SHETLAND VEGETATION SURVEY

HANDBOOK OF FIELD METHODS

Merlewood, May 1974.

VEGETATION SURVEY OF SHETLAND
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Preface

The purpose of this handbook is to fill you in on the background to this summer's survey, to explain its purpose, and to give a detailed account of the methods involved in the vegetation survey.

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Introduction

The Shetland Islands cover an area of about 550 square miles, and consist of well over a hundred islands and islets, of which about fifteen are inhabited. The southernmost tip of Mainland, the largest island, lies over 100 miles north-west of John-O' Groats.

Geologically, the islands are very diverse. The main rock types are metamorphic, deriving from the Caledonian mountain-building period some 450 million years ago: those include schists, gneisses, quartzites and limestones. There are extensive deposits of Old Red Sandstone, mainly in the west, the extreme south, and the east of Mainland; and there are igneous rocks of both Caledonian and Old Red Sandstone age. These are mainly granites and diorites, with serpentine in the extreme north on Unst and volcanic lavas among the sandstone.

The inland topography is gentle, with wide valleys, on the limestone especially, and hills extending up to 1475' (on Ronas Hill in North Mainland) but mostly c. 800 ft. Around the shores, there is a striking contrast between the sheer cliffs on many of the exposed coasts, and the numerous "voes" or inlets, which are very sheltered and calm.

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These were formed by the drowning of river valleys when the sea-level rose after the ice-ages.

Very few trees grow on Shetland, and nearly all of those are planted, in the more sheltered parts. Extensive areas are covered by peat, especially on Mainland and the large northern island of Yell. As a result, much of Shetland has a very mono onous appearance.

The population of Shetland is about 18,000, and the main traditional industries are fishing, crofting and knitting. Fishing, particularly the whitefish industry, can be very profitable, especially for some of the smaller inhabited islands.

The soil on Shetlard is poor in most parts, and only about 6% of the land area is under cultivation. The best soils lie on the sandstone in the south, and on the limestone areas; these are the main crofting districts. Most agricultural land is under grass.

The Shetland climate is best summed up as being mild, moist and windy.

Due to the proximity of the sea to all parts of the islands, there is little variation in temperature through the year, average monthly temperatures ranging from 3°C (Feb.) to 12°C (July-August). The exposed situations of the islands means that they are subject to high winds, with about 40 days of gales per year. The rainfall, however, is not extreme (about 40" per annum), but it is distributed throughout the year, so that damp, misty and drizzly days are very common.

Background to the survey

The discovery of extensive oil fields off the east coast of Shetland, and the likelihood of more being found to the west, has meant that Shetland has to face the prospect of large-scale development. Initially, this has meant the provision of service facilities for off-shore rigs, but within the next few years when the oil is landed, the oil companies will be needing pipelines, oil terminals, greatly increased servicing facilities, and new housing for the oil workmen.

Such development is bound to conflict with the traditional way of life of the islands, and this prospect has been of great concern to the County Council, who are preparing a Development Plan to form the basis of future planning.

One of the potentially serious threats to the islands is the effect that development will have on the natural features of the Shetland: the geology, the landscape and the wildlife.

At the moment, information on Shetland wildlife is generally diffuse and scattered, and there are large gaps in our knowledge. To remedy this situation, the Institute of Terrestrial Ecology, (which was formerly the Research branch of the Nature Conservancy) is organising a survey to cover as many aspects as possible of the natural environment of Shetland.

This summer, work will be done particularly on the terrestrial vegetation, the freshwater and littoral habitats, and the sea-bird populations. A survey of the geomorphology and geology of Shetland, based on information derived from maps, has already been completed, and later stages of the work will involve development of mathematical models to try to predict the effects of specified factors on the Shetland environment in its present state.

The vegetation survey

The survey of the terrestrial vegetation of Shetland, in which you will be involved this summer, is based on methods developed here at Merlewood, by Bunce and Shaw (1973), for surveys of the semi-natural woodlands of Great Britain and also used in a survey of the native pinewoods of Scotland.

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A number of randomly - distributed points are marked on a map, and these are taken as the sampling plots for the survey. Each plot, is visited, and a 200 m² quadrat is set up. Within this quadrat, all the plants are recorded, a soil pit is dug and described, and information is recorded on the habitats present, using a system similar to that advocated by Elton and Miller (J. Ecol. 42, 460). After the summer, this data will be analysed, using multivariate techniques, such as ordination, to help establish the range of variation in Shetland vegetation. It will also be used to help set up the mathematical models of the environment.

Methods (i) locating the plot

You will be working in pairs on the survey, and the work can be split between you; you will soon develop your own method of working as a team.

The first step will always be to locate the sampling plot you are going to visit. These plots are marked as numbered points on the 1" O.S. maps which you will have been given. Alternatively, they may be marked on aerial photographs: see next section.

You should first get to the general area where the plot is located. First thing in the morning, you will either be driven out from one of the bases and dropped near your first plot, or, if you are on a trip away from a base for several days (as will happen when working on some of the islands and remoter areas of Mainland - in this case camping equipment will be provided) you will have to walk out from your camp. Later in the day, you will usually be walking from the previously-completed plot.

Since the plots are distributed in a random manner, it is important that there should be no subjective bias in locating them on the ground, and the plots in the field should be located as accurately as possible from the map. This is done in stages.

- i) Firstly, find an easily-recognisable landscape feature on the map, near the plot to be sampled, which can be readily located in the field; such a feature could be a sharp bend in a road or track, a fork in a river, the corner of a lake, or any other such unambiguous feature.
 - ii) Go to this control point on the ground.

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- iii) Using the map and Silva compass provided, take a bearing from the control point to the plot to be visited. Don't forget to add 10° for magnetic declination.
- iv) Measure the distance from the control point to the plot, using the scale on the Silva compass. This is in 1/16ths of an inch; 1/16 of an inch on the map will equal 110 yards on the ground.
- v) Now pace the <u>exact</u> number of yards measured from the control point, following the correct bearing on the compass. The last pace you take will land your foot exactly in the middle of the plot to be sampled.

You should make allowance if your pace is less than one yard on average (i.e. if your average pace is 2'6", add on 6" for each pace, or in other words, one extra pace every five).

If you need to pace uphill, you will have to add on extra paces to compensate for this. Thus for slopes of the approximate angle given below, add the given percentages onto the original number of paces.

For example, if the distance from your control point to the plot is 1/16" on the map, (i.e. 110 yards on the ground), and it is all up a slope of about 25°, you should add on 11 yards, making 121 paces in all.

If this procedure is rigidly adhered to, it will ensure absolute absence of bias in locating the sampling plot. There may be some loss of accuracy (for example due to a slight deviation from the bearing walked, or the paces being slightly longer or shorter than 1 yard), so that the point on the map and the point in the field do not correspond exactly. This however, is not important, as long as there has been no subjective bias in locating the plot in the field.

On a few occasions, a plot on the map will not in fact be surveyed.

This will mainly be the case if there is any risk to life; for example, if the plot turns out to be on a steep cliff on a dangerously boggy piece of ground. Plots should also be scrubbed if they turn out to be on cultivated land, such as cabbage patches or potato fields. If a plot is on grassland which is obviously used for grazing and is enclosed, permission should be asked of the crofter concerned before venturing on it.

If we are able to obtain aerial photographs of Shetland at a 1:10,000 scale before the field season, however we will use those to locate the rlots. You will be provided with aerial photographs of the area around the plot, with the plot centre marked on as a point or pin-hole. You will then simply have to locate the area of the photo, using the map, and then navigate your way to the plot, using features identifiable on the ground from the photos. To give you an idea of the scale of those photos, a distance of 1 mm on the photo represents 10 metres (about 10 paces) on the ground.

We have included descriptions of both methods of locating plots, since we have not, as yet, decided which will be used; i.e. maps or photographs.

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on the appy (i.e. 198 yards on the ground), and it is all up abyer. The year should say on 11 youds, making 121 paces in al

Recording data in the plot

The basic sampling unit, as mentioned above, is a 200 m² quadrat. This is set up using the five posts and strings provided. The centre post has a bolt on top, on which is a right-angled cross held on by a wing-nut. The other four posts are the corner-poles of the plot, and each has a 10-metre cord tied to it. Each of these cords can be attached to the centre pole by clips, and they form the diagonals of the plot.

When a quadrat is set up, the centre post should be stuck into the ground at the central point of the plot (which has been paced out as described above). The cross on top of the post should be spun round, and when it has stopped, it should be secured in position by tightening the wing-nut. This cross is used to orientate the four diagonals, and spinning it ensures that this orientation is random.

The next stage is to unroll the orange cord from each of the corner posts, and to clip it onto the centre post. The corner post should be carried out by one member of the team until the cord is taut; the other member can use the nails in the right-angled cross to sight onto the corner post, to make sure that it is orientated correctly.

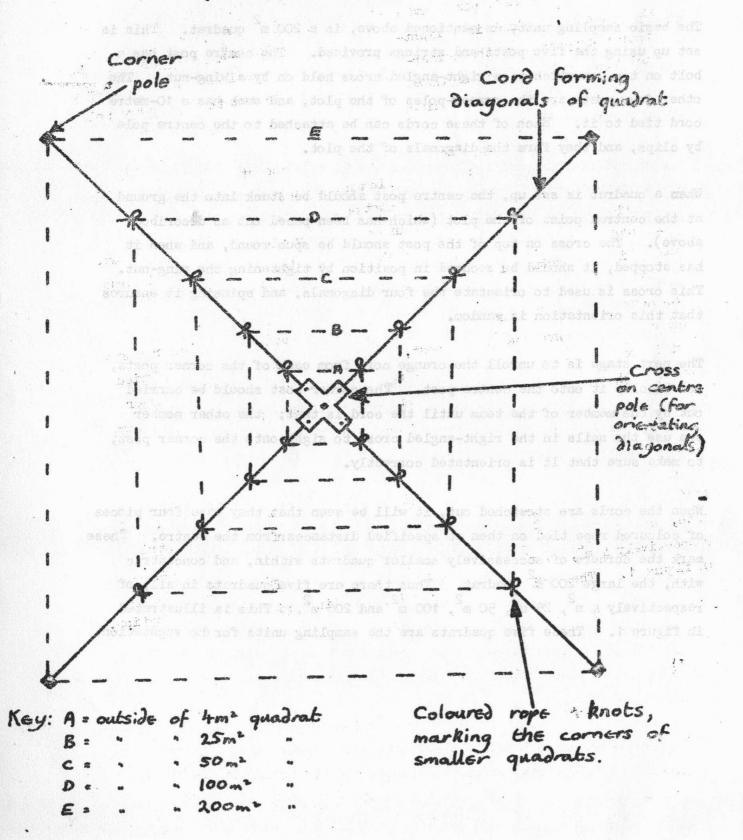
When the cords are stretched out, it will be seen that they have four pieces of coloured rope tied on them at specified distances from the centre. These mark the corners of successively smaller quadrats within, and concentric with, the large 200 m² quadrat. Thus there are five quadrats in all, of respectively 4 m², 25 m², 50 m², 100 m² and 200 m². This is illustrated in figure 1. These five quadrats are the sampling units for the vegetation.

Colours) nife knots marking the compas of smaller quadrals.

Figure 1

Afrial view of quadrat

(To scale: 1cm = 1m)



Ground flora

The sheet used for recording the ground flora is shown in figure 2. When filling it in, first enter the stratum and plot numbers as given on the map. (Thus point no. 12: 7 on the map is recorded as Stratum no. 12. Plot no. 7).

You should start recording in the smallest quadrat, (the 4 m² quadrat). All vascular plants, bryophytes and macrolichens growing on the soil in this quadrat should be recorded in the space on the data sheet marked "4 m² quadrat". Any plants which are not known, or whose identification is dubious, should be put in a polythene bag, clearly labelled with the plot number, and retained for identification or confirmation. Mosses and lichens not growing on the soil (e.g. those epiphytic on heather, or growing on rock) are to be ignored.

Next, move out into the 25 m² quadrat, and repeat this procedure, this time only recording plants which have <u>not</u> occurred in the 4 m² quadrat; then carry on out into each of the three remaining quadrats, each time only recording plants which have not been found in inner quadrats.

When the presence of all the plants has been recorded, the next thing is to work out a percentage cover-abundance for each species forthe full plot. Estimates should be given to the nearest 5%. If a species is widely scattered, but with less than 5% cover, it should be recorded as 1 in the cover-abundance column. Species occurring as only a singly or a few isolated specimens should be recorded as +. It is advisable for both members of the team to estimate % cover for each species, at least at first and to record the mean value of the two estimates, in order to increase its reliability.

The cover-abundance % of the other categories (rock, water, litter, bare ground and bryophytes) should be recorded at the bottom of the sheet.

Code	Species (4 m ² quadrat)	C.A.	Code	Species (50 m ² quadrat)	Co
	Callura vulgaris Sphagnum rubellum S. papillosum S. plumulosum Griophorum vaginatum Eriophorum vaginatum Oriophorum vaginatum Oriophorum vaginatum Criophorum Criop	65 5 5 5 + - + + + +		Cladonia impera Luzula mult: Plona	++
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SERTENJE PROBREDADINANJA BARAN MINIMANIA NA MARIA MA				Cladmia pyxidata	+
Code	Species (25 m ² quadrat)	C.A.	(28)	Code Species (25 m ² quad	
(3820)	Dicrenum scoparium Erica cinerea Hylocomium splendens	1		Conserve Electrons (congression selectors conserve selectors (items of the bost of	
ALL PROPERTY OF THE PARTY OF TH	Scopania gracilis	+	Code	Species (200 m ² quadrat)	C.
				Potentilla erecta Aulacomaium palustre Sphagnum cuspidatum	+++

'Cover/abundance of) other categories)

Rock = Bare ground =

-% Water = +% Bryophytes =

+ % Litter = 7000

1%

ode	Species (4 m ² quadrat)	C.A.	Code	Species (50 m ² quadrat)
	Calluna intgaris Paternaria dicica	40		RhyHdiadelphus squeerosus
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	Succisa pratensis Toriella torbuesa	+	Code	TO VOTE STATEMENT AND A PROPERTY.
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er production of the desiration of the second	Hypnum cupressiforme Agrestis camina Festuca ovina	5		
code	Species (25 m ² quadrat)	C.A.		
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	Lycopodium selago Fruncia abtusa	+		Dichessian scapionan
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isto.	Code Books Com Code Potendala Comales Andre Comales Delice			Cladonia pyxidata
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Cover/abundance of) Rock = | % Water = | % Litter = | lower categories | Bare ground = +% Bryophytes = | lower categories | low 'Cover/abundance of)

Ignore the column marked "code". This is for use later on when sorting out the data back at Merlewood. Examples of completed field sheets are given in Figure 2.

Soil

To obtain a general picture of the type of soil present in the plot, without letting soil sampling become a time-consuming exercise, the soil is to be described from a single profile, in the exact centre of the plot (i.e. where the centre pole was placed). The soil data sheet has been worked out in advance (see Figure 3), and all that you have to do is to cross off those attributes which apply to the profile in question. To expose a profile, dig down as deep as you can with the spade, and collect cores of the soil below this level using the auger.

First, it is necessary to distinguish between the different horizons of the soil. The <u>litter layer</u> consists of undecomposed or readily recognisable plant remains. If this is present, record the depths between which it is found (attribute 5) and its composition; this is done by seeing what plant remains you can recognise in the litter (attributes 6 - 13). If there is standing water in the soil saturating the litter layer, record attribute 14. If there is no litter layer, delete this section completely with a diagonal line.

The <u>organic matter layer</u> consists of decomposed plant remains, with no (or virtually no) admixed mineral matter. This may be very shallow, as on some grassland, or very deep, where there is deep peat cover. If this is present, record the depths between which it occurs. If the peat is deeper than the length of the auger, record the maximum depth as 75+ cm (75 cm. is the length of the auger).

Colour (attributes 16-18): self explanatory.

Decomposition: this is a measure of the amount of decay of the organic matter. To determine this, take a handful of the organic matter and squeeze it in your hand. If only clear water cozes out, record low decomposition (21). If the whole handful cozes out as a black mush, then the material is completely decomposed (attrib. 19). If blackish or brownish water emerges, record medium decomposition (20).

Texture: Amorphous (22) humus rubbed in the fingers will break up into a black smear: if granular (23), it will retain some crumb-like structure when rubbed. Mixed fibrous-amorphous (25) is an intimate mixture of the two types of organic matter; layered f - a. (26) indicates the two types are separate, and distinctly layered.

Moisture: it will be obvious if the soil is submerged (27). If a handful of organic matter cozes water without being squeezed it is very wet (28); if it has to be squeezed to expel water, it is wet (29). If no water cozes out on being squeezed, it is damp (30), and if it feels dry, record 31.

If there is no organic matter layer, delete this section.

The mixed mineral/organic matter layer is an intimate mixture of mineral particles and humus. This layer will often be only poorly developed. It can be distinguished from overlying organic matter by rubbing in the fingers, when mineral particles will be felt, and from underlying mineral matter by the dark colour of the admixed humus. If present, record the depths between which it is found: if it extends below the depth of the auger, again record maximum depth as 75+ cm.

Transition with mineral soil: the transition to the underlying mineral soil (if present) can be abrupt (33) or the two layers will gradually brend, with no distinct join between them (34). If there is no underlying mineral soil reached, cross ou this section.

Texture: to distinguish clay (35), silt (36), and sand (37), try to roll a lump of soil between your hands into a sausage. If you cannot succeed, and the roll crumbles, it is sand. If you can, and can then bend this sausage into the form of a ring, it is clay. If the sausage breaks when you try to bend it, it is silt. If the layer consists of pure gravel (particles over 1/8"), record 38. If more than about 10% of this layer is made -up of stones, record attributes 39-41, depending on the texture of the matrix (determined by the sausage test).

Colour: fairly obvious. A mottled layer (46) is one where changes in the water level cause alternating aerobic and anaerobic conditions, which will lead to deposition of iron oxides in the mineral matter. The mottled appearance is revealed by breaking the soil up in your fingers, when you will see alternating pale and reddish patches. This occurs most commonly in clays.

Moisture: as for the organic layer.

Structure: this is the type of aggregation shown by the soil particles, and is determined by breaking the soil in your fingers. If there is no aggregation at all between particles, it is a powder (51). If the particles aggregate in to small lumps (like breadcrumbs) it is a crumb (52) and if it stays as a solid lump, it is a clod (53). (This latter is most typical of clay soils).

Again, if this layer is not present, delete this section.

The <u>leached layer</u> is a pale layer immediately underlying the organic matter layer, and occurs typically in high rainfall areas, where humus and mineral ions are washed down through the soil, to form a podzol. It will usually be underlain by the weathered mineral layer. If present, record the depth, the colour (white - 55 - or grey - 56), and the texture (determined in the same way as for the mixed mineral/organic layer. If absent, delete this section.

5 Depth 0 - 3 cm 7 Other bryos 8 Fern 10 Other dicots 13 Other monocot 12 Ertoph/Trichoph 14 Standing water 12 Grass/sedge 13 Other monocot 12 Ertoph/Trichoph 14 Standing water 15 Depth 3 - 75 + cm Decomposition: 22 Amorphous 27 Submerged 23 Granular 28 V. met 16 Black 20 Medium 24 Fibrous 29 Wet 17 Depth 2 Texture: 25 Mixed fib/amorph30 Damp 26 Layered fib/amorph30 Damp 26 Layered fib/amor 31 Dry 20 Depth - cm 35 Clay 42 Etack 48 We: 47 V. wet 48 We: 47 V. wet 48 We: 48 Damp 49 Damp 40 Stony/silt 41 Stony/sand 40 Stony/silt 45 Red Structure: 33 Sharp 39 Stony/clay 46 Mottled 51 Powder 52 Crumb 53 Clay 61 Stony/sand 57 Clay 61 Stony/silt 59 Sand 63 Stony/sand 63 Stony/sand 65 V. wet 72 Gravel 50 Mottled 84 Black 66 Wet 73 Stony/slit 87 Red Colour: 70 Silt 78 Red Colour: 71 Sand 79 Red Colour: 75 Stony/slit 81 Powder Compaction: 85 Red Colour: 75 Stony/slit 81 Powder Compaction: 95 Red/Drown 75 Stony/slit 81 Powder Compaction: 85 Red/Drown 75 Stony/slit 81 Powder Compaction: 85 Red/Drown 85 R	1 Stratum no. (Boy) 2 Plot no 1	tow, who have an executive designation to the control of the executive property and a series of the control of	48 4 Date 4/3/74
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88 Depth from 12 cm 89 Clay

LITTER LAYER	makan kanan kanan mengani mengani di mengani mengani mengani mengani mengani mengani mengani mengani mengani m	Composition:	
	6 Sphagnum	9-Ericoid	12 Grass/sedge
5 Depth 0 - 1 cm	7 Other bryon	10 Other dicets	13 Other monocots
	8 Fern	11 Erioph/Trichoph	14 Standing water
	tion the South of the major Francis and		
ORGANIC MATTER LAYI		Texture:	Moisture:
15 Depth cm	Decomposition:	22 Amozphous	27 Submerged
Colour:	19 High	23 Granular	28 V. wet
16 Black	20 Medium	24 Fibrous	29 Wet
17 Dark brown	21 Low	25 Mixed fib/amorp	
18 Light brown	A graduate de la companya de la comp	26 Layered fib/amo	or 31 Day
MIXED MINERAL/ORGAN	VIC MATTER LAYER		Moisture:
	Texture:	Colour:	47 V. wet
32 Depth - 12 cm	35 Clay	42 Black	48 Wet
Solver and the	36 Silt	43 Brown	49 Deno
Transition with	37 Sand	44 Yellow/brown	50 Dry
mineral 2011:	38 Gravel	45 Red	Structure:
33 Sharp	39 Stony/clay	46 Mottled	51 Powder
34 Gradual		40 Mottled	50 Crumb
34 Gladual	40 Stony/silt	retion) and the Ob	
54 E3 E8	41 Stony/sand	basa yasati 14	53 C1od
LEACHED LAYER	Colour:	Texture:	60 Gravel
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54 Depth - cm	56 Grevish	58 Silt	62 Stony/silt
tilie von 18 90	58 5111	59 Sand 20 00 40	63 Stony/sand
WEATHERED MINERAL I	AVED	Colour:	Nature of
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64 Denth			deposition layer
64 Depth - cm	69 Clay	77 Yellow/brown	(if present)
	70 Silt	78 Yellow	
Moisture:	71 Sand	79 Red	Colour:
65 V. wet	72 Gravel	80 Mottled	84 Black
66 Wet	73 Stony Clay	Structure:	85 Red/brown
67 Damp	74 Stony/silt	81 Powder	Compaction:
68 Dry	75 Stony/sand	82 Crumb	·86 Hard
5 FOR THE SE	to the second	83 Clod	87 Friable
UNDERLYING MATERIAL		90 Sand	93 Stony/sand
Stockers 12 cp	Texture:	91 Gravel	94 Rock fragments

92 Stony/clay

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Habitat data

These two sheets are intended to record various features of the area, some being physical variables and attributes, while others can also be considered in terms of their value as microhabitats for, say, invertebrate life. Yet others record the present management regime of the area.

The first sheet (plot habitat data) is to record those features found within the plot. The second sheet (habitats within 50 m. of plot edge) is to record features lying outside the plot, up to a distance of 50 m, which may have an effect on the plot itself. When you start work, it is advisable to pace out 50 m, but soon you should get a rough idea of the distance simply by looking. (50 m. is in fact $2\frac{1}{2}$ times the length of the diagonal of the 200 m² quadrat.

Plot habitats

Record stratum and plot number, as for the other sheets. The slope (attribute 5) is measured, using the clino-meter provided, across the plot from the highest to the lowest point, passing through the centre. If one member of the team stands at the highest point, the other can go to the lowest point, and sight along the wooden body of the clino-meter. When the plumb line has steadied, hold it in place against the protractor scale and read off the slope. Aspect (6) is the bearing down this same slope, measured with the silva compass. (Do not read the aspect up the slope).

Rocky habitats: 7-9 must be solid outcrops, and not loose boulders (as far as can be determined). A rock ledge (10) is a horizontal surface of any size on a rock outcrop or cliff. A gully (11) is the space between two rock outcrops facing one another. It should be at least 3 m. high, and under $1\frac{1}{2}$ times its height across from face to face. Stones rocks and boulders (12-14) are loose rocks lying on the ground, distinguished by size. Rock piles (15) must be at least 1 m high, and can be artificial

or natural. Rock patterns (16) are regular patterns made by rocks, due to such features as creep, wind and/or frost. They usually take the form of alternate stripes of rock and turf. Stone, rock and boulder fields (17-19) are areas where at least 50% of the ground area is covered in loose rocks: the distinction between the three is based on the mean size of the rocks (as in 12-14). A scree (20) is fairly obvious: it must be at least 20 m², and be unstable. This also includes man-made screes caused by earth-moving operations. Erocad mineral soil and eroded peat (21 & 22) are also obvious: they must be at least 1 m² to be recorded.

Vegetation habitats: dense heather (23) must be at least 25 m2 to be recorded. Grassland (26) is an area of at least 100 m2 where the dominant plants are grass. Sphagnum tussocks (25) must be at least 1 m across. A Sphagnum lawn (26) is an area of Sphagnum covering at least 10 m2, Moss tussocks (27) must be at least 1 m across, and be terminated by any bryophyte other than Sphagnum. Fern clumps (28) can be of any form, including bracken: they must cover at least 2 m2 to be recorded. Spring bryophytes (29) are any bryophytes growing around the area of a spring. Attributes 30-32 cover the presence of any bryophyte growing on soil, rock or peat. Aquatic bryophytes (33) are those growing in running or still water. All lichens on soil, peat or rock should be recorded (34-36): the small crustose lichens on rock may be hard to see at first, but are obvious when looked for. Ephiphytic lichens (37) are those growing on other plants; i.e. trees, shrubs, Calluna, bryophytes, etc. Aquatic vegetation (38) covers only true aquatic plants; not land plants which have been submerged. Any macrofungi seen should be noted (39), and also any live tree or shrub which may be growing in the plot (40).

ator size on rook offered or eliff. A gally (1) is the space between

and under to times the height sories from thee to tees. Stenes or the ground, distinguit

J state . Resk giles (15) sunt be at least t a bigh, but can be

Aquatic habitats: fresh-water bodies are distinguished as three size classes (41-43). Slow and fast streams (44 and 45) are distinguished as those flowing slower or faster than 1 mph - i.e. a slow walking speed. If a stream is present in the plot, then the nature of its bed should be recorded (46-50): there may, of course, be more than one type in a plot. If there is a definite spring emerging from the ground it should be recorded as 51 or 52. If, however, there is only a slight coze of water, without it forming a definite spring, record it as a seepage (57). Any artificial ditch or drain should be noted as wet (54) or dry (53). A marsh or bog (55) is any area which oozes water under your foot when you tread on it. Water trickles are small, continuous streams of water which do not follow any well-defined watercourse (e.g. which just trickle over the surface of a bog). If a peat-cutting has become flooded to a depth of at least 6", record it as drowned (58). A river bank (59) is any slope over 1 m high going down to a river. river cutting (60) is a cutting through rock, at least 1 m deep.

Animals: sheep, cattle, pony and rabbit (61-64) may be recorded either if seen in the plot while approaching it, or if traces are found (e.g. droppings, hoof-marks, wool, etc.) If there is any sign of the vegetation having been eaten (e.g. grass leaves chopped off short), record it as bitten (65). If there are droppings of any sort present, at average density of about $5/m^2$ or less, record few (66); if more than about $5/m^2$, record many (67). A sheep lay (68) is an area where sheep lie overnight: it may show some flattening of the vegetation, but is typical chiefly by the piles of droppings which are clustered around.

If there has obviously been no grazing at all in the plot (e.g. if it is fenced off, with lush vegetation) record this (69). If any dead bodies or bones of animals are found, this should be noted (70). The presence of earthworms (71) will be noted when the soil profile is being done.

Management: most of these categories are fairly self-explanatory. Any wall in the plot should be recorded (72 & 73); only man-made embankments are to be recorded (74). Be sure to distinguish peat diggings (75) from naturally eroding peat (22). A fence (76) covers all sorts: post and rail, wire-netting, barbed wire, etc. lines (77) indicates any sign that artificial drainage of the area Distinguish sheep enclosures in use (78) has been carried out. from ruined ones (79); the same with buildings (80 & 81). rubbish (82) covers anything of household origin, beer cans, etc. Other rubbish (83) is anything else (e.g. fertiliser bags, scrapped Paths and tracks (84 and 85) are not made up; machinery, etc). handcart tracks (86) are made up but not tarmacked. road" (87) is a misprint; it should read "tarmac road;" thus only roads which have been tarred over should be recorded here. midden (88) is a manure heap; obvious if recent, but old ones are easily recognised as piles of rocks with dense nettles growing out of them.

If obvious traces of burning are present among the vegetation (e.g. ashes, charred heather), record this as recent burning (89). If there are no signs of burning evident among the vegetation, but traces are found in the topsoil or among the surface litter (e.g. fragments of charcoal), record past burning (90). Any form of quarrying or excavation, other than past diggings, is recorded as 91.

On the space at the bottom of the form record any other useful information you can think of concerning the area within the plot. If you can recognise rocks, it would be useful to record geological information from the plot (e.g. the nature of the solid geology from outcrops, the nature of the surface boulders, if any, what rocks were found in the soil, and what the drift geology is). Anything unusual not covered by the other sheets can be put down; any small animals you may recognise, or anything else that comes to mind.

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BOCKY HABITATS	The same of the same of	P. A. C. A.	A CONTRACTOR OF THE PROPERTY O
: Outcrop (cim)		15 Rock pile	19 Boalder field
8 Outcrop (1-5m)	12 Stone (<5cm)	16 Rock patterns	20 Scree
9 Outcrop (25m)	13 Rock (5-50 cm) .	17 Stone field	21 Eroded mineral soi
10 Rock ledge	14 Boulder (>50cm)	18 Rock field	22 Eroded peat
VEGETATION HABITATS	tion droving historion independent accordance principles and uncorn address entry of		
23-Bense-heathar	28 Fern clumps	33 Aquatic bryos	37 Epiphytic licher
24 Grassland	29 Spring bryos	34 Lichens on soil	38 Aquatic vegetn
25 Sphagaum tooks	30 Bryos on soil	as interest on peat	39 Macrofungi
26-Ephagrum-lawn	31 Eryos, on rock	36 Lichens on rock	40 Tree/shrub
27 Moss tussocks	32-Eryos on peat	E POVID POSSE	Tedan Son Ca.
21 MOSS LUSSUCNS	and an appropriate the second of the second	STA-ACTION A PAINT AND	toda linguas griduores oras gradules tod sud toas. Hip - Vigarant entigeno, undigenesia printinga
AQUATIC HABITATS		TOTAL SERVICE AND ASSESSMENT OF	26 Spiegnum 1000
41 Pool (<1m²)2	46 Muddy bottom	51 Rocky spring	56-Water-trickles
42 Pond (1-20m2)	47 Feat bottom	52 Peat spring	57 Seepage
43 Lake (>20 m ²)	48 Sandy bottom	53 Dry ditch	59 Drowned peat cuts
44 Slow rivr/strm	49 Gravel bottom	54 Wet ditch	59 River bank
45 Fast rivr/strm	50 Rocky bottom	55-Marsh/beg	60 River cutting
ANIMALS	SE SEASON	Wolfred Loverser	
and the second second and the second	and the employee of the employee which in the control of the deposits of the employee of	67-Neny-dyoppings	70 Corpse/bones
61-Sheep	64 Rabbit		71 Earthworms
62 Cattle	66 Few droppings	69 No grazing	
63 Pony	on teadoup sures as	of 110 grazing	is districtly bein stade and arreaching representation were many distriction, were state unity districtional districtions.
MANAGEMENT	-68 Abseption 60 No drawing	Andrews (Colonial Section)	
72 Wall	77 Drain lines	82-Domestie ruteh	87 Metalled road
73 Ruined wall	78 Sheep enc.	83 Other rubbish	88 Midden
74 Embankment	79 Ruined enc.	84 Path (<1 m)	89 Recent burning
75 Peat dig	80 Building in use	85 Track (1-5m)	90 Past burning
76 Fence	81 Ruined buldg	86 Hardcore track	91 Quarry/excvtn
	Ballath (<1 B), N. S	restaints gamery up mining the extression in the part of the description in the con-	

GEOLOGICAL INFORMATION AND ANY OFHER COMMENTS

Blanket bog on deep peats: very wet. No rock ouicrops or stones in plot. Very heavily grazed.

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5 Stope 12	6 Aspect 324°	3 Pecardur RB+ PAR	A Data S/S/S
Outcrop (>5m) 10 Rock ledge	11 Gully 12 50 cm (5 cm) 13 Rook (5 50 cm) 14 Boulder (>50cm)	15 Rock pile 16 Rock patterns 17 Stone field 18 Rock field	19 Boulder field 20 Scree 21 Eroded mineral sol 22 Eroded peat
VEGETATION HABITATS 23 Dense heather 24 Grassland 25 Sphagnum tssks 26 Sphagnum lawn 27 Moss tussocks	28 Fern clumps 29 Spring bryos 30 Bryos on soil 31 Bryos on rock 32 Bryos on peat	33 Aquatic bryos 34 Dichens on soil 35 Lichens on peat 36 Dichens on rock	19 Mat 101 C
AQUATIC HABITATS 41 Pool (<1m ²) ₂ 42 Pond (1-20m ₂) 43 Lake (>20 m ²) 44 Slow rivr/strm 45 Fast rivr/strm	46 Muddy bottom 47 Peat bottom 48 Sandy bottom 49 Gravel bottom 50 Rocky bottom	51 Rocky spring 52 Peat spring 53 Dry ditch 54 Wet ditch 55 Marsh/bog	56 Water trickles 57 Seepage 53 Drowned peat cuts 59 River bank 60 River cutting
ANIMALS 61 Sheep 62 Cattle 63 Pony	64 Robbit 65 Vogetation bit 66 Few Troppings	67 Many droppings	70 Compse/hones
MANAGEMENT 72 Wall	77 Drain lines 78 Sheep enc.	82 Domestic rubsh 83 Other rubbish	87 Metalled road 88 Midden 89 Recent burning

GEOLOGICAL IN ORMATION AND ANY OTHER COMMENTS

73 Ruined wall

74 Embankment

75 Peat dig 76 Fence

78 Sheep enc.

79 Rained enc.

Shorton soil over sempentine; several sempontine outcomps in plat. Vegetation v. short; heavy grazing prossure. Many loose rocks among vegetation.

80 Building in use 85 Track (1-5m)

81 Ruined buldg 86 Hardcore track

84 Path (<1 m)

90 Past burning

91 Quarry/excvtn

Examples of completed plot habitat sheets are shown in figure 4.

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50 m area habitats

This is similar in many respects to the plot habitat sheet. The instructions for the aquatic habitats and the animals are identical to the plot sheet, as are those for the management category, with a few additions. Attribute 41 records any sign of ploughing in the current year. The types of buildings are differentiated. A croft (43) is the typical crofting cottage, still in use as a croft. If the croft is ruined, record 44. A house (45 - 47) is any dwelling place not forming part of a crofting farm. Any other buildings (e.g. barns) are recorded (48 if in use: 49 if ruined). Peat stacks (62) are the piles of peat turfs stacked to dry near the diggings, or by a road.

Land use and landforms: mostly fairly obvious. Areas of rough grazing (63) are those where no improvement has obviously taken place: e.g. areas of moor and bog where sheep are simply put out. This contrasts with improved grazing (64), when the land has been drained and/or fertilised. Arable land (65) is that used for growing crops. Any other human activity (66) covers anything that is not agricultural (e.g. a village, a garage, a small factory, etc). Some plots may lie near the sea, when maritime landforms will be noted (67-70). Wet bog differs from blanket peat in that water lies at or very near the surface: on blanket peat, the ground is firm, and oozes little, if any, water when trodden on. Areas of bog, peat, grassland, saltmarsh or dunes (71-75) must be over 100 m² in extent to be recorded. River gorges must be at least 3 m deep.

The space at the bottom can be again used to fill in any other information which may occur to you while doing the plot; for example, the solid and drift geology, the birds in the area, any insects you may recognise, what the weather is like, or anything else.

Completed sheets are shown in figure 5.

HABITAT DATA Area within 50 m edge of plot

Stratum no. (809) 2 Plot no.

3 Recorder RB+ PAB 4 Date 4/3/74

AQUAT	TC	HAB	TT	AT	S	100
the time of the car wanted	ACTION THAT	No Will service	Section Section		-	

5,-	2001	(tan)
6	Pond	(1-20m²)
	Lake	(>20m²)

10 Muddy bottom 11 Peat bottom 12 Sandy bottom

15 Rocky spring 16 Peat spring 17 Dry ditch 18 Wet-ditch

21 Scopage 22 Drowned peat co 23 River bank 24 River cutting

20 Water triskle

8 Slow rvr/strm 9 Fast rvr/strm 13 Gravel bottom 14 Rocky bottom

19 Marsh/boa

ANIMALS

25-Sheep-26 Cattle 27 Pony

28 Rabbit 29 Vegetation bttn 32 Sheep lay

31 Many droppings 34 Corporchones

30 Few droppings 33 No grazing

35 Earthworms

MANAGEMENT

36-4011 37 Ruined wall 38 Embankment 39-Peak-diggings 40 Fence

41 Ploaghing

42 Drain lines

43 Croft

44 Ruined croft 45 Occupied house 46 Unoccupied hse

49 Othr ruined buldg56 Hardcore track

47 Ruined house 54 Path (41 m) 48 Other bldg in use55 Track (1-5 m)

50 Sheep enc. 51 Ruined enc. 50 Domestic rubsh 59 Recent burning

53 Other rubbish:

57-Metal-led-road 58 Midden

60 Past burning 61 Quarry/excavati

62-Peat-stacks

LAND USE AND LANDFORMS

43 Rough grazing

67 Sea cliff

71 Het bog 72 Planket peat 75 Dunes

64 Improved grazing 68 Rocky shore

65 Arable Sandy mes 69 Sandy/mddy shore73 Grassland

76 River gorge

66 Other human actity 70 Pebble shore

OTHER NOTES

(e.g. Geology of the area; any birds; insects or other animals noted around the plot; other comments)

Whole area on blanket peat; very wet in parts. Some small outcrops of basal conflowerate and red sandstone. Heavy grazing on whole aron; no fences, a easily acceptible from road.

HABITAT DATA Area within 50 m edge of plot

Stratum no (Serpe in)2 Plot no. 2

3 Recorder R8+ PAB 4 Date 5/3/74

AU	UAT	TC	HAH	ITAT:
2000	APL IN DOOR	AND THE WAR	AND THE PROPERTY.	and the state of t

5	Pool	(<1m ²) ₂
6	Pond	$(<1m^2)_2$ $(1-20m^2)$

7 Lake (>20m) 8-Slow r r/strm 9 Fast rvr/strm

10 Muddy bottom 11 Peat bottom

12 Sandy bottom 13 Gravel bottom 14 Rocky bottom

18 Wet ditch 19 Marsh/bog

15 Rocky spring 16 Peat spring 17 Dry ditch

20 Water trickle 21 Seepage

22 Drowned peat cu 23 River bank 24 River cutting

ANIMALS

25-Sheep 26 Cattle 27-Popy

29 Vegetation bttm 32 Sheep lay 35 Earthworms

31 Many droppings

34 Corpse/Sonos

30 Few droppings 33 No grazing

MANAGEMENT

36 Wall 37 Ruined-wall 38 Embankment 39 Peat diggings +0-Fence 41 Ploughing

42 Drain lines

43 Croft 44 Ruined croft 51 Ruined enc. 58 Midden 45 Occupied house 52 Domestic rubsh 59 Recent burning

46 Unoccupied hse 53 Other rubbish

48 Other bldg in use55 Track (1-5 m) 62 Peat stacks

50 Sheep enc.

57 Metalled road

60 Past burning 47 Ruined house 54 Path (<1 m) 61 Quarry/excavati

49 Othr ruined buldg56 Hardcore track

LAND USE AND LANDFORMS

63 Rough grazing 67 Sea cliff 71 Wet bog 64 Improved grazing 68 Rocky shore 72 Blanket peat

75 Dunes

65 Arable 69 Sandy/mddy shore 79 Grassland

76 River gorge

66 Other human activty 70 Pebble shore 74 Saltmarsh

OTHER NOTES

(e.g. Geology of the area; any birds; insects or other animals noted around the plot; other comments)

Whole crea on serpontine, with shallow soils, many rock onterops and rocks among voyetation. Grazing over whole area (shope pany droppings noted).

Finishing the plot

When you have done all this, the recording of the plot is now complete. Make sure you have entered the stratum and plot numbers on all 4 sheets, and that the sheets have been fully filled in. Check that you have taken a soil sample, and that this, and any unidentified plants you have collected, are in polythene bags labelled clearly with stratum and plot number. Make certain that you have collected together all your equipment and samples into the rucksack. You can now move onto the next plot, and start the whole procedure all over again.

The completed field sheets in this handbook (figures 2a - 5a and 26 - 56), are actual data sets collected during a short visit to Shetland in March this year. One set, labelled "Stratum (Bog)" (figures 2a - 5a) was collected on blanket bog overlying deep peat a few miles outside Lewick (grid reference HU 443429). The other set, labelled "Stratum (Serpentina)" (figures 26 - 56) was collected on grassland overlying the serpentine rocks on Unst, the northernmost large island of Shetland (grid reference HP 636113).

Apart from showing how to fill in field sheets, these are intended to give you some slight idea of what plants may be found in Shetland, and is mainly for those of you that have not been there before.

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Appendix 1

List of survey equipment provided

- 1 rucksack
- 1 set plot-marking equipment
- 1 spade
- 2 recording boards and pencils

Data sheets

- 1 ruler
- 1 soil auger and handle
- 1 Silva compass
- 1 clinometer

Polythene bags

Aluminium labels (for polythene bags)

Maps.