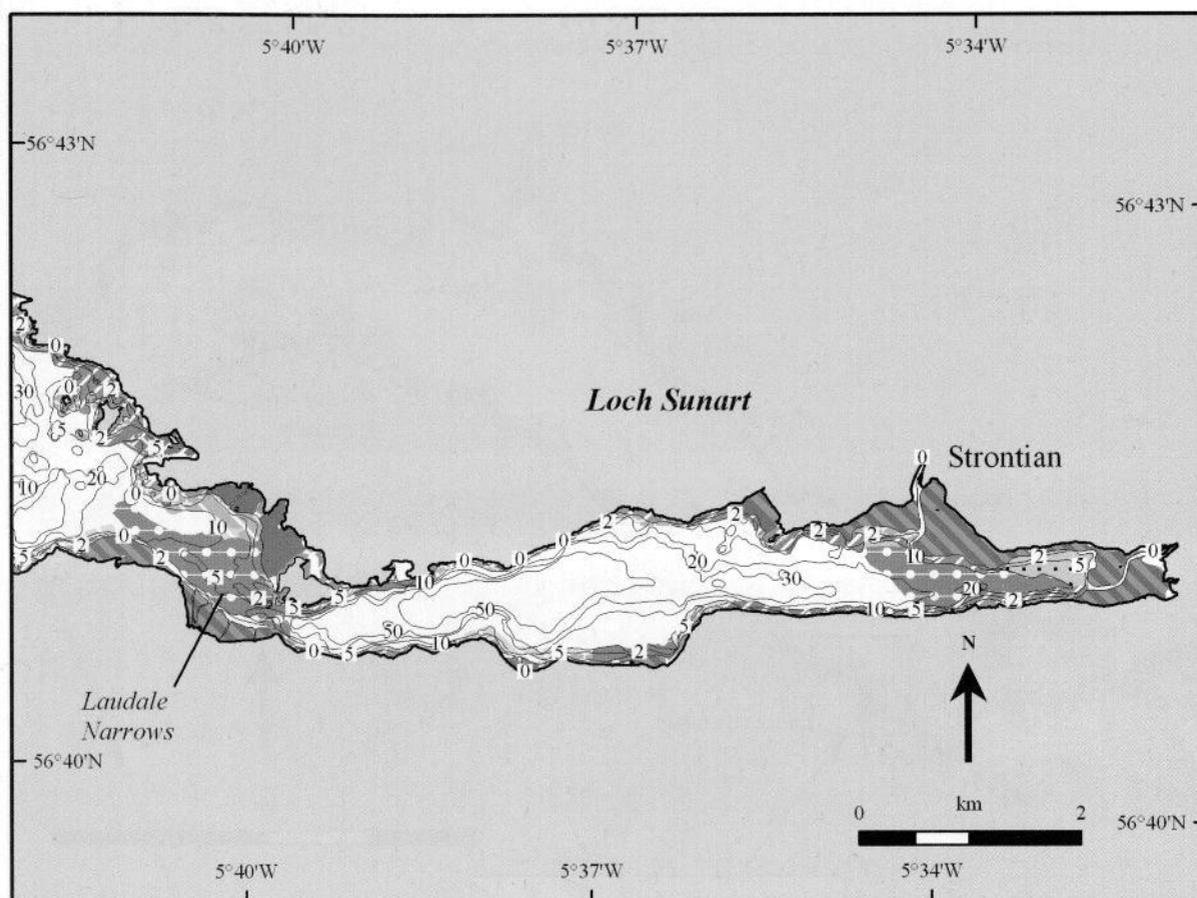


Figure 17.2 (continued)

biotope burrowing megafauna and seapens (SpMeg) is also present, with a lower abundance of *P. multiplicatus* than in the central basin. Coarse sand in the Laudale Narrows, exposed to strong tidal streams, supports a particularly dense bed of the file shell *Limaria hians* in the shallow-water rapids (Lim). These beds in turn support beds of the brittlestars *O. nigra* and *O. fragilis*. In comparison with the epifauna, the infaunal community, sampled in Laudale Narrows, is very species poor, comprising a few bivalves *Nucula nitidosa* and polychaetes *Aonides oxycephala* and *Lepidonotus squamatus*.

Loch Teacuis: This smaller adjoining loch is composed of two basins joined by a narrow channel and enters Loch Sunart via two narrow, shallow channels either side of Carna. Sublittoral habitats within Loch Teacuis are mainly sediment, the percentage of mud increasing further into the loch away from the mouth. On the whole, species-richness within the fine muddy sediments is not as high as corresponding habitats in Loch Sunart.

Infralittoral habitats in the inner basin are mainly silted boulders with scattered *L. saccharina* and foliose algae (LsacX). Above this biotope, in the upper infralittoral, a steep gravel slope with the horse mussel *Modiolus modiolus* occurs with clumps of the file shell *L. hians* (Lim). One of the best-developed beds of *L. hians* occurs in the central Caolas Rahuaidh Narrows. The narrow tide-swept channels at the entrance of Loch Teacuis consist of a mixture of coarse sands and rocks. In the sediment are the bivalves *Dosinia lupinus* and *Ensis* sp., while the rocks support a luxuriant growth of foliose red algae, together with the kelp *L. hyperborea* on the most stable rocks. Deeper areas within the basins are mainly soft mud with the sea-pen *V. mirabilis* and the anemone *C. lloydii* (SpMeg). The northern (outer) basin of Loch Teacuis is shallow and predominantly sandy with scattered boulders. Large numbers of scallops, both *Pecten maximus* and *Aequipecten opercularis*, are found in these sandy habitats (VirOph). In general, species-richness is not high in

the outer basin. Habitats within the central narrows had more small stones and empty shells, giving rise to higher species richness.

The muddy sands and shell-gravels which occur throughout Loch Teacuis at various depths support a very wide range of species, but most characteristically have populations of *V. mirabilis*, *C. lloydii*, the brittlestar *Ophiura albida* and *P. maximus* (VirOph). The infauna is characterised by polychaetes, including *Tharyx marioni*, and small bivalves such as *Abra alba* and *Mysella bidentata*. In the Risga channel the ascidian *Molgula occulta* is found in high density on the sediment, while some of the sites in the outer loch have populations of the large solitary hydroid *Corymorpha nutans*. In shallow water, species of red algae such as *Scinaia turgida*, *Halarachnion ligulatum* and a variety of filamentous red and brown algae grow, attached to small pebbles and shells.

The upper basins of Loch Teacuis and the basin of Loch na Droma Buidhe, both of which are possibly subject to slight salinity reductions, lack *F. quadrangularis* and have very few *P. multiplicatus*. Burrowing megafauna, including Norway lobster *N. norvegicus*, the prawn *Calocaris macandreae*, the uncommon box crab *Goneplax rhomboides* and the goby *Lesueurigobius friesii*, are widespread in the mud (SpMeg). These habitats also support an infaunal community of polychaetes such as *Lumbrineris hibernica* and small bivalves *A. alba* and *Corbula gibba*.

Nature conservation

Conservation sites			
Site name	Status	Location	Main features
Loch Sunart Woodlands	cSAC	NM 665 605	Marine interest for otters <i>Lutra lutra</i>
Loch Sunart	MCA	NM 570 580	Marine biological (includes Loch Teacuis)
	SAC	NM 570 580	Reefs (including file shell nests)
	SSSI; GCR	NM 570 580	Oak woodlands, geological
Glenborrodale	RSPB	NN 607 607	Ornithological, botanical
Glencripesdale	NNR; SSSI	NN 667 593	Botanical (ashwood slopes)

Human influences

Coastal developments and uses

Loch Sunart and Loch Teacuis are located in a remote part of western Scotland. Most of the southern shore of Loch Sunart and virtually all of Loch Teacuis are inaccessible by public road, and consequently there is little terrestrial development around the lochs. The A861/B8007 single-track road follows the north shore of Loch Sunart, providing access to the Ardnamurchan Peninsula. Strontian and Salen are the only two urban developments in the area. Ardnamurchan and Morvern have considerable scenic appeal, and the area attracts many visitors each year. Forestry is an important land use around the shores of both lochs; in addition to conifer plantations, there are extensive areas of native broad-leaved woodland.

Marine developments and uses

Point source discharges to the designated area are limited to private septic-tank outlets from housing and a caravan/camping park complex. Up the loch from the designated area, the Strontian WWTW (sewage settlement only) discharges from a population of 945 into Loch Sunart.

While there are no fish farms within the designated area, there are three operational fish farms in Loch Sunart, but all at distances greater than 2 km from the designated area. The loch is extensively used for commercial shellfish growing, although there is no official classification from the Food Standards Agency Scotland (FSAS). There are production sites for shellfish within the

growing water (Scottish Environment Protection Agency 2003). There is also a small fishing industry, based on creeling for Norway lobsters *N. norvegicus*, near Salen Bay and around Sligneach Mór and Oronsay (Donnan 1993).

Highland Regional Council (1988) issued the *Loch Sunart framework plan* which aims to establish a balance between mariculture, fishing and recreational use of the area. The plan identified the need to set aside areas amidst the mariculture developments to maintain traditional fishing fleets and areas for recreational use. This framework was updated in March 1999 and the boundaries of the plan area remain the same as for the 1988 document. The area therefore includes the section of the Ardnamurchan peninsula which faces Mull (i.e. from the Point of Ardnamurchan to Maclean's Nose on the north side of the mouth of the loch). It then encompasses the whole of Loch Sunart and Loch Teacuis, extending to Auliston Point which marks the mouth of the loch on the south side. The area policies set out in the 1988 plan have been reviewed in light of developments in aquaculture practice, new nature conservation designations and policy initiatives in this area, and new information which has become available on the marine zone (Highland Council 2004). Tourism provides a major financial input to the area during summer months. Loch Sunart offers safe, sheltered anchorages and attracts many sailing and motor cruisers.

References and further reading

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Recent surveys not cited within the text:

Bates, C.R., Moore, C.G., Harries, D.B., Austin, W. & Lyndon, A.R. 2004. Broad scale mapping of sublittoral habitats in Loch Sunart, Scotland. Scottish Natural Heritage Commissioned Report No. 006 (ROAME No. F01AA401C).

Sites surveyed

Survey 15: 1989 MNCR Loch Sunart survey (Allen 1954; Davies 1990).

Survey 17: 1987 NCC/MCS Seasearch Loch Sunart sublittoral survey (MacKinnon & Lumb 1988).

Survey 84: 1978 Smith west Inverness-shire & north Argyll littoral survey (Smith 1978).

Survey 175: 1990 MNCR Loch Sunart sediment survey (Davies & Connor 1993).

Survey 463: 1994 MNCR Ardnamurchan Peninsula sublittoral survey.

Survey 469: 1994 MNCR/SNH Ardnamurchan Peninsula and north Mull ROV survey.

Survey 497: 1994 SNH Loch Sunart biotope survey (Fuller *et al.* 1996).

Survey 734: 1995 SNH Loch Sunart sublittoral biotope survey (Howson 1996).

Survey 762: 1997 JNCC/MCS Seasearch Loch Sunart survey.

Littoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
84	3	Ruhba an t-Sionnach, Loch Sunart	NM 661 607	56°40.8'N 05°49.1'W	F
84	4	Camaschoirk, Loch Sunart	NM 760 600	56°40.6'N 05°39.4'W	F, FX, S, IMX, ZnoI
84	L	Lochaline, Loch Aline	NM 670 443	56°32.0'N 05°47.3'W	LS, LR
175	1	Head of loch, Loch Sunart	NM 831 606	56°41.2'N 05°32.5'W	AP.P, FvesX
175	2	Strontian Beach, Loch Sunart	NM 818 609	56°41.3'N 05°33.8'W	AscX, YG, Ver.Ver, Fspi, MytX, Pel
175	3	Glenborrodale Bay, Loch Sunart	NM 608 607	56°40.6'N 05°54.3'W	MacAre, AscX, Lan, FcerX, FserX
175	4	SW Glenborrodale Bay, Loch Sunart	NM 607 606	56°40.5'N 05°54.4'W	Asc.Asc, Fser.R, BPat.Sem
175	5	SW of Torr Molach, Loch Sunart	NM 671 619	56°41.4'N 05°48.2'W	Cor, Ver.Ver, Fspi, Asc.VS, Pel, BPat.Sem
175	6	Salen Harbour, Loch Sunart	NM 689 646	56°42.9'N 05°46.6'W	HedMac.Are, Ver.Ver, AscX.mac, YG, Pel
175	7	Mouth of Barr River, Loch Teacuis, Loch Sunart	NM 619 569	56°38.6'N 05°53.0'W	AscX, FvesX, Lan, AscX.mac, Fspi, Pel
175	8	NW end Caolas Rahuaidh Narrows, Loch Teacuis, Loch Sunart	NM 628 564	56°38.4'N 05°52.0'W	Ver.Ver, Fspi, Asc.T, Fserr.T, Pel
175	9	Head of Loch Teacuis, Loch Sunart	NM 651 544	56°37.4'N 05°49.7'W	MacAre, FvesX, AscX.mac, Asc.VS, FserX, Pel
175	10	Shore at Doirlinn, Loch Sunart	NM 607 586	56°39.4'N 05°54.3'W	AscX, FvesX, EphX, AscX.mac, YG, Fspi, FserX, Pel
175	11	E shore, Eilean nan Eildean, Loch Sunart	NM 612 583	56°39.3'N 05°53.8'W	Ver.Ver, Fser.R, Asc.T, Ldig.Ldig, Pel, BPat.Sem

Littoral sites – continued					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
175	12	W shore Port na Croisg, Loch Sunart	NM 582 615	56°40.9'N 05°56.9'W	Fspi, Asc.Asc, Pel, FserX
175	13	Head of Loch na Droma Buidhe, Loch Sunart	NM 608 586	56°39.5'N 05°54.2'W	AreSyn, IMU, AscX, LMX, YG, Ver.Ver, Fspi, Pel
175	14	Rubha Camp an Rìgh, Loch Sunart	NM 580 614	56°40.9'N 05°57.1'W	SwSed, Fser.R
175	15	Shore on SW Oronsay, Loch na Droma Buidhe, Loch Sunart	NM 580 586	56°39.4'N 05°56.9'W	FvesX, G, YG, Fspi, Fser.Fser.Bo, PelB, Ldig.Ldig.Bo, BPat.Sem
175	16	Sand-flats NW of Eilean Mór, Loch Sunart	NM 756 608	56°41.1'N 05°39.8'W	MacAre, VsenMtru, FserX, Lan
175	17	Bay SW of Eilean Mór, Loch Sunart	NM 756 603	56°40.8'N 05°39.7'W	Ver.Ver, Fves, Fspi, Asc.Asc, Fser.T, Ldig.T, Pel
175	18	Shore at head of Camas nan Geall, Loch Sunart	NM 559 618	56°41.0'N 05°59.1'W	FvesX, Lan, Fspi, PelB
175	19	NE Sligheach Mór, Loch Sunart	NM 562 602	56°40.2'N 05°58.7'W	YG, FvesB, PelB, Asc.Asc, Ldig.Ldig, Fser.R
175	20	Auliston Point, Loch Sunart	NM 537 586	56°39.3'N 06°01.1'W	Cor, YG, Ver.Ver, Fser.Fser, Ldig.Ldig, PelB, BPat.Sem
175	21	W side of entrance, S Eilean Mór, Oronsay, Loch Sunart		NM 588 599	56°40.1'N 05°56.2'W
175	22	Inner S Eilean Mór, Oronsay, Loch Sunart	NM 588 593	56°39.7'N 05°56.2'W	
175	23	S Eilean nam Ba, Oronsay, Loch Sunart	NM 592 587	56°39.5'N 05°55.7'W	
175	24	Innis nam Feorag, Loch Sunart	NM 620 604	56°40.4'N 05°53.1'W	
175	25	Dun Ghallain, Loch Sunart	NM 648 602	56°40.4'N 05°50.3'W	
497	1	Camas Fearna, Loch Sunart	NM 575 618	56°41.1'N 05°57.5'W	AscX.mac
497	2	Port an Fhaing, Loch Sunart	NM 588 619	56°41.2'N 05°56.3'W	Asc.Asc
497	3	Rubha a' Gharaidh Bhig, Loch Sunart	NM 583 619	56°41.1'N 05°56.7'W	FvesX
497	4	Sgeir Port an t-Sruthain (b), Loch Sunart	NM 600 607	56°40.6'N 05°55.1'W	BPat.Lic, Asc.Asc
497	5	Sgeir Port an t-Sruthain (a), Loch Sunart	NM 601 606	56°40.5'N 05°55.0'W	AscX.mac
497	6	Glenborrodale Bay, Loch Sunart	NM 608 607	56°40.6'N 05°54.3'W	AscX.mac, FcerX
497	7	South of Rubha na Cailliche, Loch Sunart	NM 639 607	56°40.7'N 05°51.2'W	BPat.Lic, Asc.Asc
497	8	Rubha na Cailliche, Loch Sunart	NM 637 608	56°40.7'N 05°51.4'W	Asc.VS
497	9	E of Rubh' an t-Sionnach, Loch Sunart	NM 662 612	56°41.0'N 05°49.0'W	Asc.VS
497	10	W of Rubha Suainphort (b), Loch Sunart	NM 664 613	56°41.1'N 05°48.8'W	Fves
497	11	W of Rubha Suainphort (a), Loch Sunart	NM 665 613	56°41.1'N 05°48.7'W	BPat.Sem
497	12	S of Camastorsa (b), Loch Sunart	NM 671 620	56°41.5'N 05°48.1'W	Asc.Asc
497	13	S of Camastorsa (a), Loch Sunart	NM 672 621	56°41.5'N 05°48.1'W	BPat.Lic, Asc.Asc
497	14	Salen Harbour, Loch Sunart	NM 689 646	56°42.9'N 05°46.6'W	AscX.mac, FcerX
497	15	W of Resipole, Loch Sunart	NM 717 639	56°42.6'N 05°43.8'W	Asc.Asc, BPat.Sem
497	16	Resipole, Loch Sunart	NM 722 637	56°42.6'N 05°43.3'W	AscX
497	17	E of Port na h-Uamha, Loch Sunart	NM 738 624	56°41.9'N 05°41.7'W	AscX.mac
497	18	Garbh Eilean (c), Loch Sunart	NM 744 618	56°41.6'N 05°41.0'W	BPat, Asc.Asc
497	19	Garbh Eilean (b), Loch Sunart	NM 744 618	56°41.6'N 05°41.0'W	AscX.mac
497	20	Garbh Eilean (a), Loch Sunart	NM 744 618	56°41.6'N 05°41.0'W	BPat, Asc.Asc
497	21	W of Sron na Saobhaidh, Loch Sunart	NM 773 606	56°41.0'N 05°38.1'W	Asc.Asc
497	22	W of Eilean a' Mhuirich, Loch Sunart	NM 795 607	56°41.1'N 05°36.0'W	AscX

Littoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
497	23	E of Tomain t-Sidhein Jetty, Loch Sunart	NM 825 607	56°41.2'N 05°33.0'W	FvesX
497	24	W of Lurgan Dearg Uillt, Loch Sunart	NM 826 603	56°41.0'N 05°32.9'W	Asc.VS
497	25	E of Rubha na Cloiche, Loch Sunart	NM 821 604	56°41.0'N 05°33.4'W	AscX.mac
497	26	Port a Challtuin (East), Loch Sunart	NM 791 599	56°40.7'N 05°36.3'W	AscX.mac
497	27	Liddlesdale Bay, Loch Sunart	NM 777 597	56°40.6'N 05°37.7'W	AscX.mac, FcerX
497	28	E of Rubha nan Clach, Loch Sunart	NM 757 599	56°40.6'N 05°39.7'W	AscX.mac
497	29	W of Rubha nan Clach, Loch Sunart	NM 754 600	56°40.6'N 05°39.9'W	FvesX
497	30	E of Rubh' an Dunain, Loch Sunart	NM 748 602	56°40.7'N 05°40.5'W	FvesX
497	31	Laudale River, Loch Sunart	NM 744 607	56°41.0'N 05°41.0'W	Asc.Asc
497	32	Camas na h-Airbhe, Loch Sunart	NM 730 608	56°41.0'N 05°42.3'W	AscX
497	33	W of Eilean mo Shlinneag, Loch Sunart	NM 719 623	56°41.8'N 05°43.5'W	AscX
497	34	E of Sgeir an t-Seangain, Loch Sunart	NM 715 625	56°41.9'N 05°43.8'W	AscX
497	35	E of Rubha Aird Earnaich, Loch Sunart	NM 709 628	56°42.0'N 05°44.5'W	BPat, Asc.Asc
497	36	Rubha Aird Earnaich, Loch Sunart	NM 707 628	56°42.0'N 05°44.6'W	AscX.mac, Asc.Asc
497	37	Camas Salach, Loch Sunart	NM 684 613	56°41.1'N 05°46.9'W	AscX
497	38	SW of Camas Salach, Loch Sunart	NM 679 606	56°40.8'N 05°47.3'W	AscX
497	39	SW of Camas Salach, Loch Sunart	NM 675 604	56°40.6'N 05°47.7'W	AscX
497	40	NE of Tom an Inbhire, Loch Sunart	NM 674 605	56°40.7'N 05°47.8'W	Asc.Asc
497	42	NE of Tom an Inbhire, Loch Sunart	NM 670 602	56°40.5'N 05°48.2'W	Asc.Asc, BPat.Sem
497	43	Tom an Inbhire (a), Loch Sunart	NM 663 597	56°40.2'N 05°48.8'W	FvesX
497	44	Tom an Inbhire (b), Loch Sunart	NM 661 597	56°40.2'N 05°49.0'W	Asc.Asc, BPat.Sem
497	45	Tom an Inbhire (c), Loch Sunart	NM 660 596	56°40.2'N 05°49.1'W	Fserr.VS, BPat.Sem
497	46	Glencripesdale Bay (a), Loch Sunart	NM 663 600	56°40.4'N 05°48.9'W	AscX
497	47	Glencripesdale Bay (b), Loch Sunart	NM 659 595	56°40.1'N 05°49.2'W	FcerX
497	48	W of Glencripesdale burn (a), Loch Sunart	NM 657 593	56°40.0'N 05°49.3'W	Fves
497	49	W of Glencripesdale burn (b), Loch Sunart	NM 657 593	56°40.0'N 05°49.4'W	Asc.Asc, BPat.Sem
497	50	W of Glencripesdale Bay, Loch Sunart	NM 656 593	56°40.0'N 05°49.5'W	BPat.Sem
497	51	E of Port Chlach nan Tonn, Loch Sunart	NM 655 592	56°39.9'N 05°49.6'W	Asc.Asc
497	52	Port Chlach nan Tonn, Loch Sunart	NM 653 591	56°39.8'N 05°49.8'W	AscX
497	53	NW of Kinloch, Loch Teacuis	NM 650 551	56°37.7'N 05°49.9'W	Asc.VS
497	54	SE of Caolas Rahuaidh, Loch Teacuis	NM 632 561	56°38.2'N 05°51.7'W	Asc.T
497	55	Opposite Torr an Fhamair, Loch Teacuis	NM 630 562	56°38.2'N 05°51.8'W	Asc.T
497	56	Eilean Chulaig, Loch Teacuis	NM 627 566	56°38.4'N 05°52.2'W	Asc.T
497	57	SE of Torr an Eidhinn, Loch Teacuis	NM 625 563	56°38.3'N 05°52.4'W	AscX
497	58	Torr an Eidhinn, Loch Teacuis	NM 623 566	56°38.4'N 05°52.5'W	AscX
497	59	E of Achadh Luachrach, Loch Teacuis	NM 619 568	56°38.5'N 05°53.0'W	LMS
497	60	NW of Poll Achadh Luachrach, Loch Teacuis	NM 614 569	56°38.6'N 05°53.4'W	Asc.VS

Sublittoral sites					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
15	1	Skerry west of Sgeir Fhada, Loch Sunart	NM 551 614	56°40.8'N 05°59.9'W	AntAsH, VirOph.HAs, FoR, Lhyp.TFt
15	2	NW Sligneach Mór, Loch Sunart	NM 569 598	56°40.0'N 05°58.0'W	VirOph, ErSSwi
15	3	E of Auliston Point, Loch Sunart	NM 558 581	56°39.0'N 05°59.0'W	ErSSwi, CMX, LhypLsac.Ft
15	4	Waterfalls, East Auliston Point, Loch Sunart	NM 560 579	56°39.0'N 05°58.8'W	LhypR.Ft, Lsac.Ft, VirOph.HAs, LsacX, Ala
15	5	Creag nan Sgarbh, Oronsay, Loch Sunart	NM 586 600	56°40.1'N 05°56.4'W	AntAsH, LhypLsac.Pk
15	6	E of Rubha an Aisaig, Oronsay, Loch Sunart	NM 595 600	56°40.1'N 05°55.5'W	AntAsH, Oph
15	7	Rubha Aird Druimnich, Loch Sunart	NM 593 605	56°40.5'N 05°55.7'W	AntAsH, VirOph.HAs, LsacX, Lsac.Ft, Ldig.Ldig
15	8	Risga Pinnacle, Loch Sunart	NM 604 599	56°40.2'N 05°54.6'W	LhypLsac.Ft, ErSSwi, LhypLsac.Pk, Oph
15	9	NW of Risga, Loch Sunart	NM 607 596	56°40.0'N 05°54.3'W	AntAsH, Lhyp.Ft, VirOph.HAs, Lsac.Pk
15	10	Ross Rock, Risga, Loch Sunart	NM 609 598	56°40.1'N 05°54.1'W	AntAsH, LhypGz.Ft, Oph
15	11	SW of Bo Crithean, Carna, Loch Sunart	NM 606 582	56°39.3'N 05°54.2'W	SpMeg
15	12	Broad Rock, Loch Sunart	NM 617 598	56°40.1'N 05°53.3'W	Oph, Lsac.T, AleC, Lhyp.TPk
15	13	Sròn nam Bràthan, Laga Bay, Loch Sunart	NM 628 606	56°40.6'N 05°52.3'W	AntAsH, Lsac.Ft, K
15	14	E of Dun Ghallain, Loch Sunart	NM 651 600	56°40.3'N 05°50.0'W	Lim, Oph, Lsac
15	15	Point W of Camus Glas, Loch Sunart	NM 644 587	56°39.6'N 05°50.6'W	SpMeg, AntAsH, FaMx, Lsac.Ft, LsacX, Lsac.Pk
15	16	NE of Glencripesdale, Loch Sunart	NM 671 604	56°40.6'N 05°48.1'W	SpMeg.Fun, Lsac.Ft, Lsac
15	17	SE of Camasinas, Loch Sunart	NM 662 610	56°40.9'N 05°49.0'W	VirOph, NeoPro
15	18	SE of Torr Molach, Salen, Loch Sunart	NM 678 624	56°41.7'N 05°47.5'W	ModHAs, Lsac.Ft, NeoPro.CaTw, Fserr
15	19	SW of Rubha Bhualte, Loch Sunart	NM 694 633	56°42.2'N 05°46.0'W	NeoPro, LsacRS.Psa, AntAsH
15	20	Salen Bay, Loch Sunart	NM 691 636	56°42.4'N 05°46.3'W	SpMeg.Fun, NeoPro
15	21	W Rubha Aird Earnaich, Loch Sunart	NM 704 628	56°42.0'N 05°45.0'W	Lim, AntAsH
15	22	W of Eilean a' Chuilinn, Bunalteachan, Loch Sunart	NM 731 621	56°41.7'N 05°42.3'W	SpMeg.Fun
15	23	S of Eilean a' Chuilinn, Loch Sunart	NM 734 608	56°41.0'N 05°42.0'W	Oph
15	24	Entrance to Loch na Droma Buidhe, Loch Sunart	NM 571 588	56°39.5'N 05°57.8'W	AmenCio, Lsac.Pk, LsacX
15	25	Loch na Droma Buidhe, Loch Sunart	NM 587 585	56°39.3'N 05°56.2'W	AmenCio, SpMeg, AntAsH, Lsac.Pk
15	26	Eilean nan Gabhar, Loch Teacuis	NM 614 571	56°38.7'N 05°53.5'W	VirOph, CMX, AntAsH
15	27	NW of Eilean Chulaig, Loch Teacuis	NM 625 568	56°38.6'N 05°52.4'W	FaMx, LsacX
15	28	Caolas Rahuaidh, Loch Teacuis	NM 639 557	56°38.0'N 05°51.0'W	Lim, CMX, LsacX, ModHAs
15	29	North side of Upper Loch Teacuis	NM 646 556	56°37.9'N 05°50.3'W	SpMeg, LsacRS.Psa, LsacX, PhiVir
17	1	Rubha Aird Shlignich, Loch Sunart	NM 568 605	56°40.4'N 05°58.2'W	Lsac, FaSwV, AntAsH
17	2	Ceann Garbh, Loch Sunart	NM 578 597	56°39.9'N 05°57.2'W	VirOph.HAs, K, SpMeg
17	3	Ceann Garbh, Loch Sunart	NM 577 597	56°39.9'N 05°57.2'W	VirOph
17	4	W of Risga, Loch Sunart	NM 598 605	56°40.4'N 05°55.2'W	VirOph.HAs, Oph, VirOph
17	5	NW of Ross Rock, Loch Sunart	NM 607 600	56°40.2'N 05°54.3'W	VirOph.HAs, Lsac.Pk
17	6	Risga Channel, Loch Sunart	NM 610 603	56°40.4'N 05°54.0'W	SpMeg.Fun, FaMx, SCR, CMX, AmenCio
17	7	Head of Loch Sunart	NM 825 607	56°41.2'N 05°33.1'W	SpMeg

Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
17	8	Near to head of Loch Sunart	NM 811 607	56°41.2'N 05°34.4'W	SpMeg
17	9	Rubha na Sròine, Loch Sunart	NM 790 605	56°41.0'N 05°36.5'W	SS
17	10	E of Eilean Mór, Loch Sunart	NM 769 604	56°40.9'N 05°38.5'W	Aasp, CMX, NeoPro, ModHo, IR
17	11	Laudale Narrows (Eilean Mór to upper basin through narrows between Glas Eilean), Loch Sunart	NM 752 604	56°40.8'N 05°40.2'W	Lim
17	12	Laudale Narrows to south of Glas Eilean, Loch Sunart	NM 755 602	56°40.7'N 05°39.9'W	Lim
17	13	S of Rubha an Daimh, Loch Sunart	NM 742 612	56°41.3'N 05°41.2'W	Lim, ModHo
17	14	Laudale Narrows (Centre), Loch Sunart	NM 758 602	56°40.8'N 05°39.6'W	Lim
17	15	Laudale Narrows (South Shore), Loch Sunart	NM 749 613	56°41.3'N 05°40.5'W	Lim
17	16	Rubha Aird Earnaich, Loch Sunart	NM 701 632	56°42.2'N 05°45.3'W	CR, CMX, NeoPro
17	17	E of Rubha Aird Earnaich, Loch Sunart	NM 706 630	56°42.1'N 05°44.8'W	IMX, ModHo
17	18	Salen Bay, Loch Sunart	NM 691 637	56°42.5'N 05°46.3'W	
17	19	Dun Ghallain, Loch Sunart	NM 643 601	56°40.3'N 05°50.8'W	Lim, CMX
17	20	E of Carna, Loch Sunart	NM 628 599	56°40.2'N 05°52.3'W	SpMeg.Fun
17	21	E Carna Channel, Loch Sunart	NM 629 587	56°39.6'N 05°52.1'W	K, FaMx, IMX, CMX
17	22	W Carna Channel (Caol Achadh Lic), Loch Sunart	NM 622 580	56°39.2'N 05°52.8'W	Lsac.T
17	23	Risga Pinnacle, Loch Sunart	NM 599 607	56°40.5'N 05°55.2'W	VirOph, FaSwV, ErSSwi, SS
17	24	NE of Sligneach Mór, Loch Sunart	NM 558 605	56°40.3'N 05°59.1'W	CR, ErSSwi
175	26	Loch na Droma Buidhe, Loch Sunart	NM 587 583	56°39.3'N 05°56.1'W	SpMeg
175	27	Mouth of S Eilean Mór, Oronsay, Loch Sunart	NM 588 600	56°40.1'N 05°56.2'W	VirOph
175	28	Risga Channel, Loch Sunart	NM 608 603	56°40.3'N 05°54.3'W	VirOph
175	29	SW of Bo Crithean, Carna, Loch Sunart	NM 610 581	56°39.2'N 05°53.9'W	VirOph
175	30	NW of Eilean Chulaig, Loch Teacuis, Loch Sunart	NM 625 568	56°38.6'N 05°52.4'W	LsacX
175	31	Rubha Aird Druimnich, Loch Sunart	NM 595 607	56°40.5'N 05°55.5'W	VirOph
175	32	Caol Chàrna, Loch Sunart	NM 632 588	56°39.6'N 05°51.8'W	SpMeg.Fun
175	33	W of Rubha Aird Earnaich, Loch Sunart	NM 704 627	56°42.0'N 05°45.0'W	VirOph
175	34	Laudale Narrows, Loch Sunart	NM 755 602	56°40.7'N 05°39.9'W	Lim
463	17	East side of Sligneach Mór, Sound of Mull	NM 563 602	56°40.2'N 05°58.6'W	ErSSwi, FaSwV
463	18	Rubha Aird Shliguish, Sound of Mull	NM 569 608	56°40.5'N 05°58.1'W	AmenCio, SpMeg
469	1	NE Sligneach Mór (ROV), Loch Sunart	NM 561 604	56°40.3'N 05°58.9'W	VirOph.HAs, ErSSwi
734	1	E of Port a' Chamais, Loch Sunart	NM 545 616	56°40.9'N 06°00.5'W	LhypLsac.Ft, LsacX
734	2	Sgeir Fhada, Loch Sunart	NM 556 616	56°40.9'N 05°59.4'W	Zmar, LhypLsac.Ft
734	3	Camas nan Geall, Loch Sunart	NM 559 616	56°40.9'N 05°59.1'W	VirOph, VirOph.HAs, Ldig.Ldig, LhypLsac.Ft
734	4	East of Camas nan Geall, Loch Sunart	NM 560 609	56°40.5'N 05°58.9'W	VirOph.HAs, Ldig.Ldig, Lhyp.Ft
734	5	Camas Ban, Loch Sunart	NM 568 611	56°40.7'N 05°58.1'W	LsacX
734	6	Rubha Dubh, Loch Sunart	NM 574 612	56°40.8'N 05°57.6'W	Ldig.Ldig, Tra, LhypLsac
734	7	W of Camas Fearna, Loch Sunart	NM 574 616	56°41.0'N 05°57.6'W	VirOph.HAs, Tra
734	8	East of Camas Fearna, Loch Sunart	NM 579 615	56°40.9'N 05°57.1'W	Ldig.Ldig, LsacX, LhypLsac
734	9	Port na Croisg, Loch Sunart	NM 582 618	56°41.1'N 05°56.8'W	LhypLsac, Tra

Sublittoral sites – continued					
Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
734	10	W coast of Eilean Mór, Loch Sunart	NM 584 613	56°40.8'N 05°56.6'W	Ldig.Ldig, Tra, LhypLsac
734	11	W coast of Oronsay Island, Loch Sunart	NM 583 594	56°39.8'N 05°56.6'W	Ldig.Ldig, LsacX, LhypLsac.Ft
734	12	South-west coast of Oronsay Island, Loch Sunart	NM 579 589	56°39.5'N 05°57.0'W	Lhyp.Ft, LsacX, LhypLsac.Ft
734	13	Sligneach Mór (S coast of island), Loch Sunart	NM 560 600	56°40.1'N 05°58.9'W	Lhyp.Ft
734	14	Sligneach Beag, Loch Sunart	NM 554 601	56°40.1'N 05°59.5'W	Ldig.Ldig, Lhyp.Ft
734	15	S coast of Eilean Mór, Loch Sunart	NM 584 609	56°40.6'N 05°56.6'W	Lsac.Ft, ModHAs, LhypLsac.Ft
734	16	E coast of Eilean Mór, Loch Sunart	NM 589 613	56°40.8'N 05°56.1'W	AmenCio, Lsac.Pk, Ldig.Ldig, Lsac.Ft
734	17	E side of Glenmore Bay, Loch Sunart	NM 588 617	56°41.1'N 05°56.3'W	Lsac.Ft, PhiVir
734	18	W side of Glenmore Bay, Loch Sunart	NM 595 614	56°40.9'N 05°55.5'W	Ldig.Ldig, LsacX, LhypLsac, Tra
734	19	Rubha Aird Druimnich, Loch Sunart	NM 593 609	56°40.6'N 05°55.7'W	LhypLsac, Lsac.Pk
734	20	North-east coast of Oronsay Island, Loch Sunart	NM 598 606	56°40.5'N 05°55.2'W	AmenCio, Lsac.Ft, Ldig.Ldig, LhypLsac, Lsac.Pk
734	21	W side of Eilean an Fheidh, Loch Sunart	NM 609 604	56°40.4'N 05°54.1'W	IMS, LsacX
734	22	Eilean an Fheidh/Risga, Loch Sunart	NM 609 603	56°40.4'N 05°54.1'W	Lsac.Ft, LsacX, Tra
734	23	Rubha aird Beithe (1), Loch Sunart	NM 617 604	56°40.4'N 05°53.4'W	VirOph.HAs
734	24	Rubha aird Beithe (2), Loch Sunart	NM 619 604	56°40.5'N 05°53.1'W	Lim, VirOph.HAs, Lsac.Ft, LsacX
734	25	W side of Laga Bay, Loch Sunart	NM 632 608	56°40.7'N 05°51.9'W	VirOph.HAs, Lsac.Ft
734	26	South-west of Rubha Dubh, Loch Sunart	NM 638 605	56°40.6'N 05°51.3'W	Lim, Lsac.Ft
734	27	North-west of Oronsay Island, Loch Sunart	NM 641 601	56°40.4'N 05°50.9'W	Lim, Lsac.Ft, Lsac.Pk, Lsac
734	28	Eilean nam Gillean, Loch Sunart	NM 638 589	56°39.7'N 05°51.2'W	Lsac.Ft, ModHAs
734	29	Caol Chàrna, Loch Sunart	NM 631 588	56°39.6'N 05°51.9'W	Lsac.Ft, LsacX, Tra, Lsac.Pk
734	30	East coast of Isle of Carna, Loch Sunart	NM 628 590	56°39.8'N 05°52.2'W	AreSyn, LsacX, Tra
734	31	North-east coast of Carna Island, Loch Sunart	NM 625 596	56°40.1'N 05°52.5'W	LsacX
734	32	North coast of Carna Island, Loch Sunart	NM 622 599	56°40.2'N 05°52.8'W	Ldig.Ldig, AntAsH, AlcTub, Lhyp.TFt
734	33	North-west coast of Carna Island, Loch Sunart	NM 617 594	56°39.9'N 05°53.3'W	Ldig.Ldig, Lhyp.Ft, Lsac.Ft, AntAsH, Lsac.Pk
734	34	W coast of Carna Island, Loch Sunart	NM 614 591	56°39.7'N 05°53.6'W	LhypLsac, Tra
734	35	South-west coast of Carna Island, Loch Sunart	NM 613 586	56°39.5'N 05°53.6'W	LhypLsac, Tra
734	36	W tip of Oronsay Island, Loch Sunart	NM 607 588	56°39.6'N 05°54.2'W	LhypLsac.Ft, LsacX
734	37	W tip of Oronsay Island (2), Loch Sunart	NM 603 590	56°39.7'N 05°54.6'W	LhypLsac.Ft, Tra
734	38	North-east of Loch na Droma Buidhe, Loch Sunart	NM 597 594	56°39.9'N 05°55.2'W	Ldig.Ldig, Lsac.Ft, ModHAs
734	39	North-east coast of Oronsay Island, Loch Sunart	NM 597 596	56°40.0'N 05°55.3'W	Ldig.Ldig, AntAsH, LhypLsac.Ft, Lhyp.Pk
734	40	Bay on N coast of Oronsay Island, Loch Sunart	NM 593 597	56°40.0'N 05°55.7'W	Ldig.Ldig, Tra, LhypLsac.Ft
734	41	Sgeirean Glas, Loch Sunart	NM 589 599	56°40.1'N 05°56.1'W	ModHAs, LhypLsac.Ft

Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotores recorded
734	42	Entrance to S Eilean Mór bay, Oronsay, Loch Sunart	NM 588 598	56°40.0'N 05°56.1'W	Lsac.Ft, Tra
734	43	South-east of Carna, Loch Sunart	NM 619 577	56°39.0'N 05°53.0'W	LsacX, Tra
734	44	Caol Chàrna, Loch Sunart	NM 628 587	56°39.6'N 05°52.2'W	AmenCio, Oph, Lsac.T
734	45	East side of Coal Chana, Loch Sunart	NM 628 584	56°39.4'N 05°52.1'W	FaSwV, Verticals, ModHAs, Ldig.Ldig, Lsac.Ft, Lsac.Pk
734	46	Eilean nan Gabhar, Loch Sunart	NM 623 572	56°38.8'N 05°52.6'W	Lsac.Ft, Tra
734	47	North of Loch Teacuis, Loch Sunart	NM 625 569	56°38.6'N 05°52.4'W	VirOph.HAs, Lsac.Pk
734	48	Loch Teacuis (1), Loch Sunart	NM 630 561	56°38.2'N 05°51.8'W	Lsac.T
734	49	Loch Teacuis (2), Loch Sunart	NM 639 562	56°38.2'N 05°51.0'W	SpMeg.Fun, PhiVir, LsacX
734	50	Head of Loch Teacuis, Loch Sunart	NM 649 552	56°37.7'N 05°49.9'W	PhiVir, LsacX
734	51	Head of Loch Teacuis (2), Loch Sunart	NM 647 547	56°37.5'N 05°50.1'W	PhiVir, LsacX
734	52	South of Eilean nan Gabhar, Loch Sunart	NM 620 568	56°38.5'N 05°52.8'W	Tra
734	53	Eilean nan Eildean, Loch Sunart	NM 609 583	56°39.3'N 05°54.0'W	AreSyn, Lsac.Ft, LsacX
734	54	NW along coast from Dun Ghallain rock, Loch Sunart	NM 652 604	56°40.6'N 05°49.9'W	Lsac.Ft, LsacX, Lsac.Pk
734	55	Camasinas, Loch Sunart	NM 658 609	56°40.9'N 05°49.3'W	Oph, ModHo, LsacRS.Psa, Lsac.Pk
734	56	Rubha Bhualite, Loch Sunart	NM 685 634	56°42.3'N 05°46.9'W	LsacX, Lsac.Pk
734	57	W coast of Salen Bay, Loch Sunart	NM 688 639	56°42.5'N 05°46.6'W	Lim, Lsac.Ft
734	58	Head of Salen Bay, Loch Sunart	NM 689 640	56°42.6'N 05°46.5'W	Zmar, AreSyn, Lsac.Ft, LsacX
734	59	Salen moorings, Loch Sunart	NM 690 640	56°42.6'N 05°46.4'W	AreSyn
734	60	An Cnap, Loch Sunart	NM 695 638	56°42.5'N 05°45.9'W	Lsac.Ft, ModHAs, Lsac.Pk
734	61	Salcannan Cueliag, Loch Sunart	NM 697 639	56°42.6'N 05°45.7'W	LsacRS
734	62	Rubh Aird Beithe, Loch Sunart	NM 703 636	56°42.4'N 05°45.1'W	Aasp, FaSwV, LsacX, LsacRS.Psa
734	63	S Eilean an Eorna, Loch Sunart	NM 711 638	56°42.6'N 05°44.3'W	VirOph.HAs, Lsac.Ft
734	64	Resipole Farm, Loch Sunart	NM 722 637	56°42.5'N 05°43.3'W	Lim, LsacRS.Psa
734	65	Bunalteachan, Loch Sunart	NM 728 631	56°42.3'N 05°42.6'W	Lsac.Ft, Lsac.Pk, LsacRS.Psa
734	66	Rubha Ruadh, Loch Sunart	NM 730 630	56°42.2'N 05°42.4'W	ModHo, LsacRS.Psa
734	67	SW of Eilean a' Chuilinn, Loch Sunart	NM 726 616	56°41.4'N 05°42.8'W	VirOph.HAs, LsacRS.Psa
734	68	Eilean mo Shlinneag, Loch Sunart	NM 722 623	56°41.8'N 05°43.2'W	LsacX, Lsac.Pk, LsacRS.Psa
734	69	W of Eilean mo Shlinneag, Loch Sunart	NM 718 624	56°41.8'N 05°43.5'W	LsacX
734	70	Sgeir an t-Seangain, Loch Sunart	NM 704 627	56°42.0'N 05°45.0'W	Oph, ModHo, LsacX, Lsac
734	71	Sgeir an t-Seangain (2), Loch Sunart	NM 714 627	56°42.0'N 05°44.0'W	FaSwV, Lsac
734	72	Rubha Aird Earnaich, Loch Sunart	NM 708 629	56°42.1'N 05°44.6'W	Oph, ModHAs, Lsac
734	73	Rubha Aird Earnaich (2), Loch Sunart	NM 707 629	56°42.1'N 05°44.7'W	Lim, Lsac.Ft
734	74	W of Rubha Aird Earnaich, Loch Sunart	NM 706 626	56°41.9'N 05°44.8'W	LsacRS.Psa
734	75	Rubha Aird Earnaich (3), Loch Sunart	NM 702 625	56°41.8'N 05°45.1'W	Lsac.Ft, ModHAs, Lsac
734	76	Rubha nan Aighean, Loch Sunart	NM 694 622	56°41.6'N 05°45.9'W	Lsac.Ft, ModHAs, Lsac
734	77	Torr na Moine, Loch Sunart	NM 688 618	56°41.4'N 05°46.5'W	Lsac.Ft, Lsac.Pk
734	78	Camas Salach, Loch Sunart	NM 683 612	56°41.1'N 05°47.0'W	Lim, Ldig.Ldig, Lsac.Ft

Sublittoral sites – continued					
<i>Survey</i>	<i>Site</i>	<i>Place</i>	<i>Grid reference</i>	<i>Latitude/longitude</i>	<i>Biotores recorded</i>
734	79	South of Camas Salach, Loch Sunart	NM 674 604	56°40.6'N 05°47.8'W	AmenCio, Lsac.Ft, Ldig.Ldig, Lsac.Pk
734	80	Mouth of Glencripesdale Burn, Loch Sunart	NM 660 596	56°40.1'N 05°49.1'W	LsacX, LsacRS.Psa
734	81	Mouth of Glencripesdale Burn (2), Loch Sunart	NM 658 594	56°40.1'N 05°49.3'W	LsacX
734	82	South of Port Chlach nan Tonn, Loch Sunart	NM 649 588	56°39.7'N 05°50.1'W	Lsac.Ft
734	83	N of Eilean a' Chuilinn, Loch Sunart	NM 740 623	56°41.9'N 05°41.4'W	AreSyn LsacX, Lsac.Ft
734	84	Eilean a' Chuilinn, Loch Sunart	NM 736 620	56°41.7'N 05°41.8'W	LsacRS.Psa
734	85	Eilean a' Chuilinn/Garbh Eilean, Loch Sunart	NM 740 620	56°41.7'N 05°41.4'W	AreSyn, LsacX, LsacRS.Psa
734	86	Garbh Eilean, Loch Sunart	NM 741 621	56°41.7'N 05°41.3'W	AreSyn, LsacX
734	87	Garbh Eilean (2), Loch Sunart	NM 740 617	56°41.5'N 05°41.4'W	LsacX, LsacRS.Psa
734	88	Bay between Garbh Eilean/Rubha an Daimh, Loch Sunart	NM 742 619	56°41.6'N 05°41.2'W	Lsac.Ft
734	89	Bay between Garbh Eilean and Rubha an Daimh (2), Loch Sunart	NM 745 617	56°41.6'N 05°40.9'W	Lsac.Ft, LsacRS.Psa, Tra, Lsac.Pk
734	90	Rubha an Daimh, Loch Sunart	NM 743 615	56°41.4'N 05°41.1'W	LsacRS.Psa
734	91	Sgeir nan Eun, Loch Sunart	NM 746 611	56°41.2'N 05°40.8'W	EcorEns, LsacRS.Psa
734	92	Eilean an t-Sionnaich, Loch Sunart	NM 752 611	56°41.2'N 05°40.2'W	EcorEns, LsacRS.Psa
734	93	Eilean an t-Sionnaich (2), Loch Sunart	NM 751 610	56°41.2'N 05°40.2'W	VirOph.HAs
734	94	Camuschoirk, Loch Sunart	NM 753 606	56°41.0'N 05°40.0'W	Lim
734	95	SW coast of Eilean Mór, Loch Sunart	NM 759 602	56°40.8'N 05°39.4'W	Lim, LsacRS.Psa
734	96	Jetty east of Rubha nan Clach, Loch Sunart	NM 760 598	56°40.5'N 05°39.3'W	LsacRS.Psa
734	97	Rubha nan Clach, Loch Sunart	NM 756 600	56°40.7'N 05°39.8'W	Lim, Lsac, LsacRS.Psa
734	98	Centre of Loch Sunart (Laudale Narrows)	NM 753 603	56°40.8'N 05°40.0'W	Lim
734	99	Centre of Loch Sunart (Laudale Narrows) (2)	NM 749 606	56°41.0'N 05°40.4'W	Lim
734	100	Rubh an Dunain, Loch Sunart	NM 747 605	56°40.9'N 05°40.7'W	Lim
734	101	Mouth of Laudale River, Loch Sunart	NM 742 608	56°41.1'N 05°41.2'W	VirOph.HAs, Lsac.Ft, LsacRS.Psa
734	102	Rubha na h-Aird-beithe, Loch Sunart	NM 735 608	56°41.0'N 05°41.8'W	Oph, Lsac
734	103	Torran a Chonnaidh, Loch Sunart	NM 730 611	56°41.2'N 05°42.4'W	Lsac
734	104	Central channel of Loch Sunart (off Rubh an t-Sabhail)	NM 765 604	56°40.9'N 05°38.8'W	Lim
734	105	Sròn na Saobhaidh, Loch Sunart	NM 777 606	56°41.1'N 05°37.7'W	LsacRS.Psa
734	106	Ardnastang, Loch Sunart	NM 802 609	56°41.3'N 05°35.2'W	LsacX
734	107	Mouth of Strontian River, Loch Sunart	NM 811 610	56°41.3'N 05°34.4'W	AreSyn, Beg, LsacRS.Psa
734	108	Jetty at head of Loch Sunart	NM 823 607	56°41.2'N 05°33.2'W	Beg
734	109	Head of Loch Sunart	NM 826 607	56°41.2'N 05°32.9'W	Beg
734	110	Rubha na Cloiche, Loch Sunart	NM 819 602	56°41.0'N 05°33.6'W	AreSyn
734	111	Opposite Eilean a' Mhuirich, Loch Sunart	NM 799 602	56°40.9'N 05°35.5'W	LsacX
734	112	South-east of Port a Chaltuin, Loch Sunart	NM 790 598	56°40.6'N 05°36.4'W	Lim
734	113	Rubh an t-Sabhail, Loch Sunart	NM 778 600	56°40.7'N 05°37.6'W	VirOph.HAs, LsacRS.Psa, Lsac
734	114	Mouth of river near Liddesdale, Loch Sunart	NM 771 599	56°40.7'N 05°38.3'W	VirOph.HAs
762	2	Auliston Point, Loch Sunart	NM 549 580	56°39.0'N 05°59.9'W	SpMeg, ErSSwi, VirOph, CMU, Lsac

Sublittoral sites – continued

Survey	Site	Place	Grid reference	Latitude/longitude	Biotopes recorded
762	4	E of Auliston Point, Loch Sunart	NM 555 580	56°38.9'N 05°59.3'W	SpMeg, SedK, ErSSwi
762	5	Sligneach Beag, Loch Sunart	NM 554 600	56°40.1'N 05°59.5'W	ErSSwi
762	6	Sligneach Beag (2), Loch Sunart	NM 554 603	56°40.2'N 05°59.5'W	LhypLsac, XKScrR
762	7	Sligneach Beag (3), Loch Sunart	NM 545 604	56°40.3'N 06°00.4'W	VirOph, ErSSwi, VirOph.HAs, Lhyp
762	8	N side of Sligneach Mór, Loch Sunart	NM 563 603	56°40.2'N 05°58.6'W	ErSSwi, Ant
762	9	Sligneach Mór, Loch Sunart	NM 563 603	56°40.2'N 05°58.6'W	FaAIC, ErSSwi
762	10	Sligneach Mór (2), Loch Sunart	NM 558 606	56°40.4'N 05°59.2'W	FaSwV, FaV, ErSSwi
762	11	E side of Sligneach Mór, Loch Sunart	NM 563 603	56°40.2'N 05°58.7'W	AmenCio, ErSSwi, Lhyp.Ft
762	12	E of Rubha aird Shlignich, Loch Sunart	NM 572 607	56°40.5'N 05°57.8'W	SpMeg.Fun, ErSSwi
762	13	Camas Ban, E side of Rubha aird Shlignich, Loch Sunart	NM 570 607	56°40.4'N 05°58.0'W	AmenCio, SCR, SpMeg, K
762	14	E of third shoulder, Rubha aird Shlignich, Loch Sunart	NM 572 607	56°40.5'N 05°57.8'W	SpMeg.Fun
762	15	NE of Rubha aird Shlignich, Loch Sunart	NM 572 607	56°40.5'N 05°57.8'W	SpMeg.Fun
762	16	NE of Rubha Aird Shlignich (2), Loch Sunart	NM 572 607	56°40.5'N 05°57.8'W	SpMeg.Fun, SpMeg
762	18	NE Oronsay, Loch Sunart	NM 595 599	56°40.1'N 05°55.4'W	AntAsH, ErSSwi
762	19	E of Oronsay, Loch Sunart	NM 577 594	56°39.8'N 05°57.2'W	Oph
762	20	E side Oronsay (2), Loch Sunart	NM 608 587	56°39.5'N 05°54.1'W	AmenCio, VirOph, CMU, Lsac
762	21	E Oronsay (3), Loch Sunart	NM 603 593	56°39.8'N 05°54.6'W	AmenCio, Oph, FaMx, AntAsH
762	22	E of Oronsay (4), Loch Sunart	NM 577 594	56°39.8'N 05°57.2'W	AmenCio, CMX, K
762	23	Risga Pinnacle, Loch Sunart	NM 604 601	56°40.3'N 05°54.6'W	AmenCio, VirOph, Oph, ErSSwi
762	24	Risga Pinnacle (2), Loch Sunart	NM 604 601	56°40.3'N 05°54.6'W	K, ErSSwi
762	25	Risga pinnacle (3), Loch Sunart	NM 604 602	56°40.3'N 05°54.6'W	AmenCio, Lhyp
762	26	Pinnacle W of Risga (4), Loch Sunart	NM 604 602	56°40.3'N 05°54.6'W	VirOph, AntAsH, VirOph.HAs
762	27	Rubh an t-Sionnaich, Loch Sunart	NM 666 613	56°41.1'N 05°48.6'W	AmenCio, CMU, Lsac.Ft
762	28	SW of Rubha Bhualte, Loch Sunart	NM 684 633	56°42.2'N 05°47.0'W	VirOph, IGS, Lsac
762	29	Pinnacle SE of Salen, Loch Sunart	NM 703 628	56°42.0'N 05°45.0'W	Oph
762	30	Pinnacle SE of Salen (2), Loch Sunart	NM 703 631	56°42.2'N 05°45.1'W	Oph
762	31	Pinnacle SE of Salen (3), Loch Sunart	NM 703 628	56°42.0'N 05°45.0'W	FaMx, CMS, Oph
762	32	W of Rubha aird Earnaich, Loch Sunart	NM 703 628	56°42.0'N 05°45.0'W	AmenCio, NeoPro, Oph
762	33	Laudale Narrows, Loch Sunart	NM 756 603	56°40.8'N 05°39.8'W	Lim, Lsac.T
762	34	Laudale Narrows (2), Loch Sunart	NM 763 600	56°40.7'N 05°39.0'W	Lim
762	35	Laudale Narrows (3), Loch Sunart	NM 755 601	56°40.7'N 05°39.9'W	Lim
762	36	Laudale Narrows (4), Loch Sunart	NM 753 602	56°40.8'N 05°40.0'W	Lim
762	37	Laudale Narrows (5), Loch Sunart	NM 756 600	56°40.7'N 05°39.7'W	Oph
762	38	Laudale Narrows (6), Loch Sunart	NM 756 600	56°40.7'N 05°39.7'W	CGS, Oph

Compiled by: Kate Northen & David Connor
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