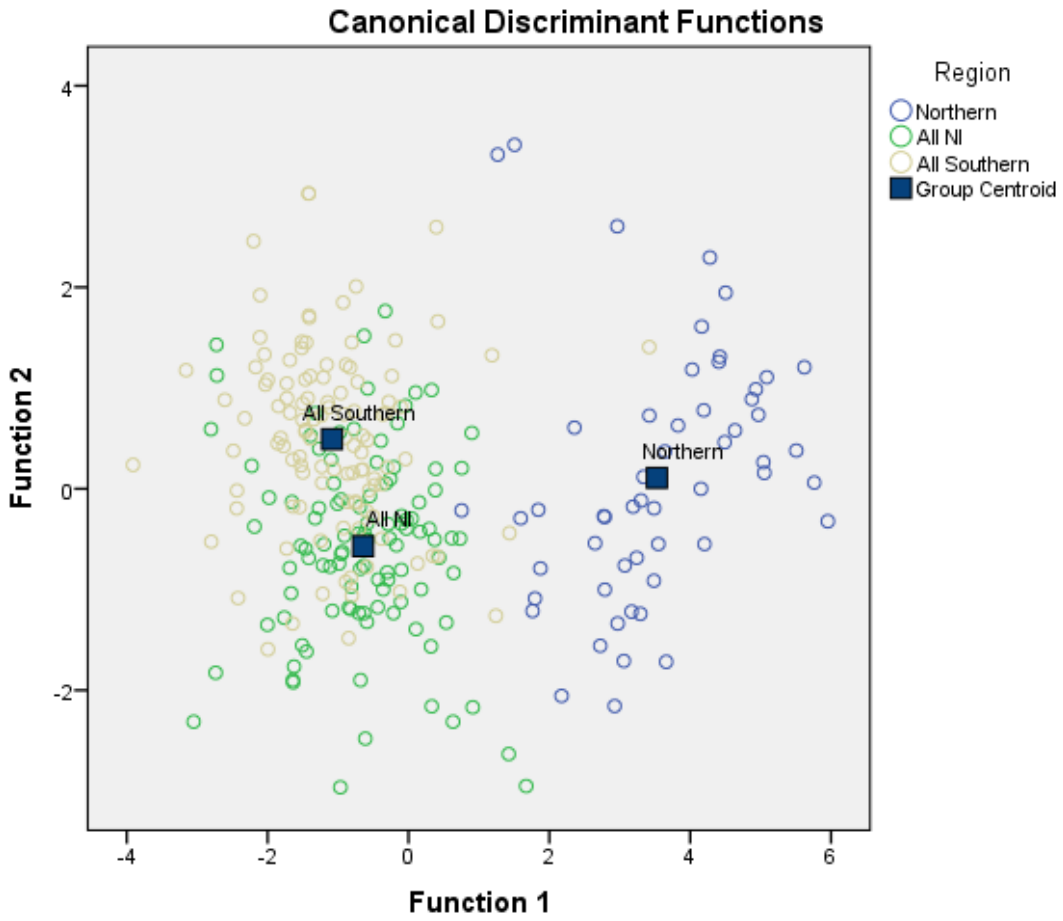
APPENDIX 8.1

RESULTS OF STATISTICAL ANALYSIS

8.1 Three group separation – Northern, NI, All Southern

Discriminant function plot of three sampling regions



Eigenvalues Output

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	3.142[a]	93.1	93.1	.871
2	.232[a]	6.9	100.0	.434
a. First 2 canonical discriminant functions were used in the analysis.				

Wilk's Lambda Output

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.196	424.547	40	.000
2	.812	54.300	19	.000

Standardised Canonical Discriminant Function Coefficients Output

	Function	
	1	2
P	-.807	-1.150
S	.200	-.155
Ti	-.741	.556
V	-.169	-.340
Cr	-.100	.131
Fe	.354	.045
Co	.061	.598
Ni	-.791	-.208
Zn	.072	-.121
Rb	.009	.096
Y	.374	-.606
Zr	.864	1.326
Nb	-.110	-.023
Mo	-.048	.089
Cs	.012	-.152
La	-.069	-.114
Ce	.385	-.019
Lu	.592	-.103
Th	.432	.159
U	.085	.168

Classification results of three sampling regions

		Region	Predicted Group Membership			Total
			Northern	All NI	Southern + Transitional	
Original	Count	Northern	52	1	1	54
		All NI	0	83	24	107
		Southern + Transitional	1	30	81	112
	%	Northern	96.3	1.9	1.9	100.0
		All NI	.0	77.6	22.4	100.0
		Southern + Transitional	.9	26.8	72.3	100.0
a. 79.1% of original grouped cases correctly classified.						

8.2 Sampling regions within the Northern group

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	37.899[a]	98.5	98.5	.987
2	.576[a]	1.5	100.0	.604
a. First 2 canonical discriminant functions were used in the analysis.				

Wilk's Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.016	170.800	40	.000
2	.635	18.870	19	.465

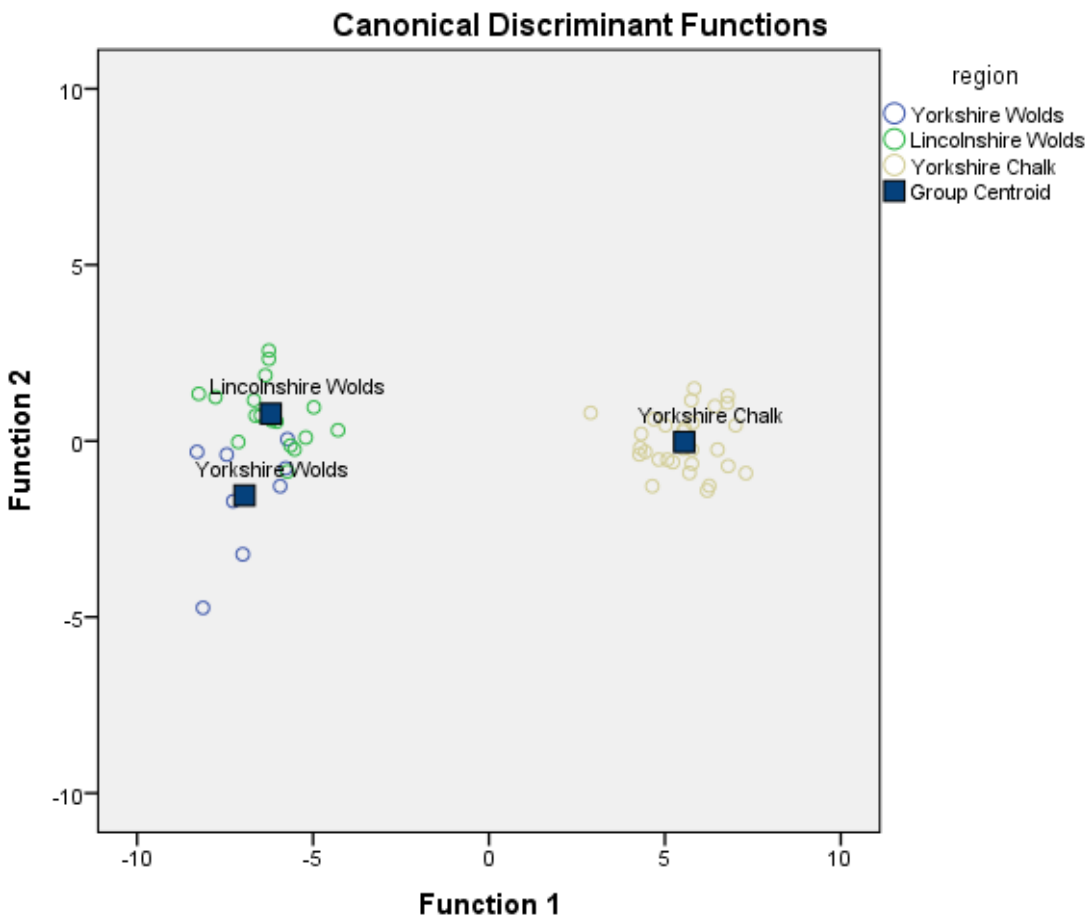
Standardised Canonical Discriminant Function Coefficients

	Function	
	1	2
P	-.876	-.832
S	.232	-.368
Ti	-.035	-.263
V	.513	-.101
Cr	.255	.872
Fe	.211	.236
Co	-.422	-.164
Ni	.225	-.219
Zn	-.927	.507
Rb	-.729	-1.173
Y	.473	-.149
Zr	.151	.111
Nb	.233	.066
Mo	-.174	-.181
Cs	.460	.266
La	.557	.029
Ce	-.005	1.394
Lu	-.148	.396
Th	.426	.033
U	-.345	-.069

Classification Results

		region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Yorkshire Chalk	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Yorkshire Chalk	0	0	29	29
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Yorkshire Chalk	.0	.0	100.0	100.0
a. 96.3% of original grouped cases correctly classified.						

Discriminant function plot of Northern sampling regions



8.3 Sampling regions within the Southern + Transitional group

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.656[a]	41.3	41.3	.629
2	.594[a]	37.3	78.6	.610
3	.341[a]	21.4	100.0	.504
a. First 3 canonical discriminant functions were used in the analysis.				

Wilk's Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 3	.283	125.091	60	.000
2 through 3	.468	75.153	38	.000
3	.746	29.016	18	.048

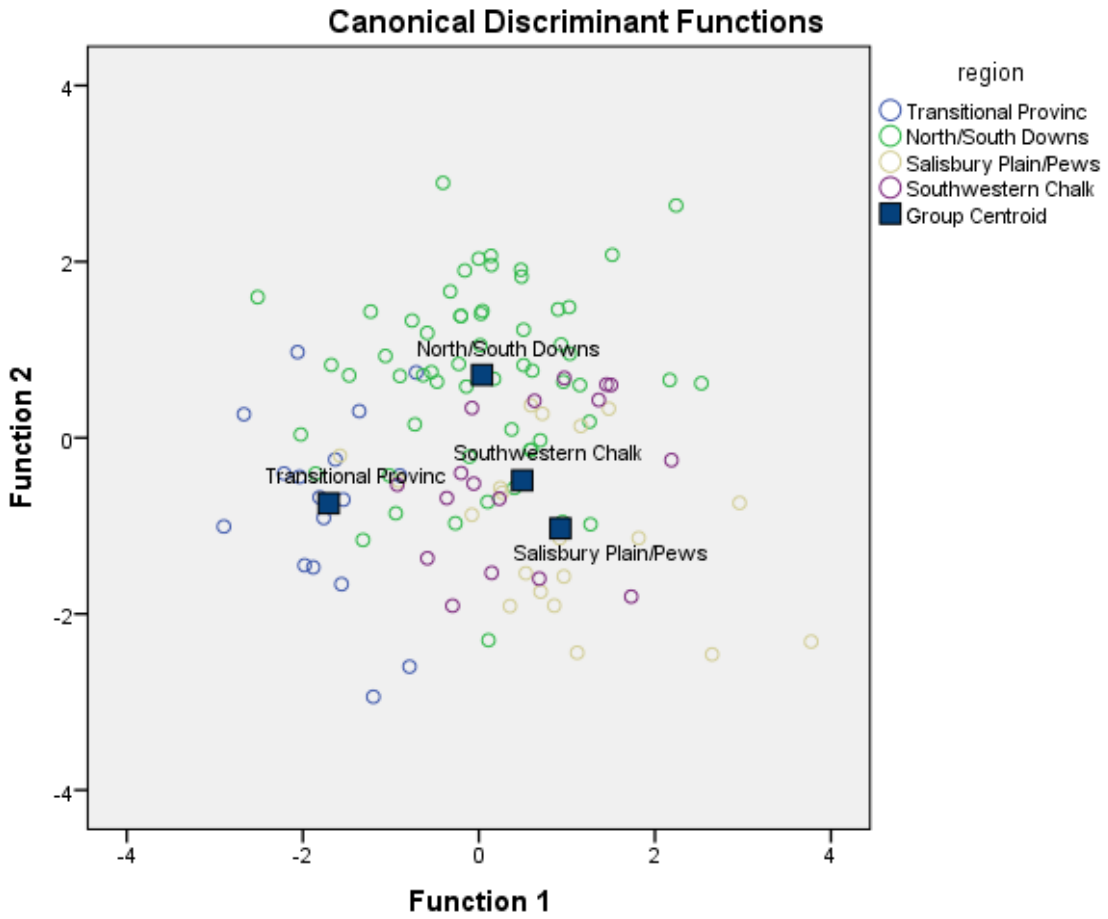
Standardised Canonical Discriminant Function Coefficients

	Function		
	1	2	3
P	.831	1.514	1.173
S	.015	-.040	.004
Ti	1.007	-1.011	.572
V	.052	.151	.063
Cr	.246	-.748	.565
Fe	.212	-.049	.164
Co	.110	.007	-.440
Ni	.407	-.403	-.189
Zn	.155	.304	-.099
Rb	1.047	.237	-.349
Y	-.207	-.112	-.086
Zr	-1.210	-.200	-.762
Nb	-.018	-.046	-.064
Mo	.055	.246	-.064
Cs	.135	-.304	-.004
La	-.084	.347	-.071
Ce	-.653	.725	.181
Lu	-.155	.140	-.337
Th	-.197	-.509	.188
U	-.020	.037	.028

Classification Results

		region	Predicted Group Membership				Total
			Trans Province	N/S Downs	S Plain/Pewsey	SW Chalk	
Original	Count	Trans Province	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
	%	Trans Province	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
a. 67.9% of original grouped cases correctly classified.							

Discriminant function plot of Northern sampling regions



8.4 Sampling regions within the Northern Ireland group

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.344[a]	100.0	100.0	.506
a. First 1 canonical discriminant functions were used in the analysis.				

Wilk's Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.744	28.077	20	.108

Standardised Canonical Discriminant Function Coefficients

	Function
	1
P	1.007
S	-.193
Ti	-.353
V	-.157
Cr	.111
Fe	.513
Co	-.317
Ni	.198
Zn	-.140
Rb	-.253
Y	.008
Zr	-1.058
Nb	.096
Mo	.108
Cs	.108
La	-.011
Ce	-.089
Lu	.426
Th	.186
U	.287

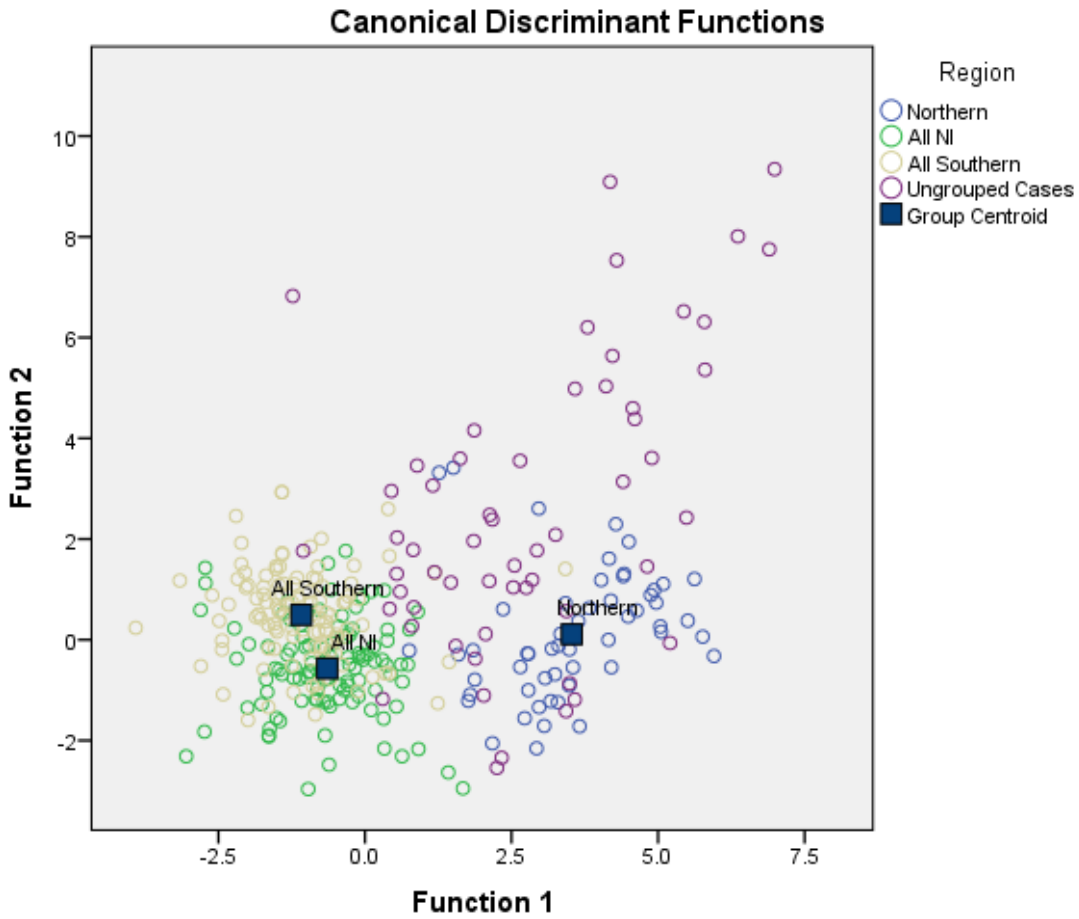
Classification Results

		region	Predicted Group Membership		Total
			Inland NI	Coastal NI	
Original	Count	Inland NI	16	1	17
		Coastal NI	19	71	90
	%	Inland NI	94.1	5.9	100.0
		Coastal NI	21.1	78.9	100.0
a. 81.3% of original grouped cases correctly classified.					

8.2 Artefact Case Studies

8.2.1 Bann Valley Artefacts

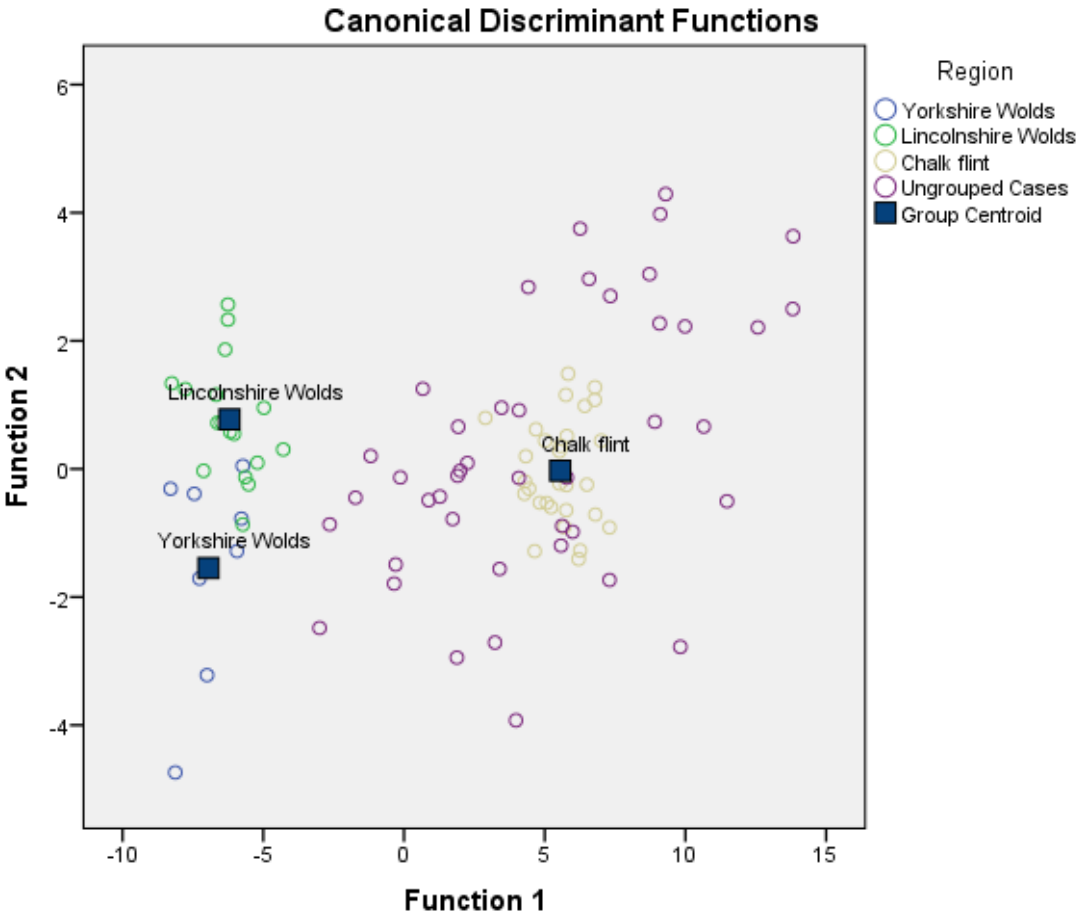
Discriminant function plot of three sampling regions and Bann Valley artefacts



Classification results of Bann Valley artefacts

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	All NI	Southern + Transitional	
Original	Count	Northern	52	1	1	54
		All NI	0	83	24	107
		Southern + Transitional	1	30	81	112
		Ungrouped cases	43	3	11	57
	%	Northern	96.3	1.9	1.9	100.0
		All NI	.0	77.6	22.4	100.0
		Southern + Transitional	.9	26.8	72.3	100.0
		Ungrouped cases	75.4	5.3	19.3	100.0
a. 79.1% of original grouped cases correctly classified.						

Discriminant function plot of Northern sampling region and Bann Valley artefacts

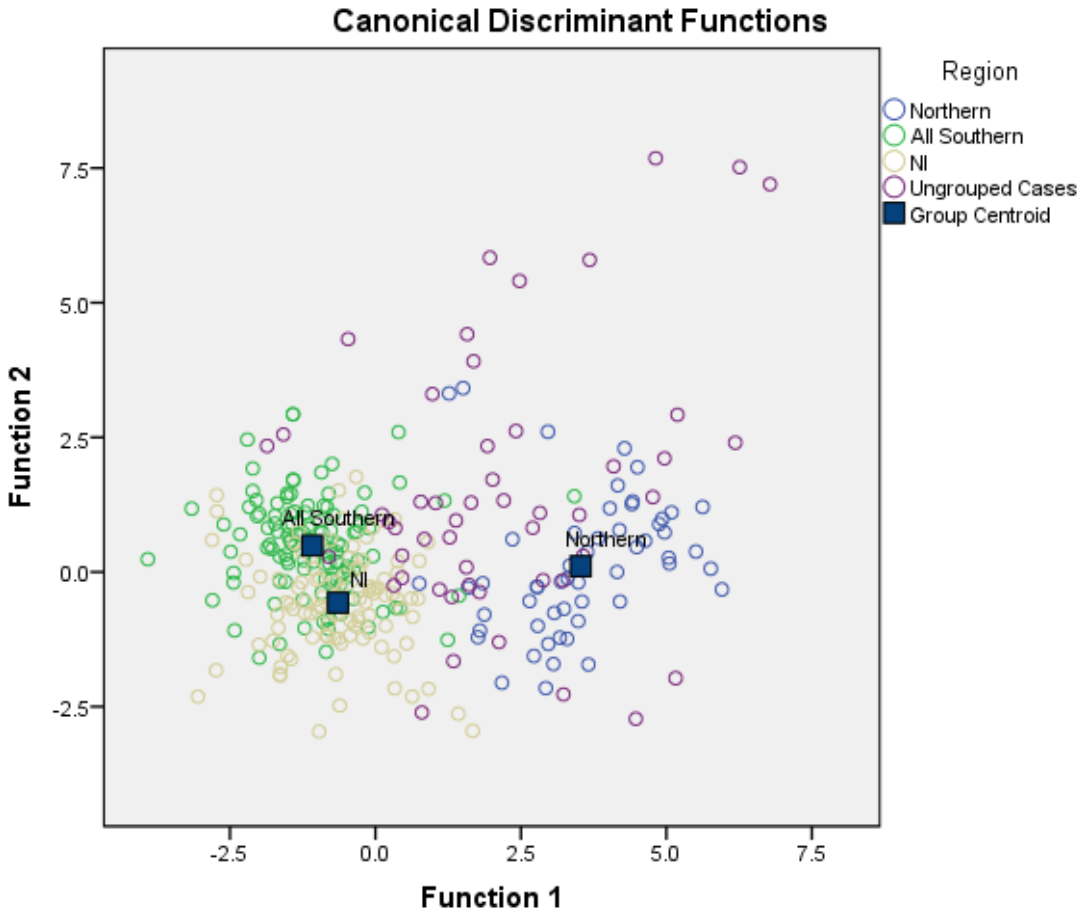


Classification results of Bann Valley artefacts within Northern Province

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Chalk flint	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Chalk flint	0	0	29	29
		Ungrouped cases	1	3	39	43
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Chalk flint	.0	.0	100.0	100.0
		Ungrouped cases	2.3	7.0	90.7	100.0
a. 96.3% of original grouped cases correctly classified.						

8.2.2 Kintyre Artefacts

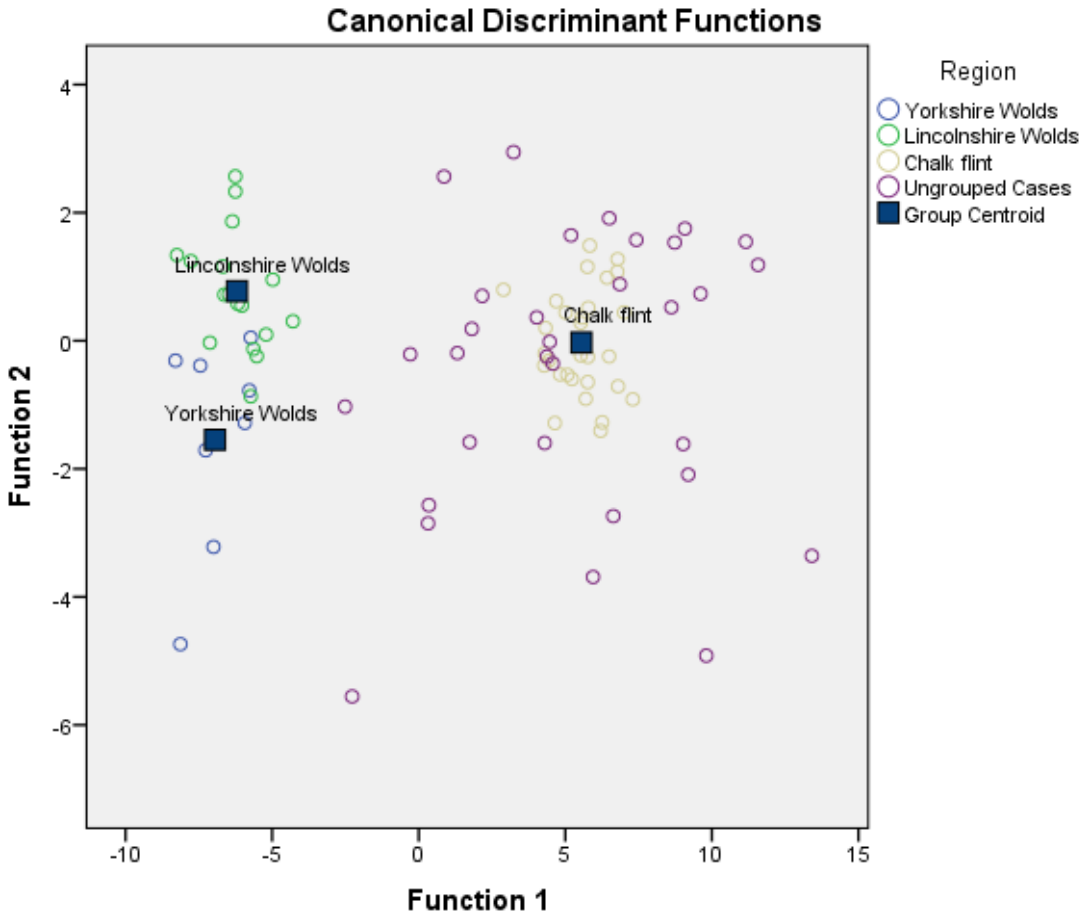
Discriminant function plot of three sampling regions and Kintyre artefacts



Discriminant function plot of three sampling regions and Kintyre artefacts

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	Southern + Transitional	NI	
Original	Count	Northern	52	1	1	54
		Southern + Transitional	1	81	30	112
		NI	0	24	83	107
		Ungrouped cases	32	10	9	51
	%	Northern	96.3	1.9	1.9	100.0
		Southern + Transitional	.9	72.3	26.8	100.0
		NI	.0	22.4	77.6	100.0
		Ungrouped cases	62.7	19.6	17.6	100.0
a. 79.1% of original grouped cases correctly classified.						

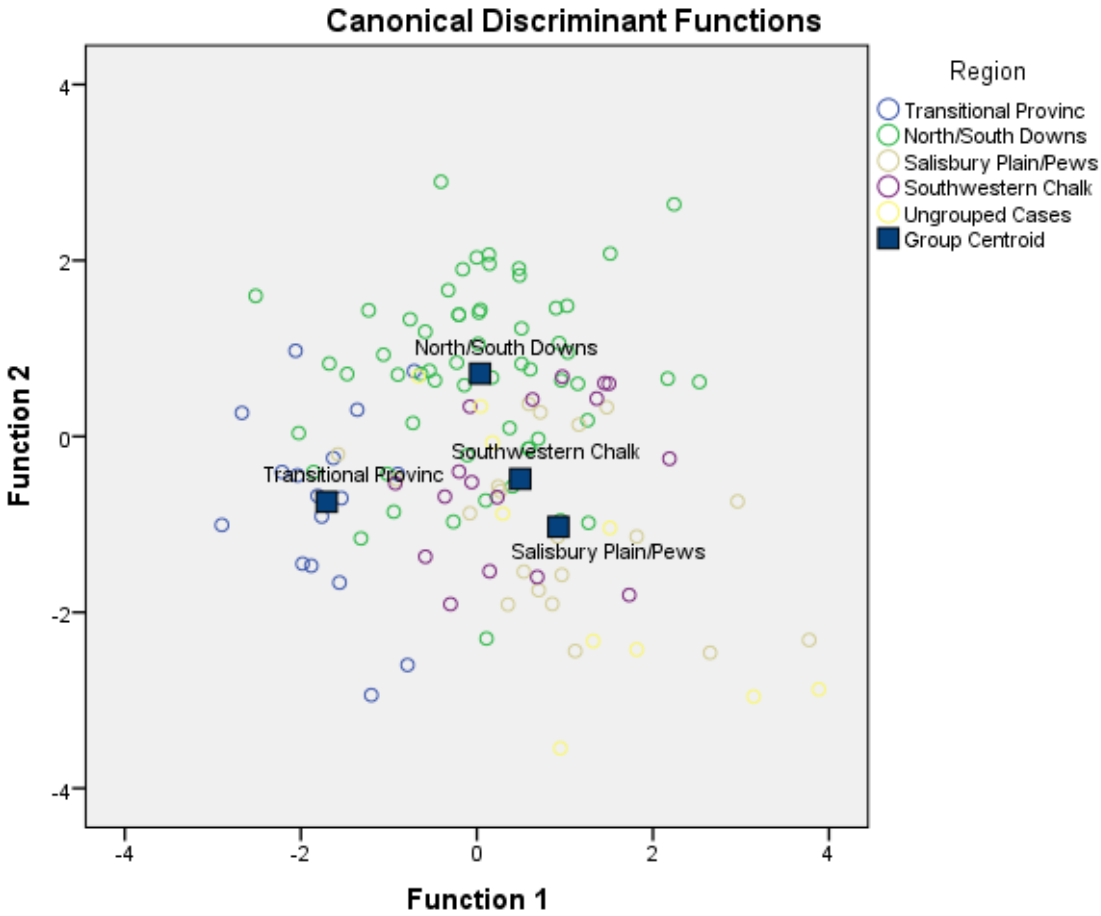
Discriminant function plot of Northern sampling region and Kintyre artefacts



Classification results of Kintyre artefacts within Northern Chalk province

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Chalk flint	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Chalk flint	0	0	29	29
		Ungrouped cases	1	1	30	32
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Chalk flint	.0	.0	100.0	100.0
		Ungrouped cases	3.1	3.1	93.8	100.0
a. 96.3% of original grouped cases correctly classified.						

Discriminant function plot of Southern and Transitional sampling regions and Kintyre artefacts



Classification results of Kintyre artefacts within the Southern + Transitional province

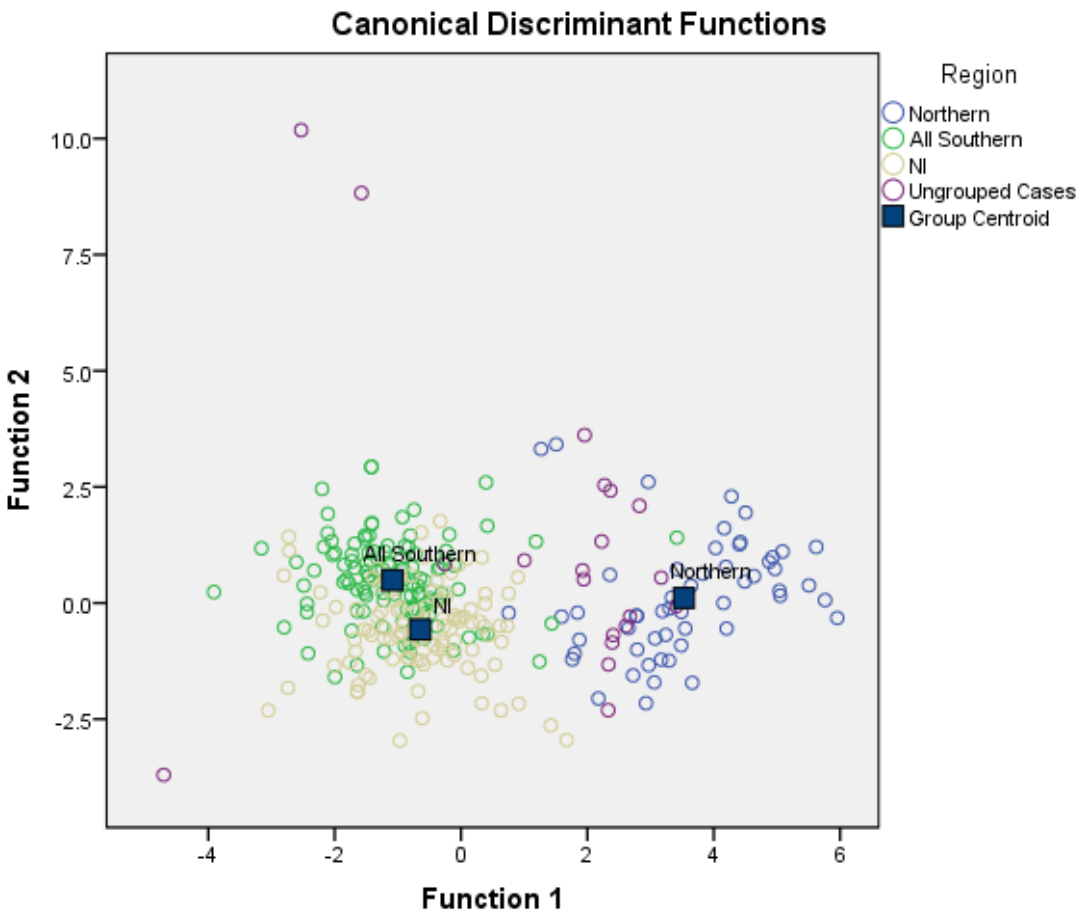
Classification Results[a]							
		Region	Predicted Group Membership				Total
			Trans. Prov.	N/S Downs	S.Plain/ Pewsey	SW Chalk	
Original	Count	Trans. Prov.	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S. Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
		Ungrouped cases	0	0	4	6	10
	%	Trans. Prov.	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S. Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
		Ungrouped cases	.0	.0	40.0	60.0	100.0
a. 67.9% of original grouped cases correctly classified.							

Classification results of Kintyre artefacts within Northern Ireland chalk formation

Classification Results[a]					
		Region	Predicted Group Membership		Total
			Inland	Coastal	
Original	Count	Inland	16	1	17
		Coastal	19	71	90
		Ungrouped cases	3	6	9
	%	Inland	94.1	5.9	100.0
		Coastal	21.1	78.9	100.0
		Ungrouped cases	33.3	66.7	100.0
a. 81.3% of original grouped cases correctly classified.					

8.2.3 Threefords Artefacts

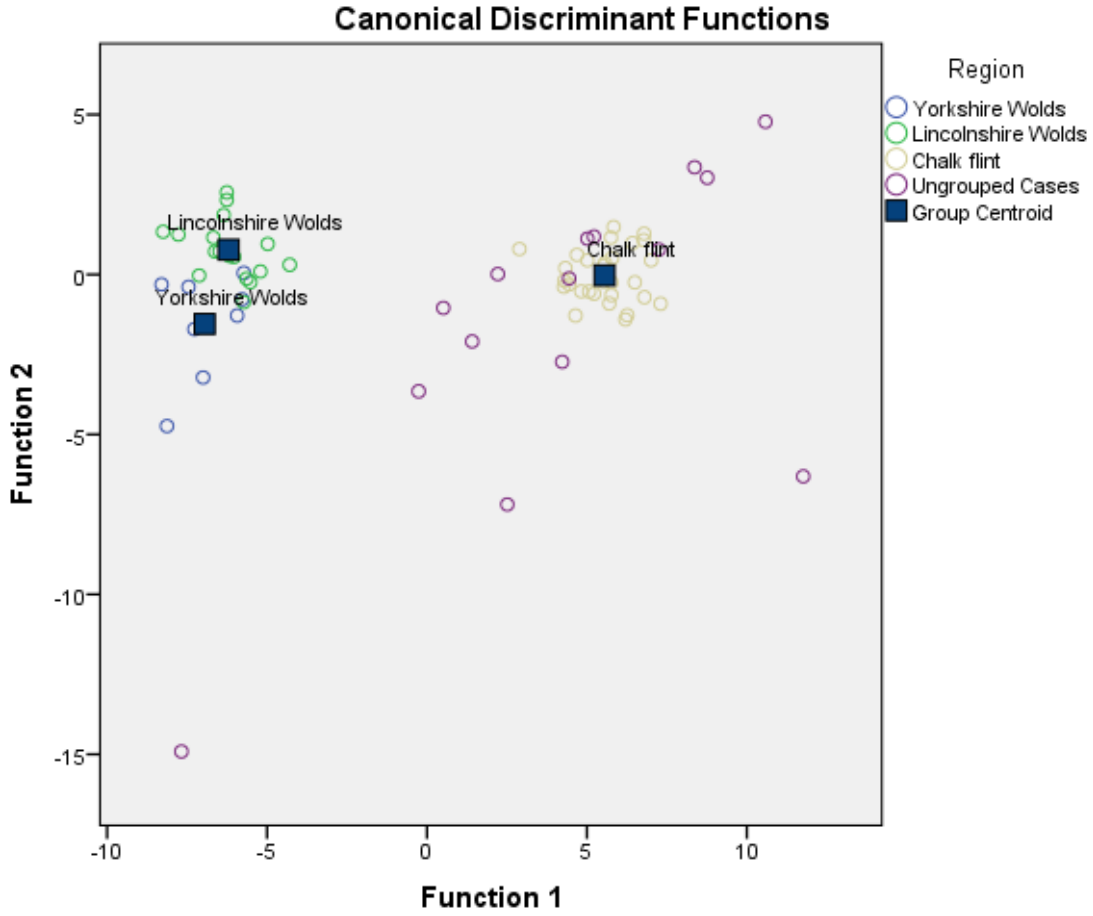
Discriminant function plot of three sampling locations and Threefords artefacts



Classification results of Threefords artefacts and three sampling regions

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	Southern + Transitional	NI	
Original	Count	Northern	52	1	1	54
		Southern + Transitional	1	81	30	112
		NI	0	24	83	107
		Ungrouped cases	15	4	1	20
	%	Northern	96.3	1.9	1.9	100.0
		Southern + Transitional	.9	72.3	26.8	100.0
		NI	.0	22.4	77.6	100.0
		Ungrouped cases	75.0	20.0	5.0	100.0
a. 79.1% of original grouped cases correctly classified.						

Discriminant function plot of Northern sampling locations and Threefords artefacts



Classification results of Threefords artefacts and Northern sampling locations

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Chalk flint	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Chalk flint	0	0	29	29
		Ungrouped cases	1	0	14	15
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Chalk flint	.0	.0	100.0	100.0
		Ungrouped cases	6.7	.0	93.3	100.0
a. 96.3% of original grouped cases correctly classified.						

Classification results of Threefords artefacts and Southern sampling locations

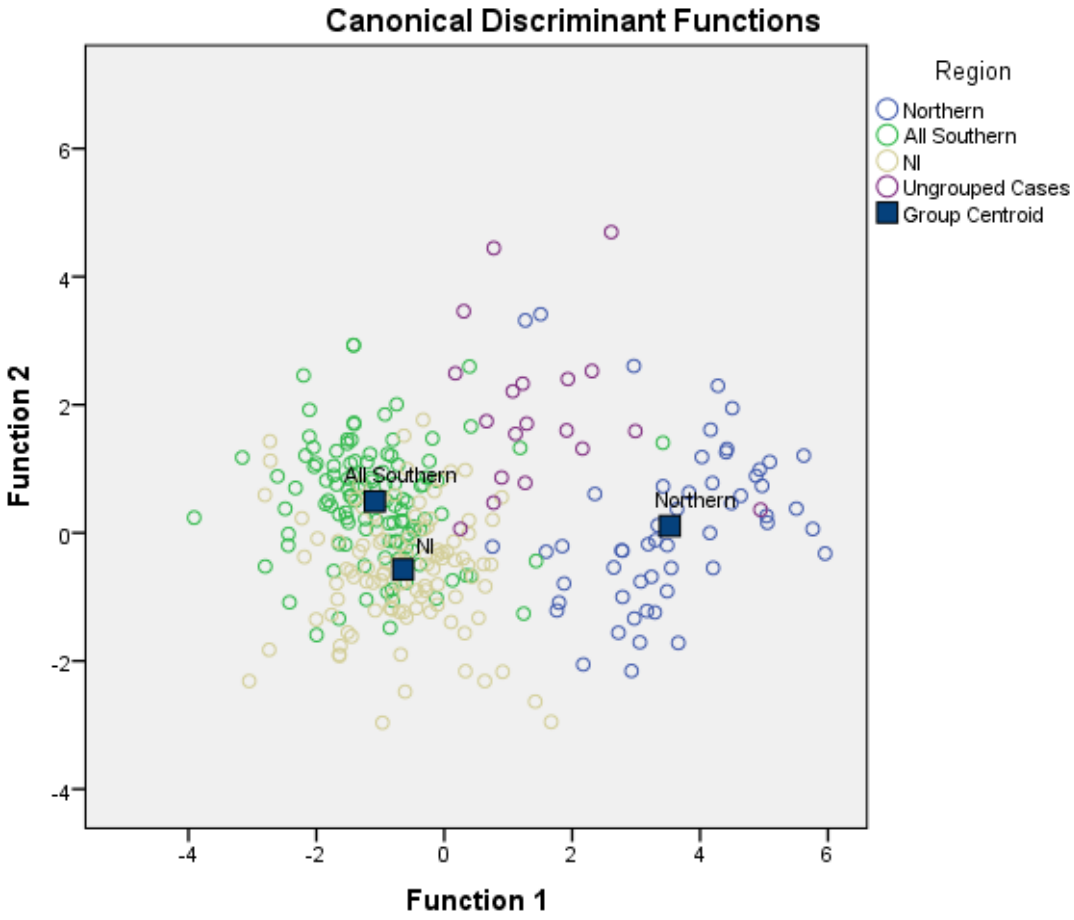
Classification Results[a]							
		Region	Predicted Group Membership				Total
			Trans. Prov.	N/S Downs	S.Plain/ Pewsey	SW Chalk	
Original	Count	Trans.Prov.	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S. Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
		Ungrouped cases	0	1	3	0	4
	%	Trans.Prov.	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S. Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
		Ungrouped cases	.0	25.0	75.0	.0	100.0
a. 67.9% of original grouped cases correctly classified.							

Classification results of Threefords artefacts and Northern Ireland sampling locations

Classification Results[a]					
		Region	Predicted Group Membership		Total
			Inland	Coastal	
Original	Count	Inland	16	1	17
		Coastal	19	71	90
		Ungrouped cases	1	0	1
	%	Inland	94.1	5.9	100.0
		Coastal	21.1	78.9	100.0
		Ungrouped cases	100.0	.0	100.0
a. 81.3% of original grouped cases correctly classified.					

8.2.4 Nether Exe Artefacts

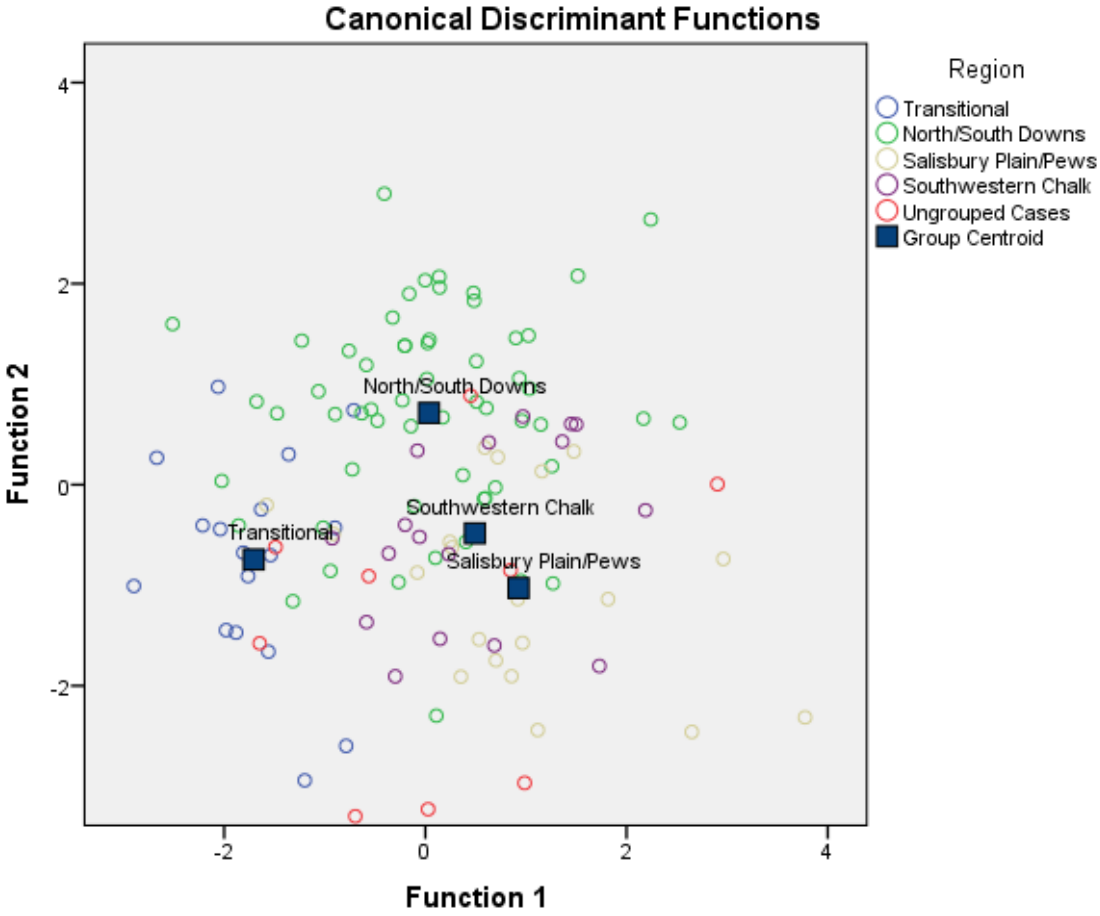
Discriminant function plot of three sampling regions and Nether Exe artefacts



Classification accuracy of Nether Exe artefacts and three sampling regions

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	Southern + Transitional	NI	
Original	Count	Northern	52	1	1	54
		Southern + Transitional	1	81	30	112
		NI	0	24	83	107
		Ungrouped cases	8	9	3	20
	%	Northern	96.3	1.9	1.9	100.0
		Southern + Transitional	.9	72.3	26.8	100.0
		NI	.0	22.4	77.6	100.0
		Ungrouped cases	40.0	45.0	15.0	100.0
a. 79.1% of original grouped cases correctly classified.						

Discriminant function plot of Southern sampling regions and Nether Exe artefacts



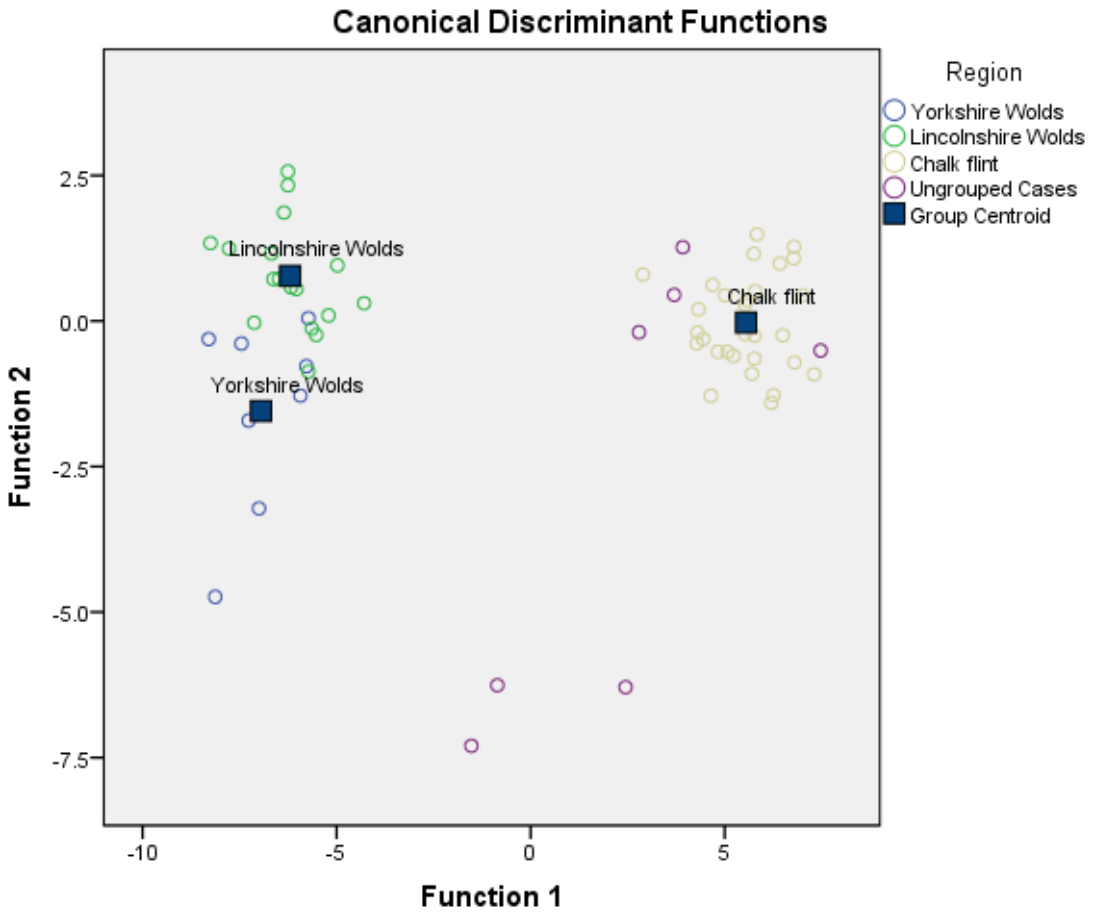
Classification results of Nether Exe artefacts and Southern sampling locations

Classification Results[a]							
		Region	Predicted Group Membership				Total
			Trans. Prov.	N/S Downs	S.Plain/ Pewsey	SW Chalk	
Original	Count	Trans.Prov.	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S. Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
		Ungrouped cases	2	1	3	3	9
	%	Trans.Prov.	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S. Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
		Ungrouped cases	22.2	11.1	33.3	33.3	100.0
a. 67.9% of original grouped cases correctly classified.							

Classification results of Nether Exe artefacts and Northern sampling regions

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Chalk flint	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Chalk flint	0	0	29	29
		Ungrouped cases	2	0	6	8
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Chalk flint	.0	.0	100.0	100.0
		Ungrouped cases	25.0	.0	75.0	100.0
a. 96.3% of original grouped cases correctly classified.						

Discriminant function plot of Northern sampling regions and Nether Exe artefacts

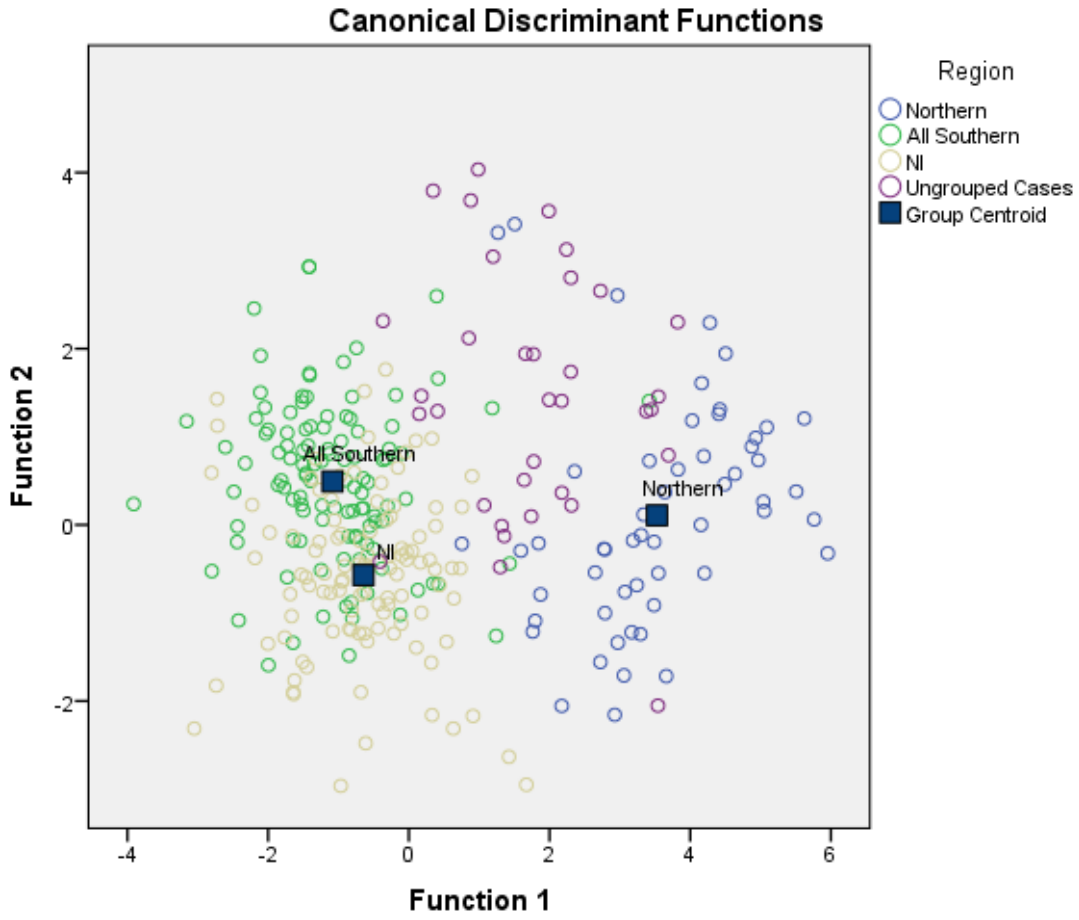


Classification results of Nether Exe artefacts in Northern Ireland sampling regions

Classification Results[a]					
		Region	Predicted Group Membership		Total
			Inland	Coastal	
Original	Count	Inland	16	1	17
		Coastal	19	71	90
		Ungrouped cases	1	2	3
	%	Inland	94.1	5.9	100.0
		Coastal	21.1	78.9	100.0
		Ungrouped cases	33.3	66.7	100.0
a. 81.3% of original grouped cases correctly classified.					

8.5 N1F recollection artefacts

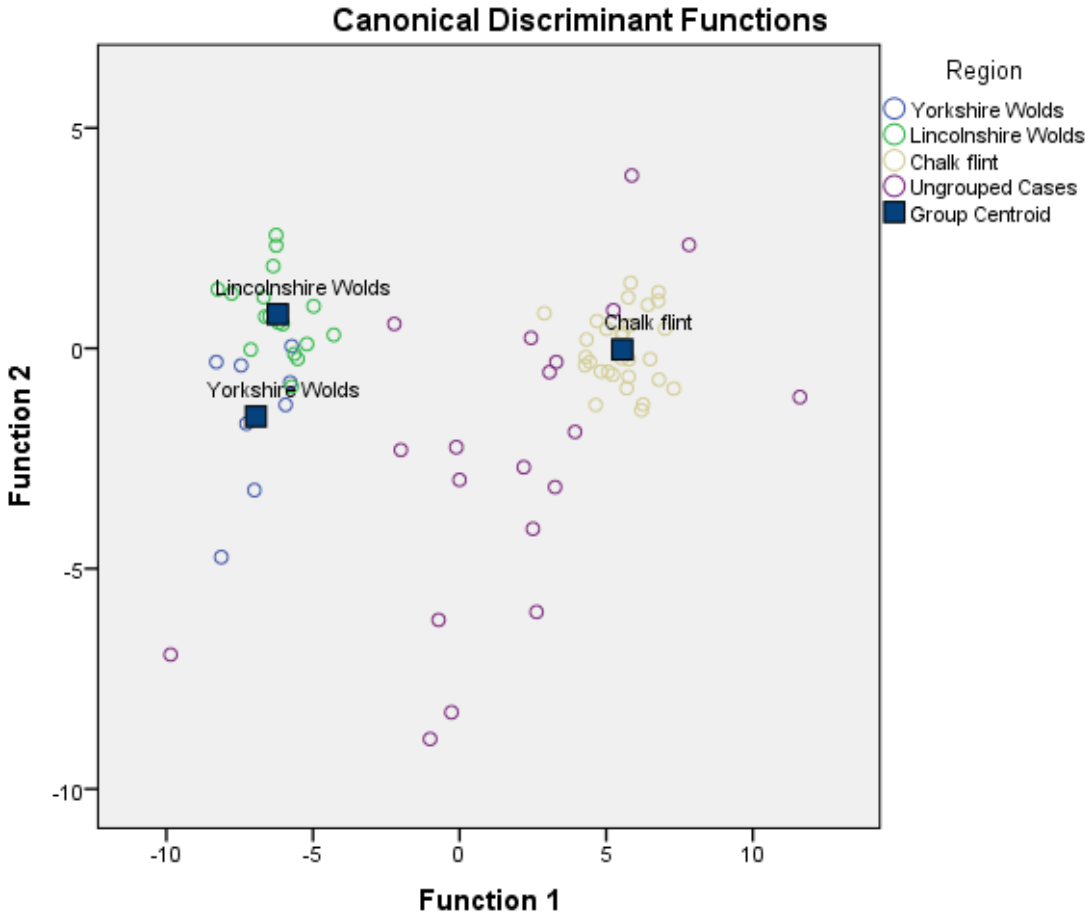
Discriminant function plot of three sampling regions and N1F recollection artefacts



Classification accuracy of N1F recollection artefacts in three sampling regions

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	Southern + Transitional	NI	
Original	Count	Northern	52	1	1	54
		Southern + Transitional	1	81	30	112
		NI	0	24	83	107
		Ungrouped cases	20	9	5	34
	%	Northern	96.3	1.9	1.9	100.0
		Southern + Transitional	.9	72.3	26.8	100.0
		NI	.0	22.4	77.6	100.0
		Ungrouped cases	58.8	26.5	14.7	100.0
a. 79.1% of original grouped cases correctly classified.						

Discriminant function plot of Northern sampling regions and N1F recollection artefacts



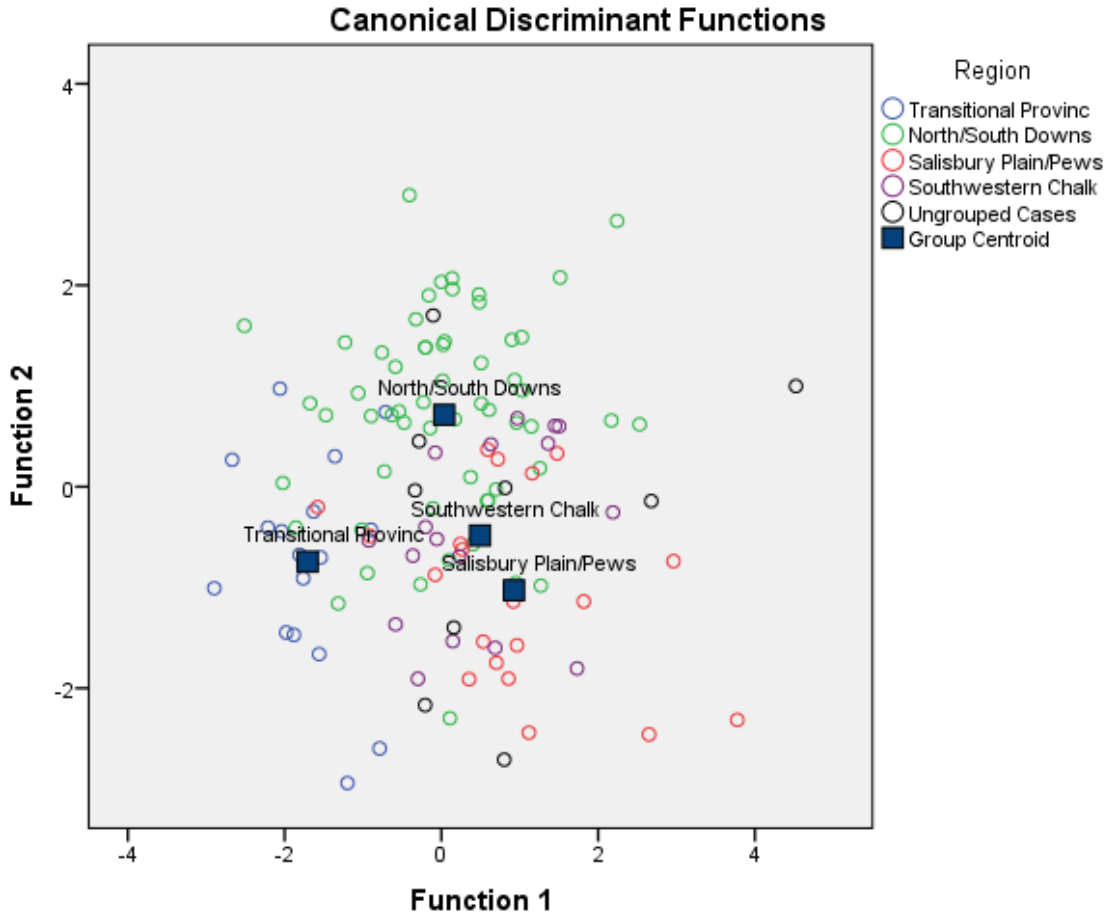
Classification of N1F recollection artefacts in Northern sampling regions

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorkshire Wolds	Lincolnshire Wolds	Chalk flint	
Original	Count	Yorkshire Wolds	7	1	0	8
		Lincolnshire Wolds	1	16	0	17
		Chalk flint	0	0	29	29
		Ungrouped cases	5	1	14	20
	%	Yorkshire Wolds	87.5	12.5	.0	100.0
		Lincolnshire Wolds	5.9	94.1	.0	100.0
		Chalk flint	.0	.0	100.0	100.0
		Ungrouped cases	25.0	5.0	70.0	100.0
a. 96.3% of original grouped cases correctly classified.						

Classification results of N1F recollection artefacts in Southern sampling regions

Classification Results[a]							
		Region	Predicted Group Membership				Total
			Trans. Prov.	N/S Downs	S. Plain/Pewsey	SW Chalk	
Original	Count	Trans. Prov.	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S. Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
		Ungrouped cases	0	1	4	4	9
	%	Trans. Prov.	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S. Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
		Ungrouped cases	.0	11.1	44.4	44.4	100.0
a. 67.9% of original grouped cases correctly classified.							

Discriminant function plot of Southern sampling regions and N1F recollection artefacts

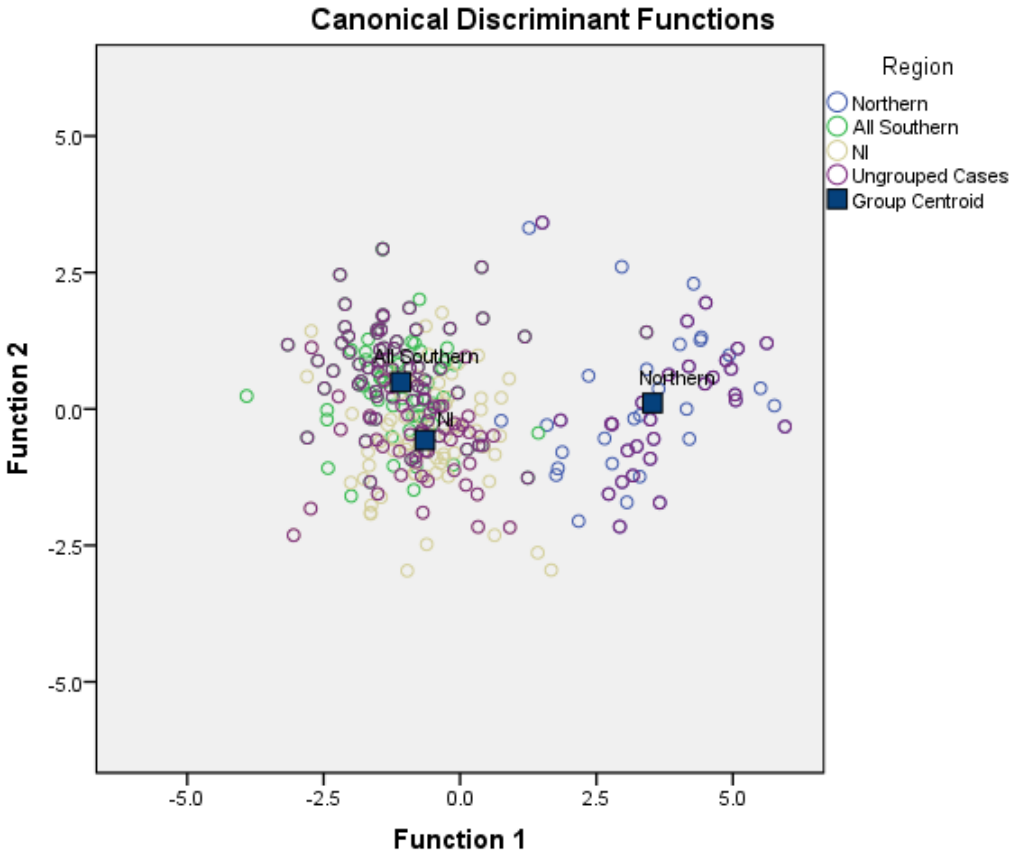


Classification results of N1F recollection artefacts in Northern Ireland sampling locations

Classification Results[a]					
		Region	Predicted Group Membership		Total
			Inland	Coastal	
Original	Count	Inland	16	1	17
		Coastal	19	71	90
		Ungrouped cases	2	3	5
	%	Inland	94.1	5.9	100.0
		Coastal	21.1	78.9	100.0
		Ungrouped cases	40.0	60.0	100.0
a. 81.3% of original grouped cases correctly classified.					

8.2.6 Blind pXRF samples

Discriminant function plot of three sampling regions and pXRF blind samples



Classification results of pXRF blind samples and three sampling locations

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Northern	S + T	NI	
Original	Count	Northern	52	1	1	54
		S + T	1	81	30	112
		NI	0	24	83	107
		Ungrouped cases	29	59	49	137
	%	Northern	96.3	1.9	1.9	100.0
		S + T	.9	72.3	26.8	100.0
		NI	.0	22.4	77.6	100.0
		Ungrouped cases	21.2	43.1	35.8	100.0
a. 79.1% of original grouped cases correctly classified.						

Classification results of pXRF blind samples and Northern sampling locations

Classification Results[a]						
		Region	Predicted Group Membership			Total
			Yorks. Wolds	Lincs. Wolds	Yorks. Chalk	
Original	Count	Yorks. Wolds	7	1	0	8
		Lincs. Wolds	1	16	0	17
		Yorks. Chalk	0	0	29	29
		Ungrouped cases	4	10	14	28
	%	Yorks. Wolds	87.5	12.5	.0	100.0
		Lincs. Wolds	5.9	94.1	.0	100.0
		Yorks. Chalk	.0	.0	100.0	100.0
		Ungrouped cases	14.3	35.7	50.0	100.0
a. 96.3% of original grouped cases correctly classified.						

Classification results of pXRF blind samples and Southern sampling locations

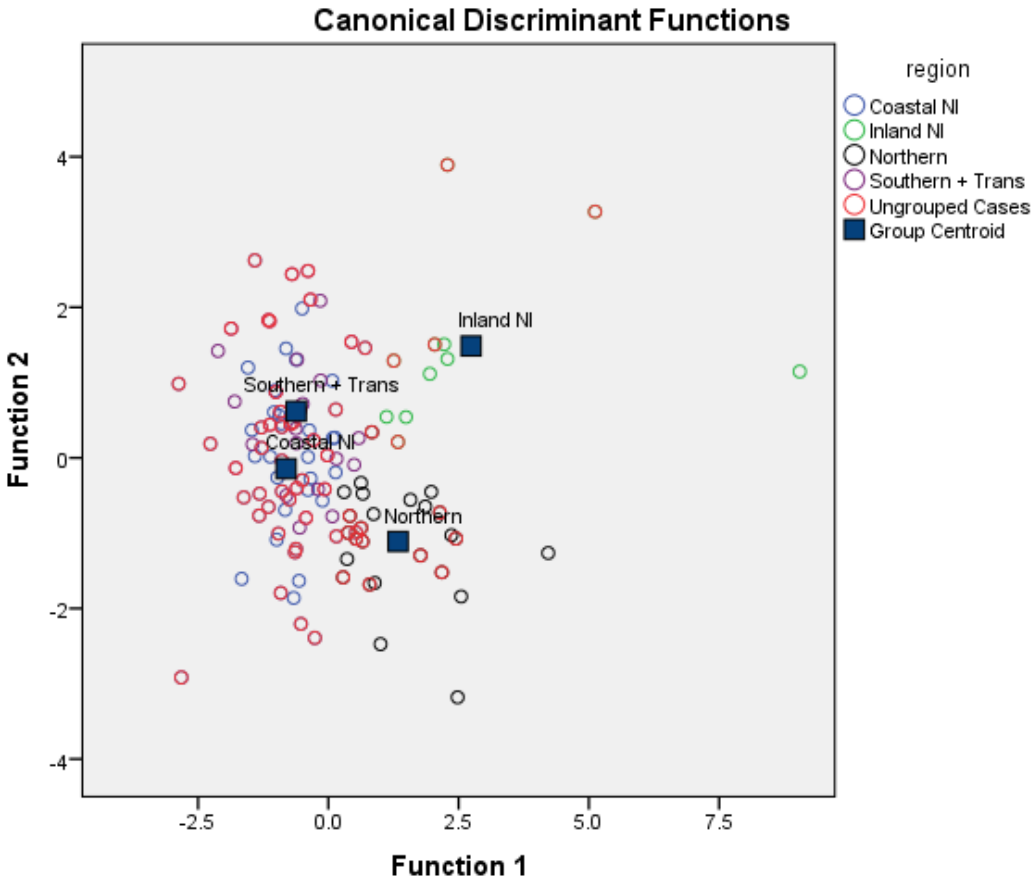
Classification Results[a]							
		Region	Predicted Group Membership				Total
			Trans. Prov.	N/S Downs	S Plain/Pewsey	SW Chalk	
Original	Count	Trans. Province	16	1	0	0	17
		N/S Downs	8	34	7	9	58
		S. Plain/Pewsey	2	1	14	3	20
		SW Chalk	1	3	1	12	17
		Ungrouped cases	15	24	13	15	67
	%	Trans. Prov.	94.1	5.9	.0	.0	100.0
		N/S Downs	13.8	58.6	12.1	15.5	100.0
		S. Plain/Pewsey	10.0	5.0	70.0	15.0	100.0
		SW Chalk	5.9	17.6	5.9	70.6	100.0
		Ungrouped cases	22.4	35.8	19.4	22.4	100.0
a. 67.9% of original grouped cases correctly classified.							

Classification results of pXRF blind samples and Northern Ireland sampling locations

Classification Results[a]					
		Region	Predicted Group Membership		Total
			Inland	Coastal	
Original	Count	Inland	16	1	17
		Coastal	19	71	90
		Ungrouped cases	16	26	42
	%	Inland	94.1	5.9	100.0
		Coastal	21.1	78.9	100.0
		Ungrouped cases	38.1	61.9	100.0
a. 81.3% of original grouped cases correctly classified.					

8.2.7 Blind ICP-MS samples

Classification results of ICP-MS blind samples and three sampling locations

Classification Results[a]							
		region	Predicted Group Membership				Total
			Coastal NI	Inland NI	Northern	Southern + Trans	
Original	Count	Coastal NI	39	1	2	13	55
		Inland NI	0	9	2	0	11
		Northern	0	0	25	1	26
		Southern + Trans	4	0	1	28	33
		Ungrouped cases	23	5	14	21	63
	%	Coastal NI	70.9	1.8	3.6	23.6	100.0
		Inland NI	.0	81.8	18.2	.0	100.0
		Northern	.0	.0	96.2	3.8	100.0
		Southern + Trans	12.1	.0	3.0	84.8	100.0
		Ungrouped cases	36.5	7.9	22.2	33.3	100.0
a. 80.8% of original grouped cases correctly classified.							

Discriminant function plot of three sampling regions and ICP-MS blind samples