Appendix 4e Fish Survey Report (June 2009)

EVALUATION OF RISK TO HIGH CONSERVATION VALUE FISH SPECIES AT PULPIT ROCK, LOCH LOMOND: PART 2

SUMMARY REPORT

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1. Background and rationale

In-loch works as one component of road modification to the A82 have the potential to impact on aquatic species of high conservation value. Four fish species are of potential concern. The powan (*Coregonus lavaretus*), is listed in schedule 5 of the Wildlife and Countryside Act 1981 and Lomond holds one of only 2 natural populations in Scotland. The river lamprey (*Lampetra fluviatilus*), brook lamprey (*Lampetra planeri*) and Atlantic salmon *(Salmo salar)* are listed in Annex II of the EC Habitats Directive (*Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora*). The Lomond catchment supports significant populations of salmon and both of these lamprey species.

The life-cycle stages that are potentially vulnerable to littoral zone development activity differ between species as follows;-

1.1 Powan

Spawning, egg incubation and hatching occurs in the littoral zone, thereafter larval fish are pelagic, inhabiting open water and therefore no longer vulnerable to shallow water activity. Powan spawn annually in late December and January in shallow water of less than 10 m depth. The eggs incubate over a period that is temperature dependant, but in Loch Lomond is usually around 60 days. Thereafter eggs hatch and the period of vulnerability to littoral zone activity ends. Habitat suitable for powan spawning is within the depth range 1 to 10 m and comprises well washed stony substrates containing very low levels of light sediments.

1.2 Lamprey

For both lamprey species the life stage that occupies shallow water is the juvenile (ammocoetes). For both species this life stage lasts for several years and thus suitable shallow water "nursery" areas for the larval stages are vulnerable at all periods of the year. Lamprey larvae require substrate types containing very high levels of light sediments into which they burrow to filter feed.

1.3 Salmonids

Salmon (and trout) spawn in small streams so the loch itself does not provide salmonid nursery habitat. However, parr will grow on in the loch and are known to often make use of relatively shallow marginal areas.

In order to investigate the potential for impact to these high conservation value fish species two approaches were adopted:

1. Fish surveys to establish species present in the vicinity of Pulpit rock.
2. Habitat surveys to assess the extent and suitability of substrates in the littoral zone for powan spawning and lamprey juveniles.

2. Study site

The study site is located towards the northern end of Loch Lomond (Fig 1) and spans an area of the western shore line approximately 1.5 km in length between NGR 232310 714322 to the north and Rubha Ban (233010 713200) to the south.

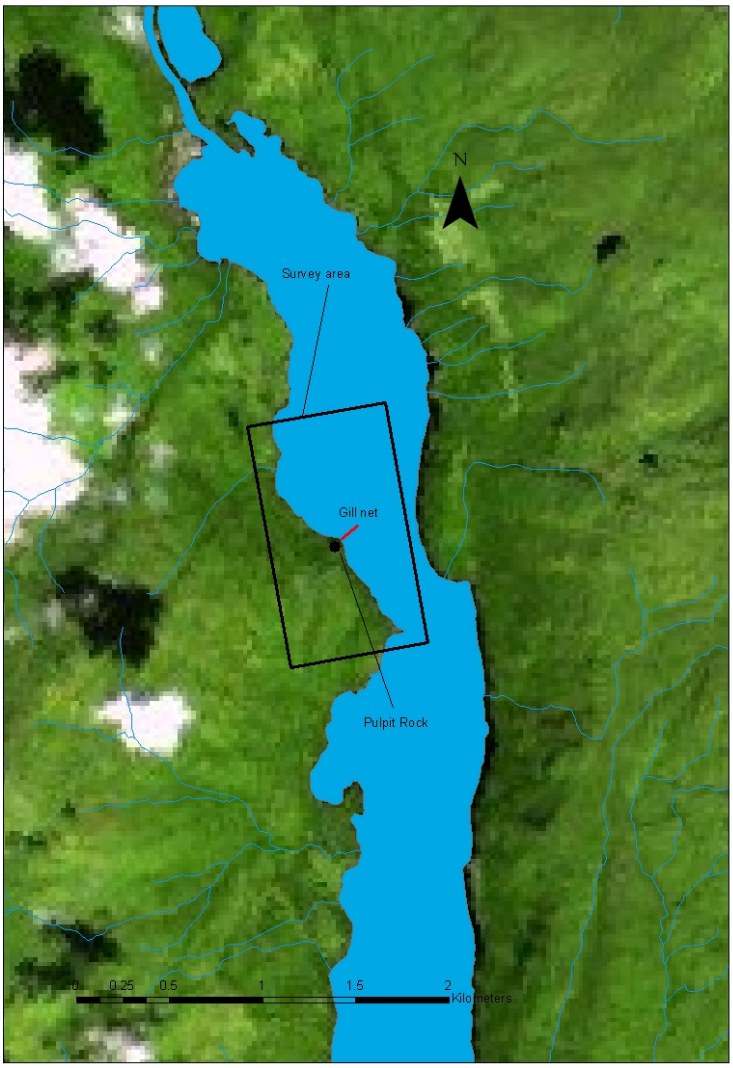

FIG. 1. ***Location of survey area showing gill netting site at Pulpit Rock***

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The area around Pulpit rock consists primarily of a rocky shoreline which shelves rapidly to a considerable water depth (fig.2).

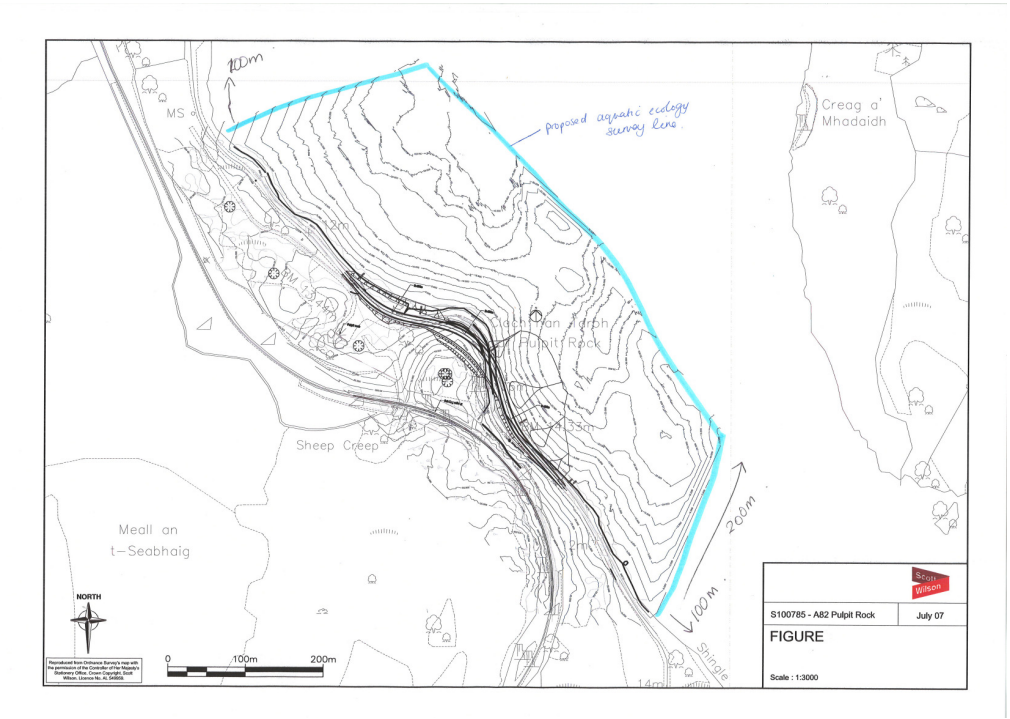

FIG. 2 . ***Bathometric survey of site at Pulpit Rock***

3. Field Methodology

3.1 Fish surveys

Fish sampling was conducted using gill nets deployed in accordance with the standard NORDIC protocol for sampling fish communities in standing water bodies. A single benthic multi-mesh net (mesh size ranging from 7 – 55mm) of approx. 60m length was deployed at NGR 232675 713695 as shown in Fig 1 for a total of three sampling events (1 per month at the same location) between April and June 2008. The net was set perpendicular to the shore line in order to give coverage of both littoral zone and mid water habitats and covered a depth range of approximately 1 – 25 m (end to end). Nets were set in late afternoon and retrieved the following morning in order to maximize capture rate and sampling efficiency.

Electro-fishing of shallow littoral zones was conducted in July (where depth of water made this practicable) to establish presence/absence of juvenile lamprey and salmonids. Substrates deemed to be suitable for juvenile lamprey were electro-fished randomly using a standard "on-off" technique designed to draw ammocoetes from their burrows. Areas providing good cover for juvenile salmonids were also fished.

3.2 Habitat surveys

Habitat surveys were conducted in June 08 under low water conditions. The littoral zone substrate of an area of shoreline extending approximately 0.75 km N-S of Pulpit rock was assessed both visually (at water depths up to 1 m) and with the use of a Remotely Operated Vehicle (ROV) (Video Ray Pro 3) at depths in excess of this.

Five underwater transects were surveyed at locations shown in fig 3 perpendicular to the shore at intervals representative of discontinuities in shoreline topography. Transects extended from 10 cms water depth to a maximum distance of 50m or to a point at which water depth exceeded 10 m - the limit at which successful powan spawning or lamprey nursery areas would be possible.

Habitat assessment was based on standard SNH protocols developed at SCENE for assessment of Vendace habitat (Appendix.1). This was modified for use in determining habitat suitability for powan and lamprey. Relative proportions of macrophytes and 8 standard substrate categories were assessed at 3m intervals along each transect. In addition, a shallow water habitat visual assessment was conducted along the shoreline at approximately 50 m intervals. These data were then subsequently used to categorise habitat as "optimal" "sub-optimal" or "poor" quality for 1) spawning and egg incubation for powan and 2) as nursery habitat for lampreys.

FIG. 3 ***Locations of habitat transect surveys in relation to Pulpit Rock***

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4. Summary of main findings

4.1 Fish surveys

Total fish captures from gill net surveys are summarized in table 1 below. Per net catches are shown in Appendix 2. A total of 7 fish species were captured over the 3 nights of netting with a mean per net capture rate of 49 specimens. Ruffe were clearly the most abundant species present (66.66% of total captures) followed by roach (16.33%) and perch (10.88%). Pike (3.4%), powan, eel and trout were the other species present. A single adult sea trout was the only salmonid captured but no parr or smolts were found to be present. However, the capture of 2 adult powan (mean FL 337.5mm; mean W 424g) suggests this area may be important for this species.

Species	Number	%Species	Average Length	Average Weight	Average Capture rate (net)	Average Capture (hrs)
Roach	24	16.326	129.9	39.4	8	0.436
Perch	16	10.884	143.8	48.8	5.33	0.290
Eel	1	0.680	381	85.57	0.33	0.018
Powan	2	1.360	337.5	424	0.66	0.036
Pike	5	3.401	371.5	564.8	1.66	0.090
Ruffe	98	66.666	109.6	21.4	32.66	1.781
Sea trout	1	0.680	400		0.33	0.018
Totals:	**147**				**49**	**2.672**

TABLE 1. ***Summary of captures from gill net surveys at Pulpit rock April - June***

Electro-fishing indicated juvenile lamprey (ammocoetes *L* = +/- 62mm) were present in the sandy substrates in shallow water (< 1m depth) in vicinity of Transect 1 (NGR 232329 714359).

No salmonids were found to present.

4.2 Habitat surveys

4.2.1 Transect surveys

The littoral zone in the vicinity of Pulpit rock is characterised by a narrow rocky shoreline which plunges steeply into deep water. Substrates are composed principally of

light sediment. This is poor quality spawning habitat for powan and generally too deep to be of value as nursery area for lamprey.

4.2.1(i)Lamprey

However, the northern part of the survey area in the vicinity Transects 1 and 2 has a wider more gently shelving littoral zone where some lamprey nursery habitat is present at distances >15 – 20 m from the shore (fig.4). South of Pulpit rock there are small amounts of optimal habitat where coarser substrates give way to light sediments but this is limited by water depth which rapidly becomes unsuitable due to the steeply shelving nature of the bed.

4.2.1(ii) Powan

Transect surveys indicated powan spawning habitat to be generally unsuitable. However, at the southern extreme of the survey area a gravel spit at Rubha Ban is a known powan spawning site and surveys at this location indicated significant optimal spawning habitat with sub optimal habitat extending into deeper water (fig 5).

4.2.2 Shoreline surveys

4.2.2(i)Lamprey

Surveys of shallow water at the loch margins indicated that lamprey habitat close to the shore was consistently poor throughout the survey area.

4.2.2(ii) Powan

The steeply shelving and rocky littoral zone around Pulpit rock (fig 2) makes this shoreline unsuitable for powan spawning. However, some limited areas of mainly sub optimal powan spawning habitat were identified to the north close to shore in the vicinity of Transect 3 (fig 6). To the south significant amounts of optimal habitat were present in the vicinity of Rubha Ban extending north of Transect 5.

4.2.3 Salmonid habitat

The main loch does not provide spawning or nursery habitat for salmonids although the shallower zones to the north may be utilized by salmon and trout parr. A small in-flowing burn enters the loch close to transect 2 and may provide some habitat for juvenile salmonids.

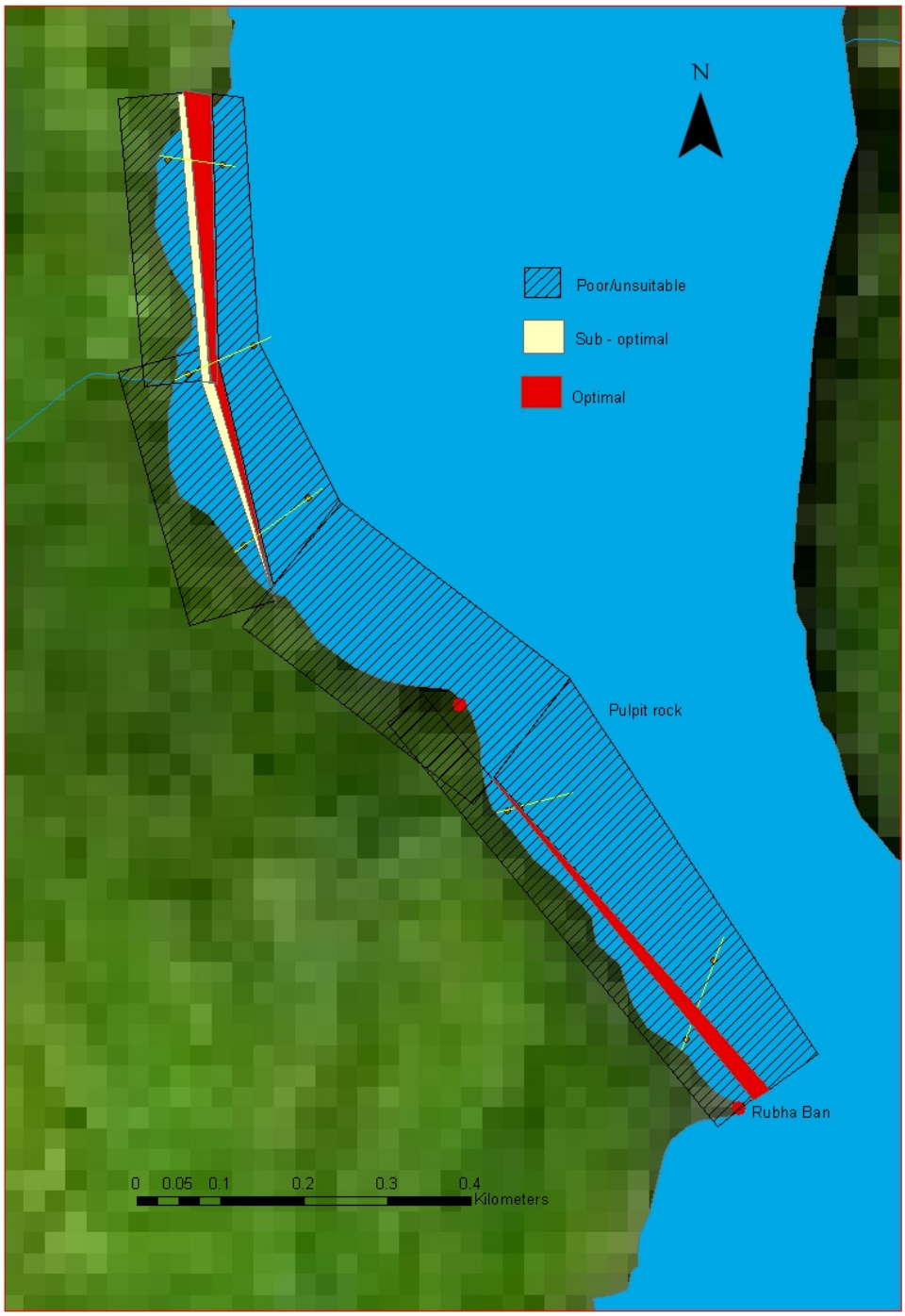

FIG. 4 ***Transect surveys showing locations of lamprey nursery habitat at Pulpit Rock***

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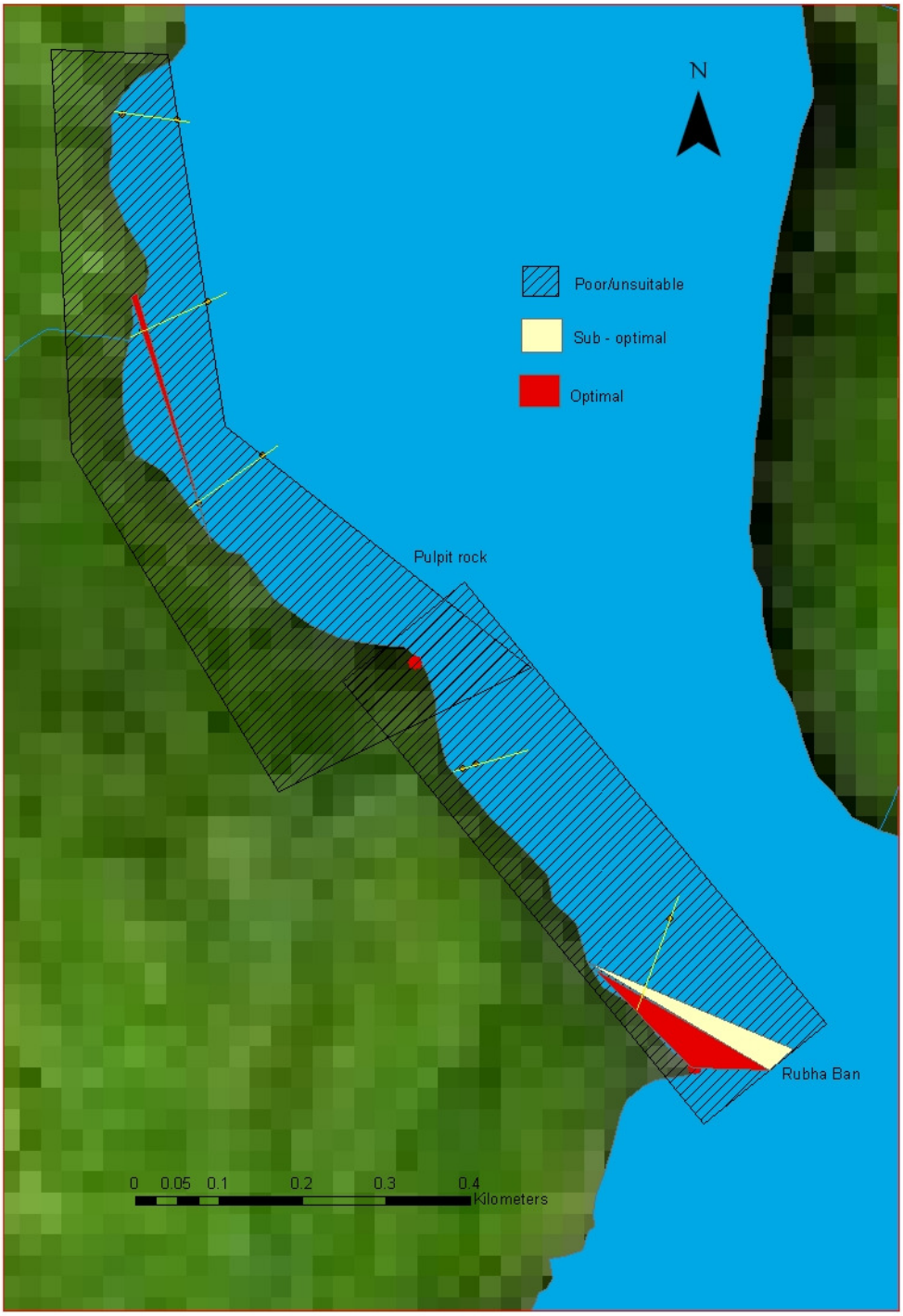

FIG. 5 ***Transect surveys showing locations of powan spawning habitat at Pulpit Rock***

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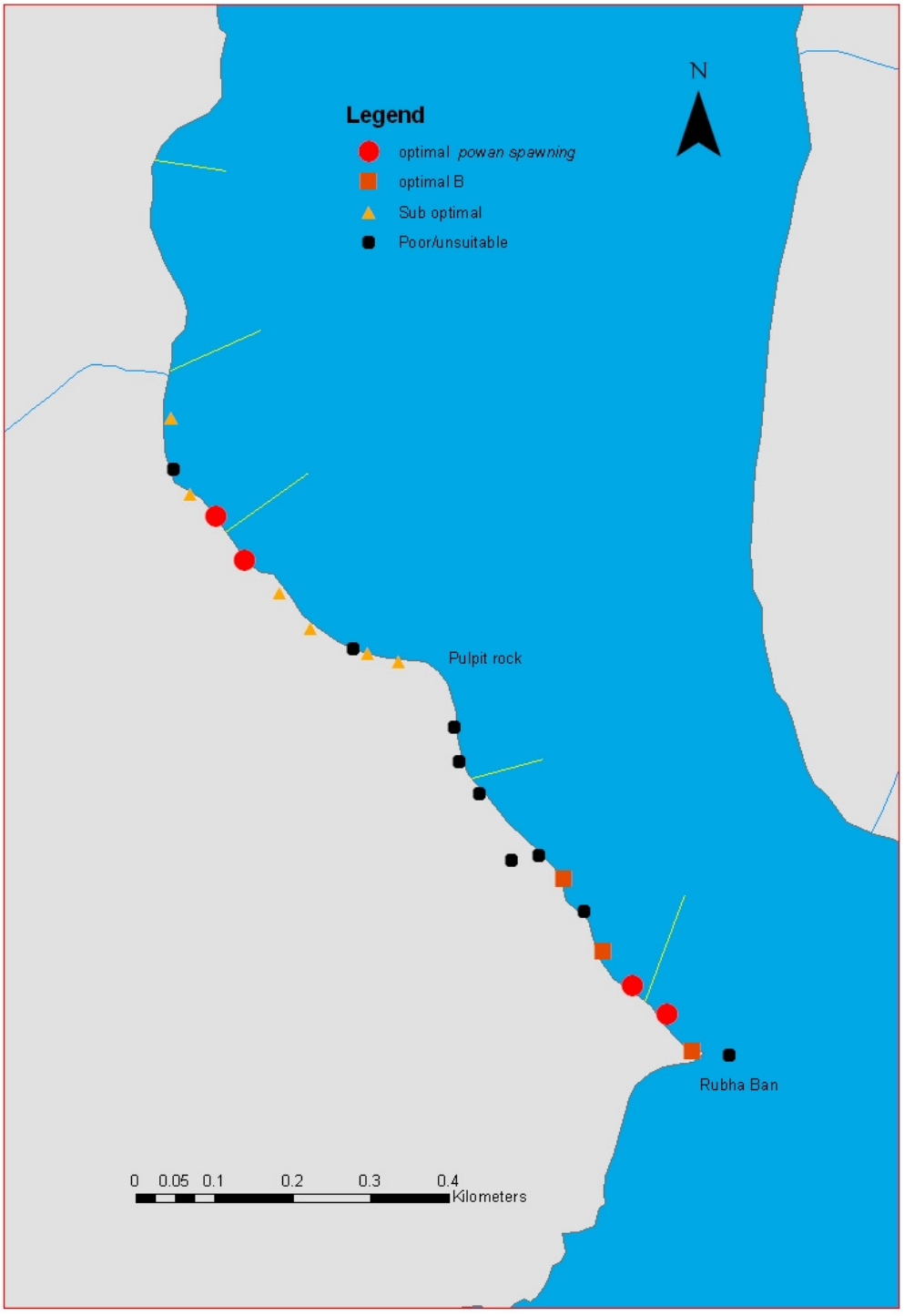

FIG. 6 ***Shoreline surveys showing locations of powan spawning habitat at Pulpit Rock***

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5 Conclusions and recommendations

5.1 Summary

5.1.1 Fish populations in the Pulpit rock area comprise principally of ruffe, roach and perch. However, a powan population is present.

5.1.2 Habitat in the immediate area of Pulpit rock is of poor quality and is generally unsuitable for powan spawning or as lamprey nursery habitat.

5.1.3 Lamprey nursery habitat is present mainly to the north of the area at some distance (> 15-20m) from the shore where some lamprey ammocoetes are present.

5.1.4 Shoreline habitats are unsuitable for lamprey

5.1.5 High quality powan spawning habitat is located at the southern extreme of the study area towards Rubha Ban. This is a known spawning site and the steeply shelving nature of the littoral zone in the upper basin means that such sites are limited in northern Loch Lomond and can therefore be regarded as being of particular importance.

5.1.6 The capture of adult powan in the gill nets is further evidence that this area is important to this species and that a population remains present in the vicinity.

5.1.7 Suitable powan spawning habitat is also present in close proximity to the shoreline immediately north of Pulpit rock in the area of Transect 3. It is not known whether this area is utilised by spawning powan.

5.2 Recommendations

5.2.1 Protection of powan spawning areas to the south of Pulpit rock should be the highest priority

5.2.2 The extent of powan spawning along the shoreline to the north should be ascertained from further surveys at spawning time

5.2.3 The importance of the lamprey nursery habitats to the north should be further investigated

5.2.4 The small burn which enters the loch close to Transect 2 will be affected by the road development. This watercourse should be electro-fished to establish if it is a nursery stream for salmonids.

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APPENDIX 1 PROTOCOL USED FOR ASSESSMENT OF HABITAT QUALITY

	Optimal		**Poor**				**Sub-optimal**	
	(requires both categories)		**(requires any one of these conditions)**					
	≥ 2 categories, comprising ≥30%	≤ 10%	≤ 20%	≥ 80%	≥ 30	≥ 60%	(any other combination of categories)	
Clay				X				
Silt		X			X			
Sand				X				
Gravel	X		X					
Pebble	X		X					
Cobble	X		X					
Boulder	X		X					
Bedrock				X				
Macrophytes						X		

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APPENDIX 2 SUMMARY OF FISH CAPTURES FROM GILL NET SURVEYS

Net	Date	Set /lift times	Time (hrs)	Depths	Nos of species	Species	fish numbers	Average Length (mm)	Average Weight (g)	% Species	Average Capture rate (Hrs)
1	**29/30 April**	1830 - 1100	16.5	5m - 25m	3	Roach	5	183.6	92.8	45.45	0.303
		1100				Perch	1	195	97	9.090	0.060
						Ruffe	5	117	27.4	45.45	0.303
						total	**11**				**0.666**
2	**27/28 May**	1600 - 1100	19	1m - 23m	7	Eel	1	381	85.57	1.639	0.052
						Perch	10	135.33	35.97	16.39	0.526
						Pike	4	293	385.07	6.557	0.210
						Roach	4	112.75	15.78	6.557	0.210
						Ruffe	40	108.44	18.57	65.57	2.105
						Sea trout	1	400		1.639	0.052
						Powan	1	345	471.8	1.639	0.052
						total	**61**				**3.210**
3	**24/25 June**	1630 - 1130	19.5	2m - 25m	5	Powan	1	330	376.29	1.333	0.051
						Perch	5	101.2	13.64	6.666	0.256
						Pike	1	450	744.7	1.333	0.051
						Roach	15	93.4	9.76	20	0.769
						Ruffe	53	103.6	18.4	70.66	2.717
						total	**75**				**3.846**

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Ford

11m

Northern extent of shallow water assessment

MS

12m

BM 13.44m

R10

Clach nan Tarbh or Pulpit Rock

R11

16m

R12

BM 14.33m

Sheep Creep

Meall an t-Seabhaig

12m

Southern extent of shallow water assessment

Sheep Creep

14m

Rubha Ban

Creag

Creag a' Mhadaidh

FB

NORTH

LEGEND

- Potential Lamprey nursery area
- Potential Powan spawning habitat
- Survey Transect (Extending to 10m depth)

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Figure 7

Fish Habitat Survey

Scale: 1:5000