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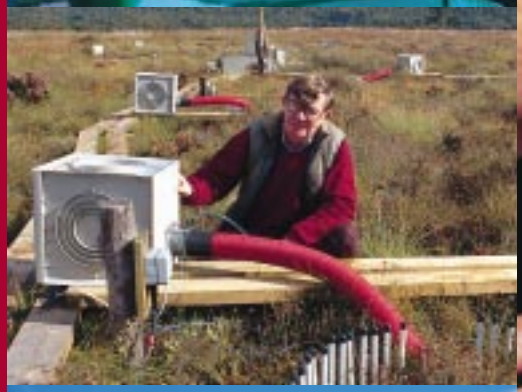

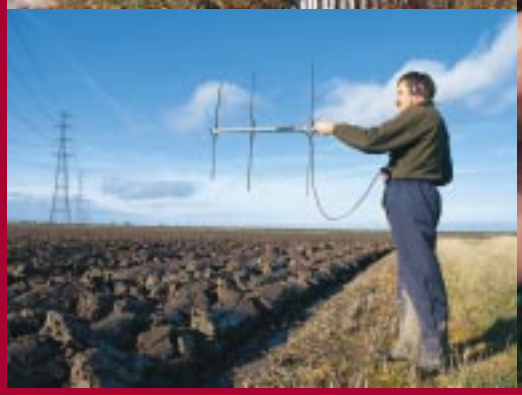

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Survey of vendace in Daer Reservoir and Loch Skene

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‘The inhabitants of Lochmaben look upon the vendace
as a mysterious fish peculiar to their lakes,
a fish in which they take a pride,
and one concerning which there are many curious traditions.’
Tate Regan (1911)

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Summary

The vendace *Coregonus albula* (L.) occurred historically at four sites in Great Britain, two in Scotland and two in England. It became extinct in Scotland at the Castle Loch about 1912 and at the Mill Loch about 1980. At the two sites in England, the population in Bassenthwaite Lake is considered to be in serious decline whilst that at Derwentwater seems at present secure.

To restore the vendace to Scotland and to provide backup populations for the two English stocks, eggs were obtained from both stocks and incubated in Scotland. The resulting fry were then transferred to waters in Scotland previously chosen as being ecologically suitable – Derwentwater fry being released in Daer Reservoir (1998) and Bassenthwaite Lake fry into Loch Skene (1997 and 1999).

Sampling was carried out in July 2003 to check the progress of these introductions, using standard mixed mesh gill nets at both Scottish locations. No vendace were found at Daer Reservoir but 55 vendace were collected at Loch Skene. Brown trout *Salmo trutta* L. and Minnow *Phoxinus phoxinus* L. were also found at both waters.

The vendace from Loch Skene showed a wide range of length (117-239 mm) and weight (16-126 gm). Length and weight frequency graphs indicated four year classes in the samples and this was subsequently supported by age analysis using scales which also showed spawning marks after age 2+. These results suggest that the vendace is now well established at Loch Skene.

Reasons for the netting survey at Daer Reservoir failing to find vendace are discussed. This could be because (a) vendace are present but are scarce and were not detected by this level of survey, (b) vendace are absent, none of the introduced fry have survived. If the latter is the case then it could be due to the original numbers being too small, the quality of stock used, predation by brown trout, the physical and biological characteristics of Daer Reservoir being unsuitable for vendace (at the time of stocking or later), or a combination of these.

Future work on vendace is discussed and some proposed. Further transfers from Derwentwater to Daer Reservoir and to another suitable site (yet to be selected) are suggested. In addition, a further site for Bassenthwaite stock, but using material from Loch Skene, should be selected and transfers carried out. In this way, and assuming success, the

vendace can be regarded as being restored as part of Scotland's biodiversity and good backup stocks would be available to support or replace either of the English populations.

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1. Introduction

The vendace *Coregonus albula* (L.) occurs in many lakes in north-west Europe, from northern Scandinavia and north-west Russia in the north to Bavaria further south and from Cumbria in the west to western Russia in the east. Though this is mainly a lake species, some populations also occur in the Baltic Sea, migrating into fresh water to spawn. In the British Isles it has been known from only four lakes. Two of these are in Scotland, the Castle and Mill Lochs (where the Lochmaben vendace was originally described as a distinct species and subspecies - *Coregonus vandesius vandesius*), and two are in England, Bassenthwaite Lake and Derwentwater (the Cumberland vendace - *Coregonus vandesius gracilior*) (Regan 1911). All of these stocks are now considered to be *Coregonus albula* (Ferguson 1974).

The population in the Castle Loch, Lochmaben became extinct at the beginning of the 20th century and none has been recorded since shortly after a new sewage works was opened there in 1911 (Maitland 1966a, 1966b). However, though it was also presumed extinct in the Mill Loch by Dottrens (1959) and others in the 1950s ('Le Dr Slack a vainement cherche pour moi le vendace du Loch Maben. Cette forme doit etre consideree comme eteinte.'), the discovery of vendace in the stomach of a Pike *Esox lucius* encouraged further research and specimens were caught there in 1966 and in subsequent years (Maitland 1967a, 1979). However, in spite of attempts to save this population, none has been seen since the late 1970s, and the species is now regarded as being extinct there too (Maitland 1989, Maitland & Lyle 1991).

The vendace, over its whole range, seems to occur in lakes of any size from a hectare or so upwards. These lakes are often quite rich and are rarely exceedingly oligotrophic. Depth seems to be not too important, though probably several metres is needed giving freedom from summer heat stress and oxygen lack as well as winter kill. It is a sensitive species, vulnerable to a number of anthropogenic pressures (Resetnikov 1988). Strong competition and/or predation from Pike, Perch *Perca fluviatilis*, Roach *Rutilus rutilus* and other species is probably very harmful unless a good deep/open water niche is available (Maitland & Campbell 1992). Egg predation from introduced Ruffe *Gymnocephalus cernuus* is a concern for *Coregonus* in general (Adams & Maitland 2000) and specifically for vendace in Bassenthwaite Lake (Winfield *et al* 1998, Winfield *et al* 2002a, Winfield *et al,* in press). There are also concerns in Bassenthwaite Lake from siltation on spawning grounds (Maitland 1996) due to runoff from land in the catchment (Winfield *et al, i*n press). The size of individual populations seems to fluctuate greatly from time to time for reasons which are unknown.

Thus the vendace is currently the rarest freshwater fish in Great Britain and the present known distribution of breeding populations of this species is restricted to two waters in Cumbria, namely Bassenthwaite Lake and Derwentwater. Genetic studies have shown differences between these two populations (Beaumont *et al* 1995). As indicated above, there is concern over the future status of the vendace in Bassenthwaite Lake due to pressures from increasing eutrophication and the introductions of coarse fish alien to this lake.

As part of its Species Action Programme in 1996, Scottish Natural Heritage commissioned a project to re-introduce vendace to Scotland using material from the Cumbrian stocks, based on fertile eggs collected at spawning time (Maitland 1967b). The first phase of that work was the selection of suitable introduction sites in SW Scotland. From 110 sites examined there, only two were found to be suitable - Daer Reservoir and Loch Skene. To maintain genetic integrity (Lindsey 1988), only vendace from Derwentwater were to be used to supply Daer

Reservoir, and only vendace from Bassenthwaite Lake were to be used to supply Loch Skene (Table 1). In 1997 and 1999 the translocation programme delivered a total of some 65,000 fry and eyed eggs to Loch Skene, and in 1998 12,800 fry to Daer Reservoir. The site selection and translocation programmes are fully reported in Lyle *et al* (1996, 1998 & 1999).

In 1999 the Environment Agency commissioned a translocation feasibility study to locate sites for vendace introductions in Cumbria. Of 87 sites examined, none were found to be immediately suitable (Lyle & Winfield 1999). Consequently, the Scottish waters may now be extremely important as possible vendace locations and also as safeguard sites for the Cumbrian stocks.

However, no study of the success of the Scottish introductions had yet been undertaken and it was important that preliminary investigations of the presence of vendace in Loch Skene and Daer Reservoir were carried out as soon as possible, prior to a fuller assessment of their status to be commissioned in 2004.

2. Objectives

The objectives of this project were to investigate if vendace fry introduced to Daer Reservoir in 1998 and to Loch Skene in 1997 and 1999 have survived at these sites, and to assess from any vendace found whether breeding populations may have been established there.

3. Methods

Sampling for vendace at Daer Reservoir and Loch Skene was carried out by gill net surveys. Given the limited objectives of the surveys, it was not necessary to apply the complete methodology recommended by Bean (2003) for the standardised survey and monitoring protocol for whitefish. However, elements of this protocol were adopted where appropriate to aid evaluation of the protocol and proscribed equipment. In this respect two 'NORDIC' type multi-mesh gill nets were used as the principal sampling method. One net each for sampling in benthic and pelagic habitats. The specifications of these nets are given in Appendix 1 and are fully described by Bean (2003). Also, their use in this project will provide some comparability with results from proposed surveys in 2004 using the full whitefish protocol methodology.

3.1 Daer Reservoir

Netting at Daer Reservoir was carried out by boat in two overnight sessions between the 28th & 29th and 29th & 30th July 2003. The two 'NORDIC' type nets only were used for the first session, set in offshore locations (Figure 1). Their positions were changed for the second session and in addition four 'S' type survey nets (see Appendix) were also used to increase the netting effort. All these nets were now set in or over the deepest area of the reservoir (Figure 1). During the second session, overnight rain led to a rise in the reservoir water level of approximately one metre. This affected the deployment of the pelagic net and reduced its catching efficiency for part of the period it was set. Full details of the periods of netting are given in Table 2 (code numbers are allocated to each net for each session).

3.2 Loch Skene

Loch Skene was sampled on the 22nd and 23rd July 2003 and the 'NORDIC' nets were set from a small boat. Both benthic and pelagic nets were set for four hour periods during daylight on the 22nd, and then inspected for fish catch before deciding if they should be set overnight. In the event, the benthic net was lifted completely and reset in a different, deeper location, the pelagic net was inspected and left in place. The latter was secured at each end by lines to the shores to ensure its correct deployment and security. Both nets were lifted completely in the morning of the 23rd. Full details of the periods of netting are given in Table 3 and the netting locations are given in Figure 2.

At both sites, all fish were removed from the nets are quickly as possible, identified to species and counted. Brown trout in good condition were returned to the water.

All those fish retained were later measured for fork length, while vendace were additionally weighed, identified to sex, scale samples were taken and the fish frozen for possible future analysis. A sample of scales from 10 fish (including the smallest, largest and two from each corresponding to the four nodal points indicated in length frequency analyses (Figures 6 and 7)) was mounted and photographed. Ageing was based on these photographs.

4. Results

4.1 Daer Reservoir

The benthic (D1) and pelagic (D2) 'NORDIC' nets that were set out on 28th July and lifted in the morning of 29th July caught a total of 24 brown trout and one Minnow. Significantly, no vendace were taken. The catch from the repositioned 'NORDIC' nets (D3 & D4) in and over the deepest part of the reservoir, and the four 'S' type gill nets (D5) set on 29th July and lifted on 30th July, totalled 34 brown trout – again, no vendace were found. The numbers of fish taken by each net are given in Table 4. The length frequency details of the brown trout caught (excluding those released immediately from the boat) are shown in Figure 3.

The earlier survey of fish in Daer Reservoir (Lyle *et al* 1996) showed that brown trout were common there and this continues to be the case.

4.2 Loch Skene

The benthic 'NORDIC' net (S1) set off the west shore of Loch Skene on 22nd July for four hours during daylight before being lifted, caught brown trout, but no vendace. The pelagic 'NORDIC' net (S2) also set for four hours on 22nd July caught brown trout and vendace.

Both the repositioned benthic 'NORDIC' net (S3) and the pelagic 'NORDIC' net left in place (ie now S4) on 22nd July and lifted on 23rd July caught brown trout, vendace and one minnow. The total number of vendace collected (55) was adequate for the purpose of this survey and no further netting was required. The numbers of fish taken by each net are given in Table 5. For the vendace catch made by the pelagic 'NORDIC' net S4, the numbers and length ranges of vendace taken by each mesh size are given in Table 6.

The length frequency details of the brown trout caught (excluding those released immediately from the boat) are shown in Figure 4. The earlier survey of fish in Loch Skene (Lyle *et al* 1996) showed that brown trout were common there and this continues to be the case.

Data from the pelagic net indicate a clear relationship between the length of vendace caught and the mesh size of that part of the net in which they were taken (Figure 5 and Appendix 2). Only five meshes of the 11 available in the net took vendace.

The length-frequency distribution of the entire sample of vendace from Loch Skene (Figure 6) indicates a clear distinction between a group of small, presumably young, fish and the other larger vendace. Within the larger fish there is an indication of three length groups. A similar picture arises if the length- frequencies are analysed by sex (Figure 7), when there is a clear indication of four length groups, possibly corresponding to four age classes.

Analysis of the weight-frequency distribution of the entire sample of vendace from Loch Skene (Figure 8) gives a similar picture to that for lengths, with a clear distinction between the group of small and the other larger vendace. Within the larger fish there is an indication of three weight groups. A similar picture arises if the weight-frequencies are analysed by sex (Figure 9), when there is a clear indication of four weight groups altogether, possibly corresponding to four age classes.

Scale analysis was carried out on 10 of the vendace caught. A full scale and opercular analysis of all 55 fish will be carried out at a later date. Preliminary scale analysis indicates a range of age classes, with the oldest fish possibly one of those originally stocked in 1999.

The length-weight relationship of vendace from Loch Skene (Figure 10) shows a typical relationship with some suggestion of clumping of data around the four length and weight classes described above.

5. Discussion

This brief survey has shown that the presence of vendace in Daer Reservoir has not been established, but the survival and reproduction of vendace in Loch Skene has now been confirmed. Thus the introductions of vendace in 1997 and 1999 have been extremely successful and it would appear that a viable population has now been established in Loch Skene.

5.1 Daer Reservoir

The negative results of the netting effort applied at Daer Reservoir offer no evidence of the survival of vendace there. The reason(s) for the lack of success in finding vendace are unknown but could be due to one or more of the following.

a. Vendace are present, but in low numbers and not found during this level of survey. Given the relatively small number of fry (12,800 (ie one fifth of the number to Loch Skene)) introduced in 1998 to a water of this size (ie seven times larger in area than Loch Skene) it is not impossible that a small population exists but has not yet developed to a readily detectable size.

b. Vendace are present, but extremely scarce. It is possible that only a few individuals have survived from the fry introduced and that there is a low probability of them creating a viable population. Even if they do, it would be several years before the population would be of detectable size and it would be of very limited genetic diversity.

c. Vendace are absent. None of the introduced fry have survived. There are several reasons why this may have happened. The number introduced may have been simply too small to overcome natural mortality rates, predation from brown trout, entrainment into draw-off water, etc. The introduced stock came from only six female parents and their viability may have been too restricted or inadequate to cope with environmental differences between Derwentwater and Daer Reservoir (Wilkonska & Zuromska 1988). Environmental conditions at the times of introduction may have been poor – on only six occasions were introductions made at Daer Reservoir (about one third of the number made at Loch Skene) and at some of these times the physical and/or biological conditions may not have been adequate for fry to prosper (Auvinen 1988). A combination of some or all of these factors may have been operating.

d Vendace are absent because Daer Reservoir is unsuitable in some way for this species. This may be related to the fact that the site, as a public water supply reservoir, has at times, a large draw-off with associated marked fluctuations in water level. However, similar reservoirs are known to have been satisfactory introduction sites for other rare fish species with similar reproductive habitat requirements, eg Arctic Charr *Salvelinus alpinus* to Talla Reservoir, Powan *Coregonus lavaretus* to Loch Sloy and Carron Valley Reservoir (Maitland & Lyle 1990). Also, biological factors such as the availability of planktonic food organisms for the fry may have been inadequate in the single spring of introduction.

5.2 Loch Skene

The introduction to Loch Skene seems to have been very successful with several year classes following those which were originally introduced there. It is particularly fortunate that, of the two carried out, this introduction has been successful in view of the increasing threat to the population remaining in Bassenthwaite Lake. The latest monitoring report (Winfield *et al* 2003a), which covered 2002 continues to show Bassenthwaite Lake vendace in poor condition. It is important that the Loch Skene stock is monitored regularly from now on and also that consideration is given to creating at least a second 'safeguard' population of the Bassenthwaite stock.

It is worth noting here that in a similar project, the eggs of Schelly *Coregonus lavaretus* from Haweswater were transferred to Small Water and Blea Water in 1997 (ca 24,000 eggs to each). In late 2002 a reproducing population of Schelly was demonstrated in Small Water, but as yet nothing positive from the larger Blea Water (Winfield *et al* 2002b, Winfield *et al* 2003b).

5.3 Future prospects

The successful establishment of vendace in Loch Skene has indicated that future work to strengthen the establishment of this rare fish in Scotland and provide reliable backup stocks

for the populations in England is worth while. It is suggested therefore that serious consideration is given to the following proposals.

Selection of a second water into which stock from Derwentwater could be introduced. Further consideration should be given to addition sites for new populations of vendace. The original selection study (Lyle *et al* 1996) should be revisited and other waters considered. In view of the future impacts of global warming (Maitland 1991) higher altitude sites should be favoured. Thereafter, eggs or fry from Derwentwater should be introduced to both this new water and Daer Reservoir. Ideally, fry should be introduced in two separate years and the aim should be to stock each with at least 40,000 eggs or fry obtained from at least 20 males and 20 females from Derwentwater.

Selection of a second water into which Bassenthwaite stock could be introduced. It would seem a sensible precaution to have a second secure population of vendace from Bassenthwaite stock. However, because of the fragile situation with the vendace population in Bassenthwaite Lake, eggs or fry from Loch Skene should be introduced to this new water. Ideally, fry should be introduced in two separate years and the aim should be to stock with at least 40,000 eggs or fry obtained from at least 20 males and 20 females from Loch Skene. The logistics of this exercise would have to be considered carefully in view of winter conditions at Loch Skene when vendace are likely to be spawning (ie December). If such a transfer is carried out the concept of genetic 'bottlenecking' should be given due consideration.

Regular monitoring of the stocks of vendace. The monitoring of all stocks of *Coregonus* in Great Britain using a standard protocol has been proposed by Bean (2003) is and should include any further waters in which vendace is established in the future. However, similar monitoring (using hydroacoustics and survey gill netting) has been carried out for vendace in Bassenthwaite Lake and Derwentwater (Winfield *et al* 2003a) and for Gwyniad *Coregonus lavaretus* in Llyn Tegid and Schelly in Haweswater (Winfield *et al* 2002b, Winfield *et al* 2003b).

Coregonus stock register. It is important that the origin of any new stocks of vendace and other *Coregonus* species is recorded permanently in a published form. This could be done by following the example of Kallio-Nyberg & Koljonen (1988) in Finland and maintaining a register of all whitefish stocks which is updated periodically in a scientific journal.

Analysis of historic water levels at Daer Reservoir. It is possible that conditions at Daer Reservoir since the introduction there have been sufficiently extreme to stop or severely curtail recruitment (Frisk *et al* 1988), so that the present survey was effectively looking only for survivors from the original introduction. It would seem therefore to be worthwhile to examine available physicochemical data since that time, especially relating to acidic flushes and extreme water level fluctuations during the reproduction period for vendace.

6. Conclusions

The transfer of vendace from Derwentwater to Daer Reservoir has not been shown by the present survey to have been successful, though further checks at Daer Reservoir should be carried out in the future.

The transfer of vendace from Bassenthwaite Lake to Loch Skene has been very successful and it appears that a healthy mixed-age population is established there, not only restoring this species to Scotland within the catchment in which the species originally occurred, but also providing a useful backup population for the threatened stock in Bassenthwaite Lake.

Further transfer work on vendace is proposed with the aim of establishing at least four populations in Scotland, two based on the Bassenthwaite stock and two on that from Derwentwater. In addition, monitoring of all stocks of vendace should continue.

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Table 1 Physical details of Daer Reservoir and Loch Skene

(from Lyle *et al* 1996).

	Daer Reservoir	Loch Skene
GB Grid Reference	2980E 6090N	3171E 6165N
Altitude. M	342	530
Area. Hectares	202	27.9
Maximum depth. m	37.1	11
Mean depth. m	12.66	5.45
Volume. $m^3.10^4$	2557.32	152.06
PH	*Ca* 7.0	6.9

Table 2 Details of netting at Daer Reservoir

See also Figure 1.

Net type	Net code	Date set	Time set	Date lifted	Time lifted
'NORDIC' benthic	D1	28-7-03	20.20	29-7-03	10.35
'NORDIC' pelagic	D2	28-7-03	20.00	29-7-03	10.00
'NORDIC' benthic	D3	29-7-03	13.15	30-7-03	13.45
'NORDIC' pelagic	D4	29-7-03	13.30	30-7-03	13.30
'S' x 4	D5	29-7-03	13.00	30-7-03	13.00

Table 3 Fish catches from nets at Daer Reservoir, 28-30 July 2003

Net type	Net code	Date set	Time set	Date lifted	Time lifted
'NORDIC' benthic	S1	22-7-03	12.00	22-7-03	16.00
'NORDIC' pelagic	S2	22-7-03	13.00	22-7-03	17.00
'NORDIC' benthic	S3	22-7-03	17.30	23-7-03	11.00
'NORDIC' pelagic	S4	22-7-03	17.00	23-7-03	11.30

Table 4 Fish catches from nets at Daer Reservoir, 28-30 July 2003

Net type	Net code	Date set	Date lifted	B. trout	Vendace	Other fish
'NORDIC' benthic	D1	28-7-03	29-7-03	18	0	1 minnow
'NORDIC' pelagic	D2	28-7-03	29-7-03	6	0	0
'NORDIC' benthic	D3	29-7-03	30-7-03	4	0	0
'NORDIC' pelagic	D4	29-7-03	30-7-03	2	0	0
'S' x 4	D5	29-7-03	30-7-03	28	0	0

Table 5 Fish catches from nets at Loch Skene, 22-23 July 2003

Net type	Net code	Date set	Date lifted	B. trout	Vendace	Other fish
'NORDIC' benthic	S1	22-7-03	22-7-03	3	0	0
'NORDIC' pelagic	S2	22-7-03	22-7-03	1	2	0
'NORDIC' benthic	S3	22-7-03	23-7-03	16	12	1 minnow
'NORDIC' pelagic	S4	22-7-03	23-7-03	4	41	0

Table 6 Numbers and fork lengths of vendace caught in Loch Skene in the pelagic 'NORDIC' gill net (S4) by net mesh size

See also Appendix 2.

Mesh size mm	No vendace	Range in fork length mm
6.25	0	-
8	5	118-125
10	0	-
12.5	8	155-171
15.5	10	136-197
19.5	11	167-215
24	7	200-239
29	0	-
35	0	-
43	0	-
55	0	-

Table 7 Numbers of vendace caught in Loch Skene by anglers from April to August inclusive

Note: The data are minimal as it was not possible to interview all anglers who fished the loch. Information supplied by A. Hampton (National Trust for Scotland).

Date	Number of vendace	Comments
09-4-03	1	Found dead – ca 5"
17-4-03	1	-
18-4-03	1	ca 8"
03-5-03	3	-
07-5-03	1	ca 8"
11-5-03	11	-
12-5.03	3	One at ca 6"
13-5-03	5	-
31-05-03	4	One at ca 8"
1-6-03	3	One at ca 6"
8-6-03	15	One at ca 8" – also 70 brown trout
9-6-03	1	-
14-6.03	6	One at ca 8"
16-6-03	3	One at ca 10"
24-06-03	1	-
30-6-03	1	ca 6"

Figure 1 Bathymetric map of Daer Reservoir showing the locations of gill nets set for this study (see Table 2). Note: s = spillway; t = outflow tower. Contours in metres.

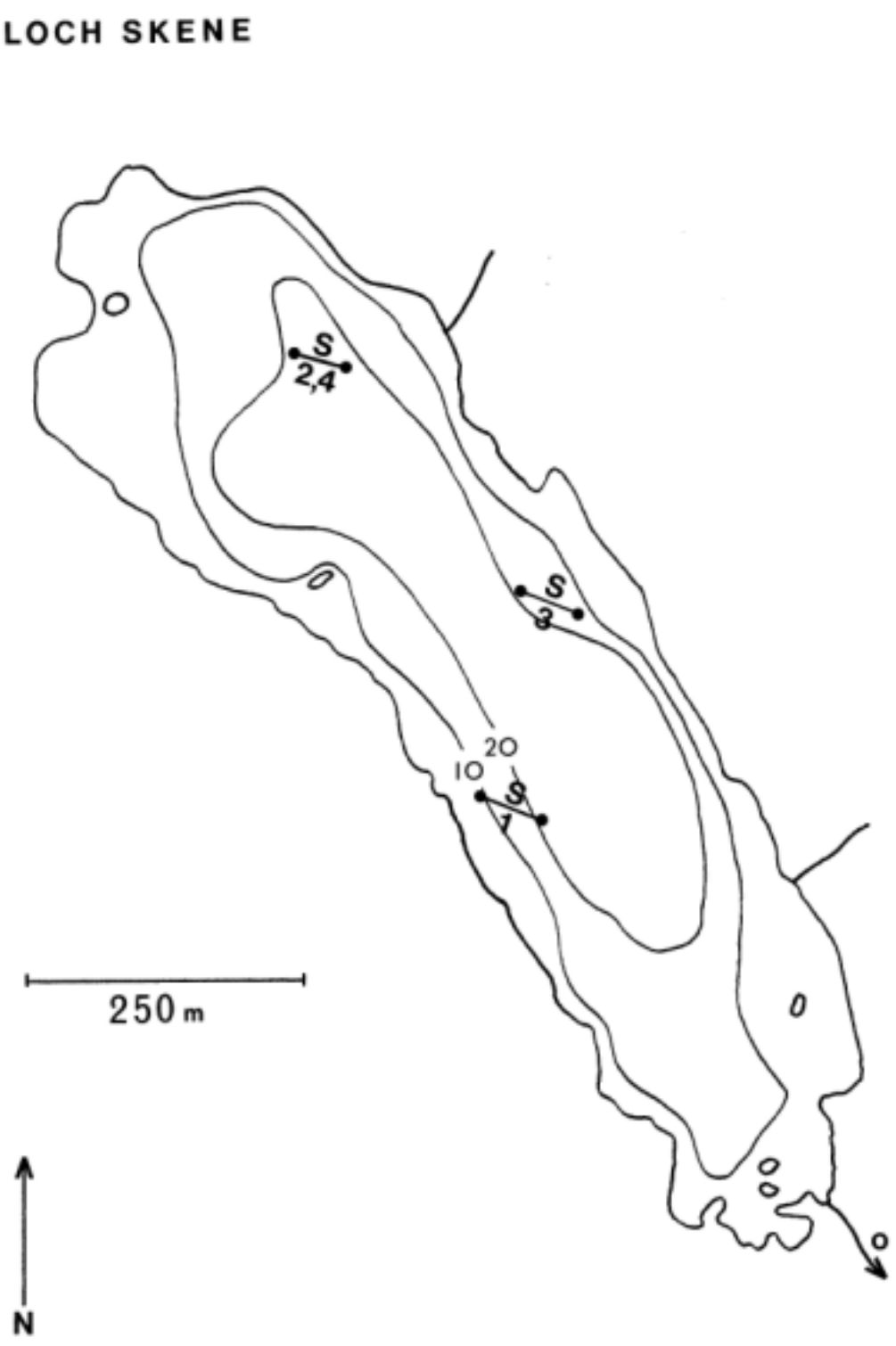

Figure 2 Bathymetric map of Loch Skene showing the locations of gill nets set for this study (see Table 3). Note: O = outflow. Contours in feet (after Murray & Pullar 1910).

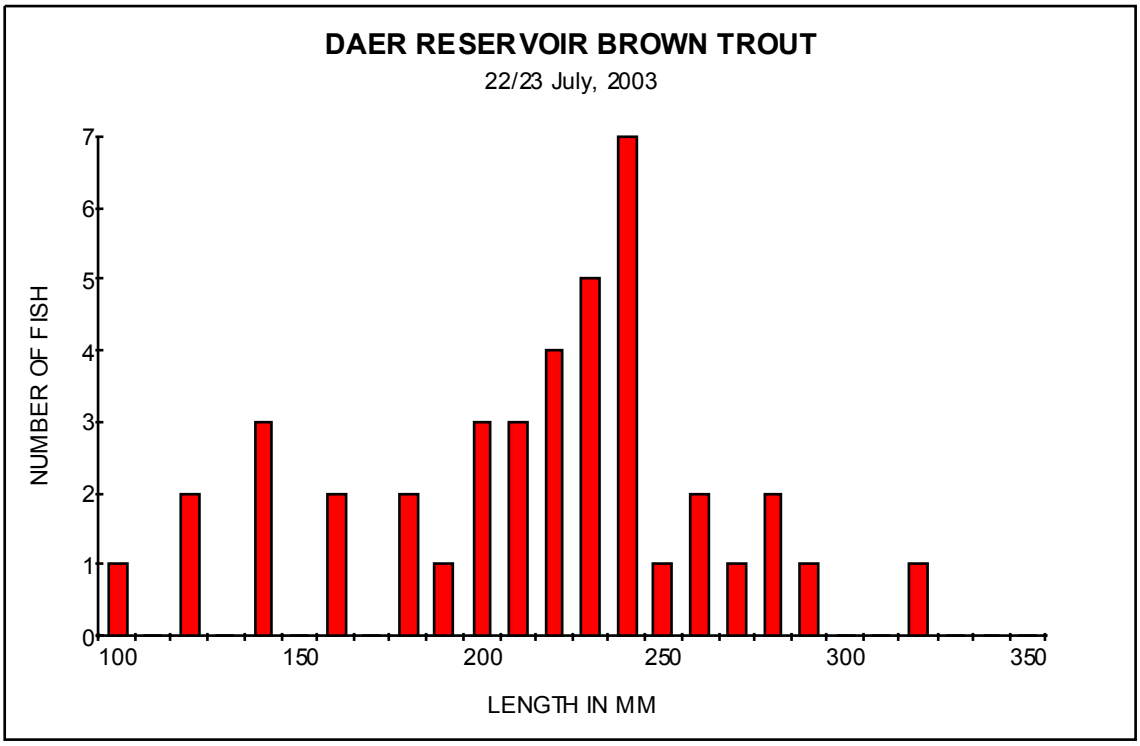

Figure 3 The length frequency distribution of brown trout from Daer Reservoir (excluding fish released)

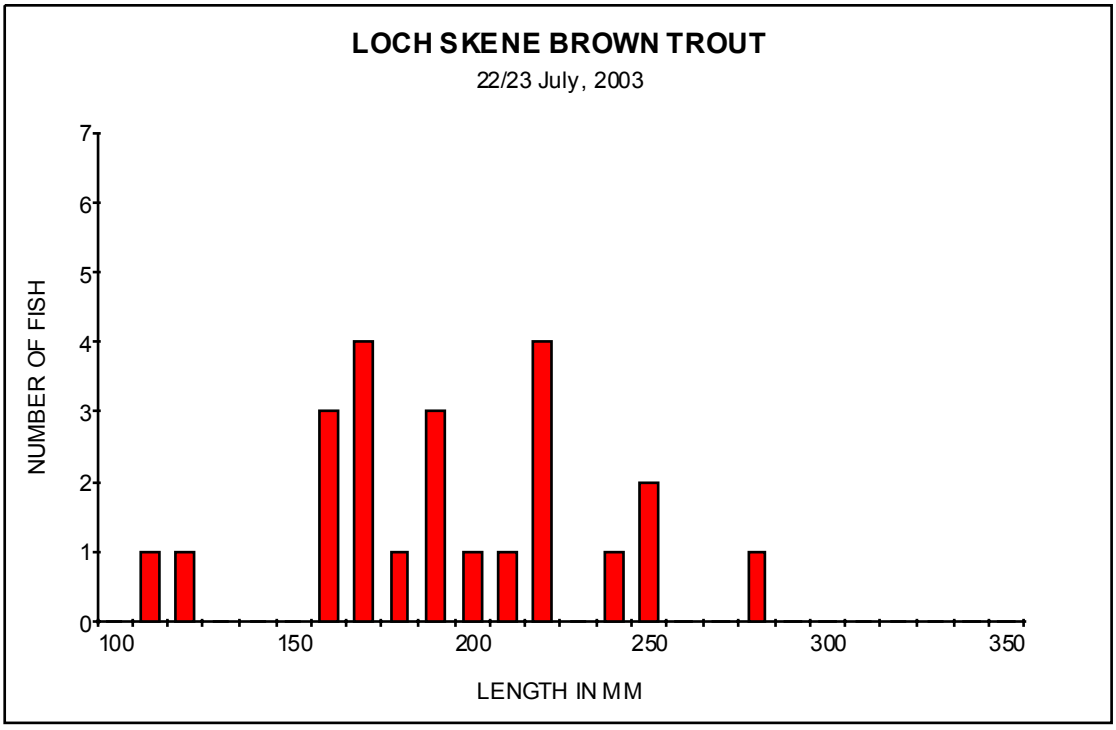

Figure 4 The length frequency distribution of brown trout from Loch Skene (excluding fish released)

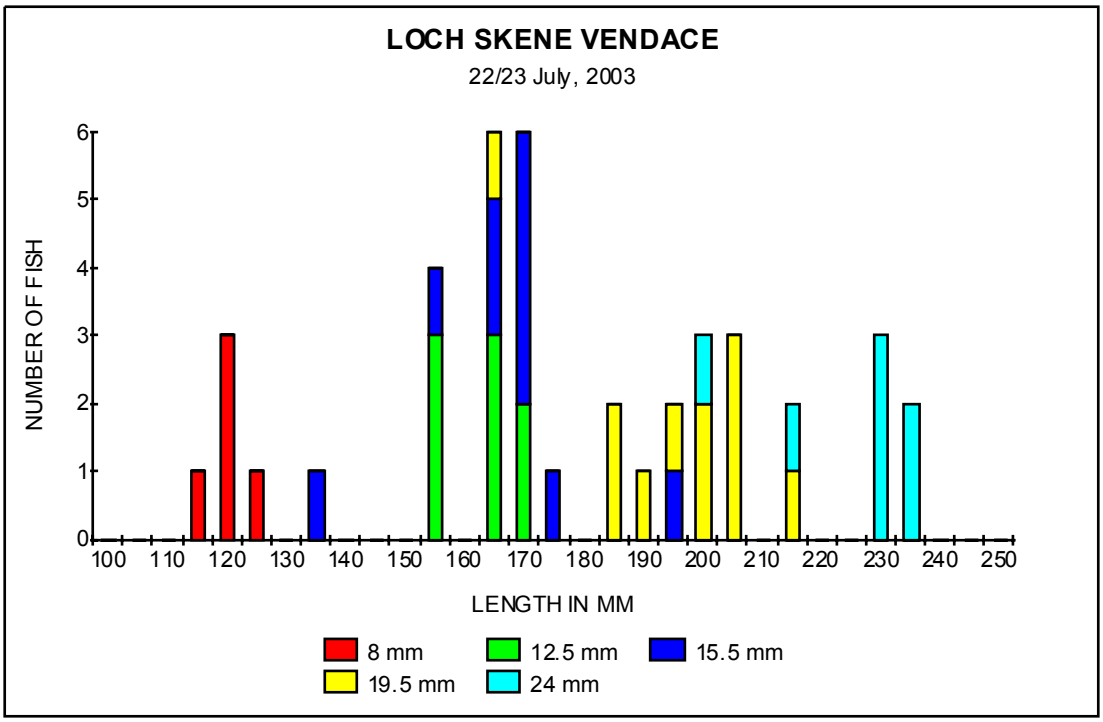

Figure 5 The length frequency distribution of vendace caught in five different meshes (8-24 mm) of the pelagic net set in Loch Skene

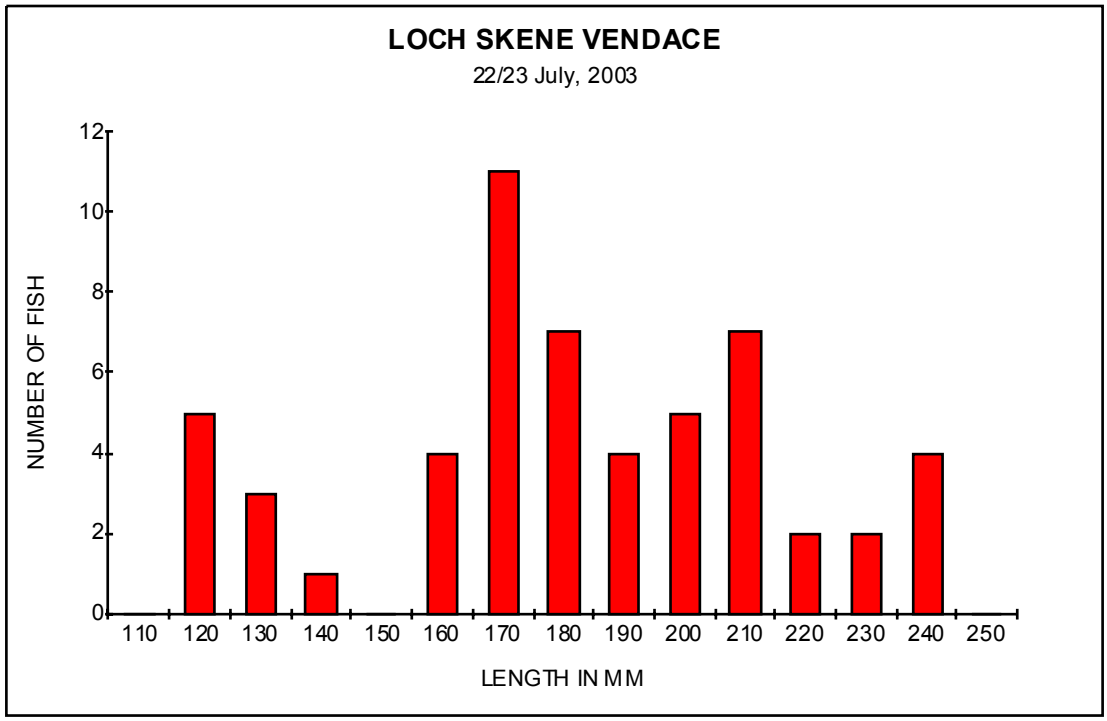

Figure 6 The length frequency distribution of vendace from Loch Skene

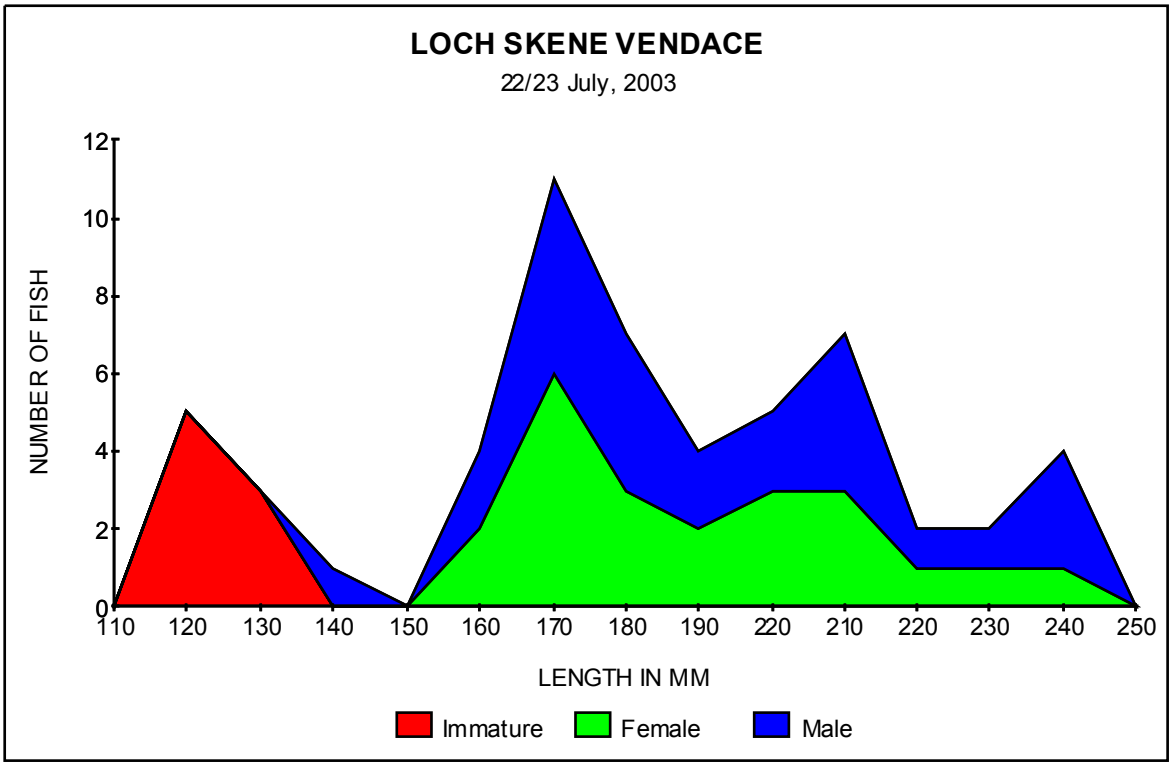

Figure 7 The length frequency of immature, female and male vendace from Loch Skene.

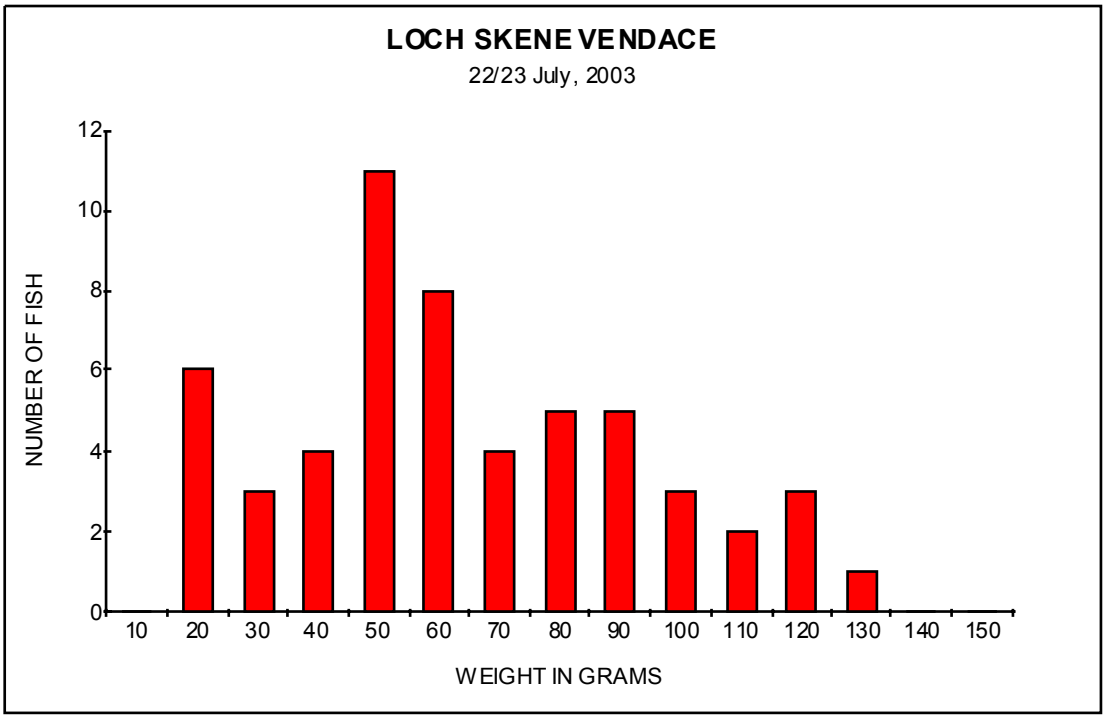

Figure 8 The weight frequency distribution of vendace from Loch Skene.

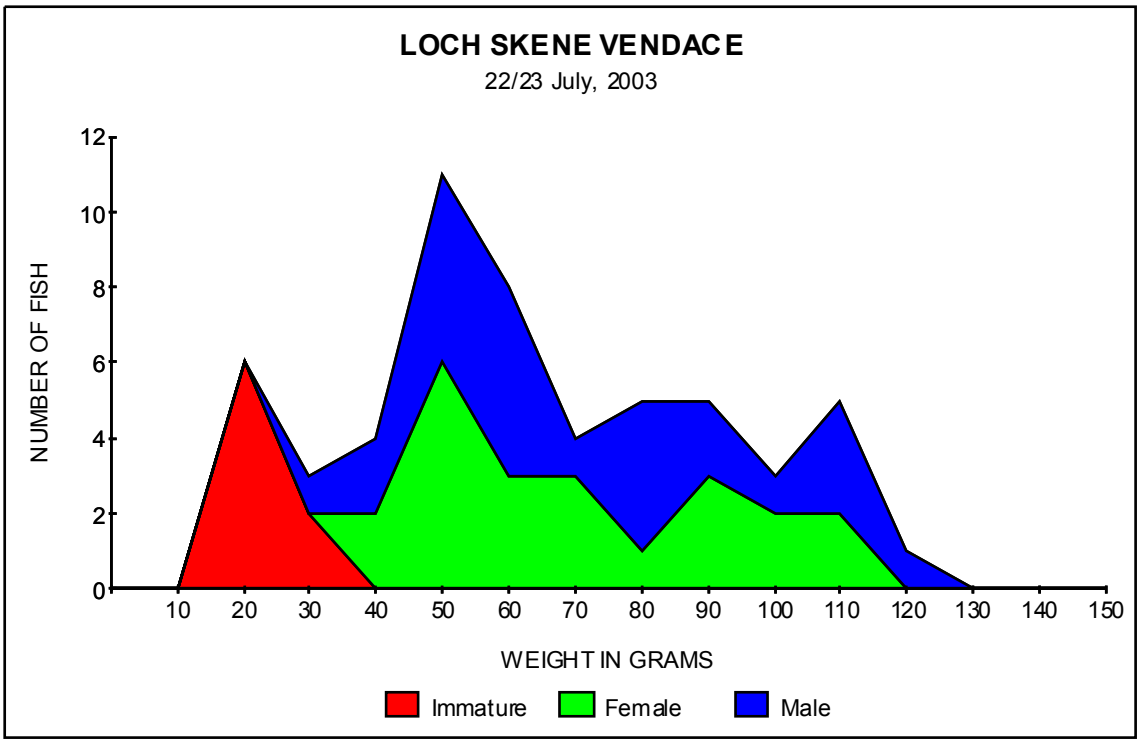

Figure 9 The weight frequency of immature, female and male vendace from Loch Skene.

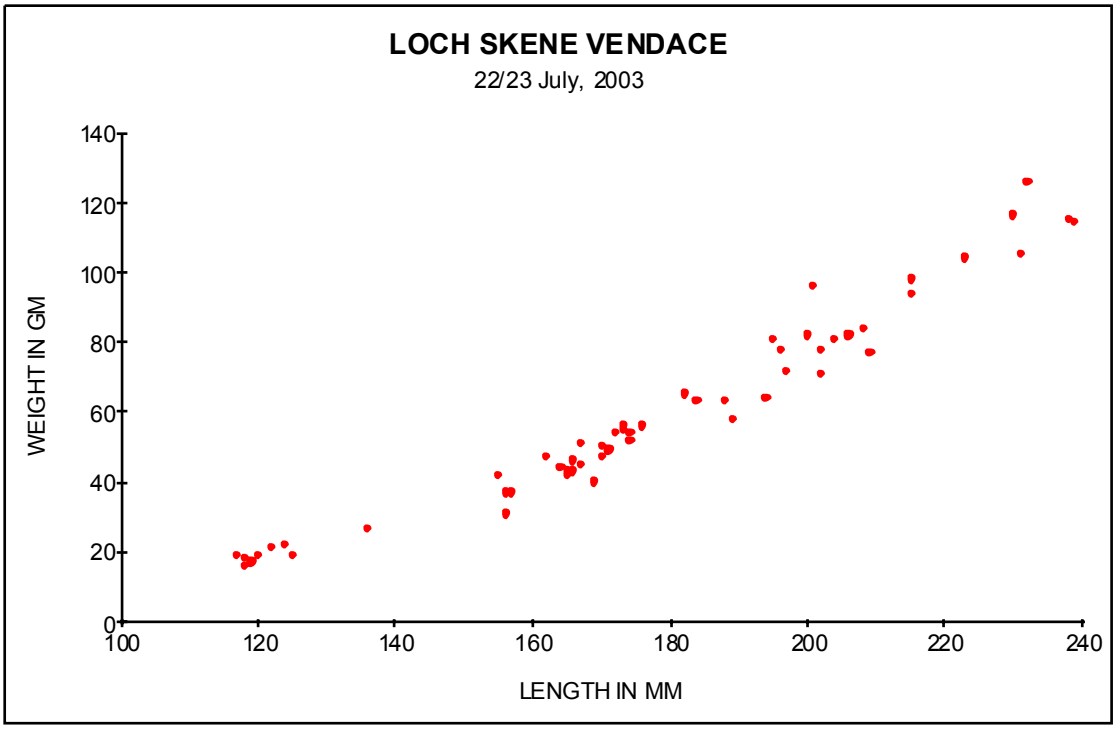

Figure 10 The length / weight relationship found among vendace from Loch Skene.

Appendix 1. Specifications of the nets used during the surveys

'NORDIC' type

Benthic net: Length, 30m. Depth, 1.5m. Number of panels, 12.

Mesh sizes (mm): 43, 19.5, 6.25, 10, 55, 8, 12.5, 24, 15.5, 5, 35, 29.

Pelagic net: Length, 27.5m. Depth, 6m. Number of panels, 11.

Mesh sizes (mm): 43, 19.5, 6.25, 10, 55, 8, 12.5, 24, 15.5, 35, 29.

'S' type

Net: Length, 30m. Depth, 1.5m. Number of panels, 12.

Mesh sizes (mm): 6.5, 8, 16.5, 38, 25, 12.5, 33, 50, 22, 43, 30, 10.

Appendix 2. Full details of vendace catches from Loch Skene

Net	Code	Length	Weight	Sex
S2				
Pelagic – all meshes (22-7-03)	46	202	78	M
	47	184	63	F
S4				
Pelagic 8 mm (23-7-03)	29	122	21	I
	30	125	19	I
	31	124	22	I
	32	118	18	I
	33	120	19	I
Pelagic 12.5 mm (23-7-03)	48	170	47	M
	49	165	43	F
	50	155	42	M
	51	166	43	M
	52	171	49	F
	53	157	37	M
	54	169	40	M
	55	156	31	F
Pelagic 15.5 mm (23-7-03)	19	173	55	F
	20	174	54	M
	21	176	56	M
	22	197	72	M
	23	170	50	F
	24	174	52	M
	25	156	37	F
	26	167	51	F
	27	165	42	M
	28	136	27	M
Pelagic 19.5 mm (23-7-03)	8	206	82	F
	9	202	71	M
	10	189	58	M
	11	196	78	F
	12	188	63	M
	13	215	98	F
	14	204	81	M
	15	209	77	M
	16	208	84	F
	17	194	64	F
	18	167	45	F
Pelagic 24mm (23-7-03)	1	231	105	F
	2	238	115	M
	3	239	114	M
	4	230	116	M
	5	200	82	M
	6	232	126	M
	7	215	94	M

Net	Code	Length	Weight	Sex
S3				
Benthic all meshes (23-7-03)	34	223	104	F
	35	201	96	F
	36	182	65	F
	37	195	81	F
	38	173	56	M
	39	162	47	F
	40	164	44	F
	41	172	54	F
	42	166	46	M
	43	119	17	I
	44	117	19	I
	45	118	16	I

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Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888