Investigating farmers and crofters' experiences of unexplained lamb loss in the Highlands and Islands of Scotland

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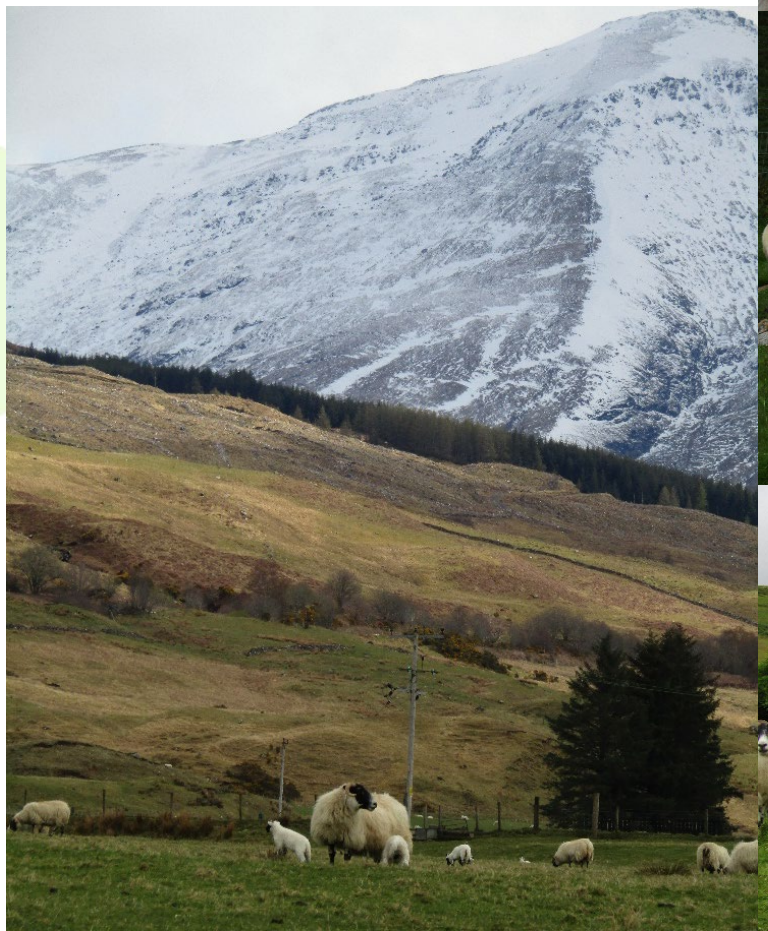
Scottish Hill Sheep

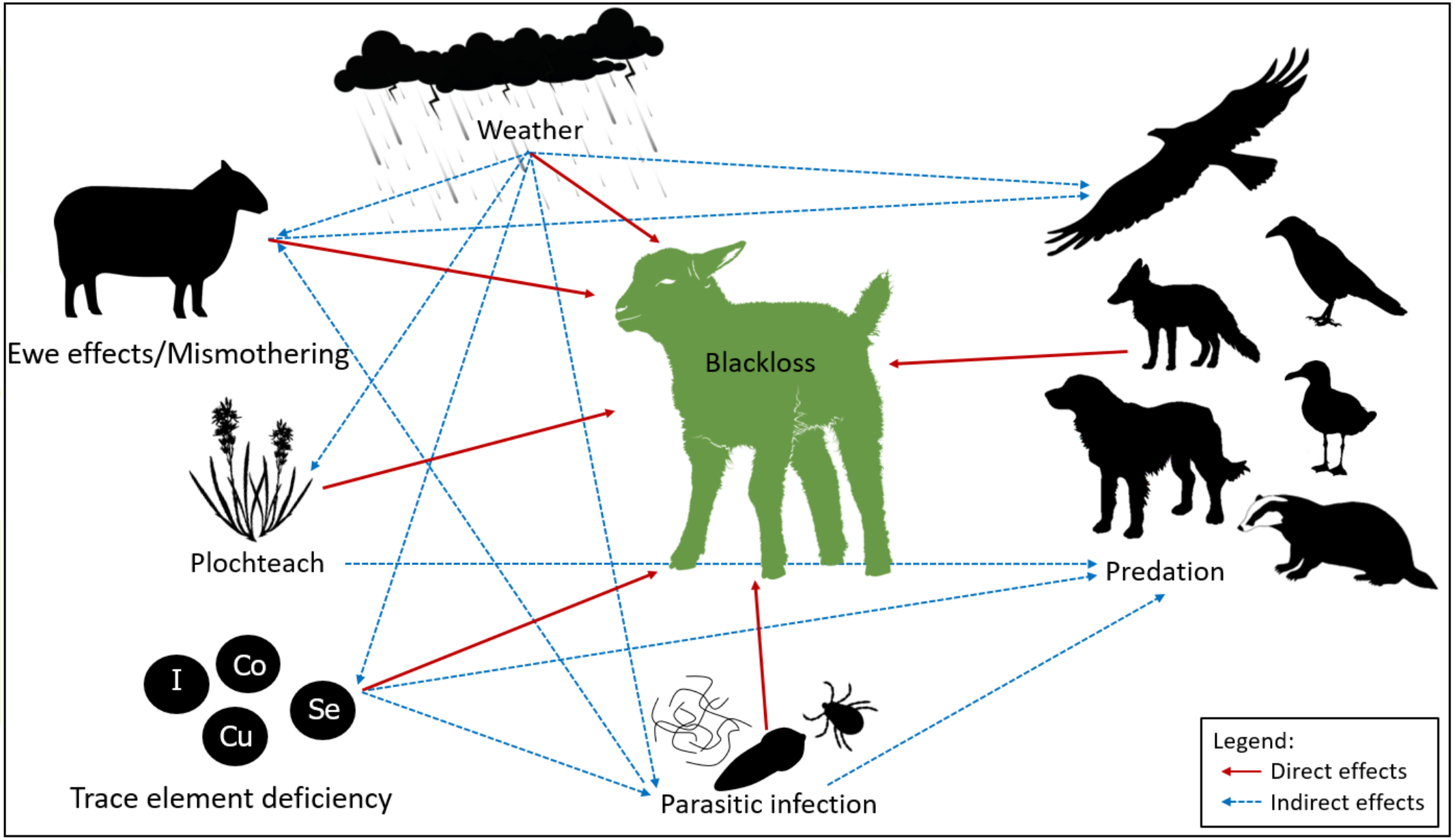
- Extensive, unenclosed upland grazing areas
- Use hardy, native breeds
- Not housed/outdoor lambing
- Flocks usually handled at least 5 times a year
  - pre-mating (Nov)
  - post-mating (Jan)
  - marking (Jun)
  - shearing (Jul)
  - weaning (Sep)
- Lambs typically sold store



Blackloss PhD Project

- Blackloss is the term used for the unexplained loss of lambs on extensive hill grazings in the Highlands of Scotland.
- My PhD project focused on losses between marking (6-8 weeks) and weaning (4-6 months).
- Average mark-wean blackloss of 18.6% (range 8.4 – 25.8%). (Tongue *et al.*, 2016)
- Lambs are not regularly supervised across extensive grazings, resulting in a lack of information on where and why lambs disappear.

Project Background- Lamb health issues and blackloss



Questionnaire

- Issued to hill sheep farmers and crofters to assess current management practices and previous experiences of blackloss.
  - Email/postal- 32 questions
  - Launched April 2020
  - Received 31 responses
  - 54% response rate

17. Please give an estimate of the proportion of lambs you have lost to blackloss during the marking to weaning period in the past 3 years: ***(Select one for each year)***

	2017	2018	2019	Don't know
0%	☐	☐	☐	☐
1-10%	☐	☐	☐	☐
11-20%	☐	☐	☐	☐
21-30%	☐	☐	☐	☐
>30%	☐	☐	☐	☐

18. What do you think are the most important causes of blackloss of lambs on your farm/croft?
(For each line please indicate level of importance)

	Important	Slightly important	Not at all important	Don't know
Mismothering	☐	☐	☐	☐
Hypothermia/Exposure	☐	☐	☐	☐
Starvation	☐	☐	☐	☐
Predators	☐	☐	☐	☐
Parasites (worms, fluke, ticks)	☐	☐	☐	☐
Plochteach/Yellowses	☐	☐	☐	☐
Trace element deficiencies	☐	☐	☐	☐
Accidents	☐	☐	☐	☐
Theft	☐	☐	☐	☐
Other (*please specify*)	☐	☐	☐	☐

19. What do you think are the main consequences of blackloss on your farm/croft?
(Please select an answer for each in order of severity)

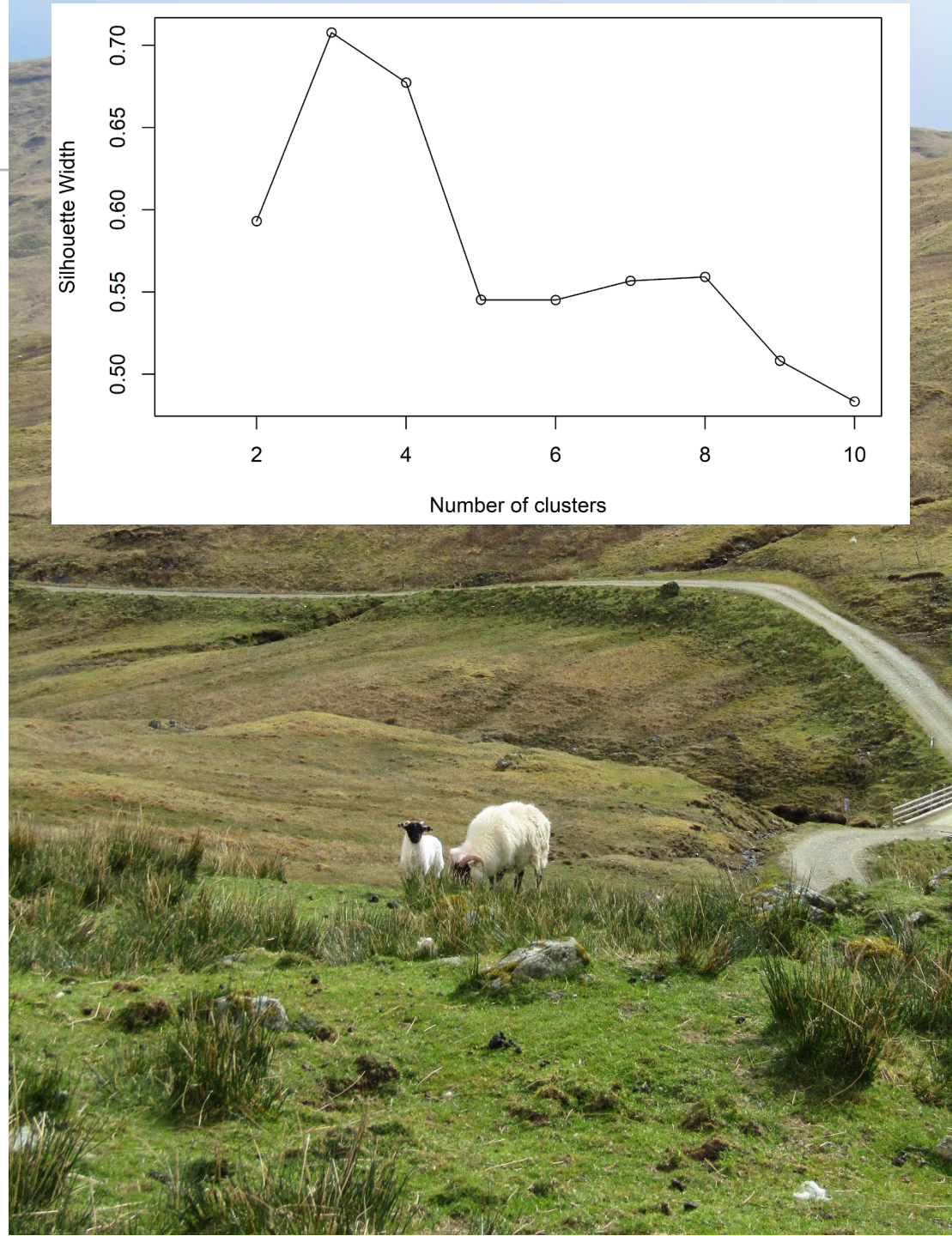
	Severe	Mild	None	Don't know
Loss of productivity	☐	☐	☐	☐
Farmer/crofter stress	☐	☐	☐	☐
Impact on animal welfare	☐	☐	☐	☐
Financial loss	☐	☐	☐	☐
Loss of breeding potential	☐	☐	☐	☐
Poor sustainability	☐	☐	☐	☐
Other (*please specify*)	☐	☐	☐	☐

Typology analysis

- Variables relating to System (type, size, common grazing access, and number of breeding ewes) were used in the clustering analysis

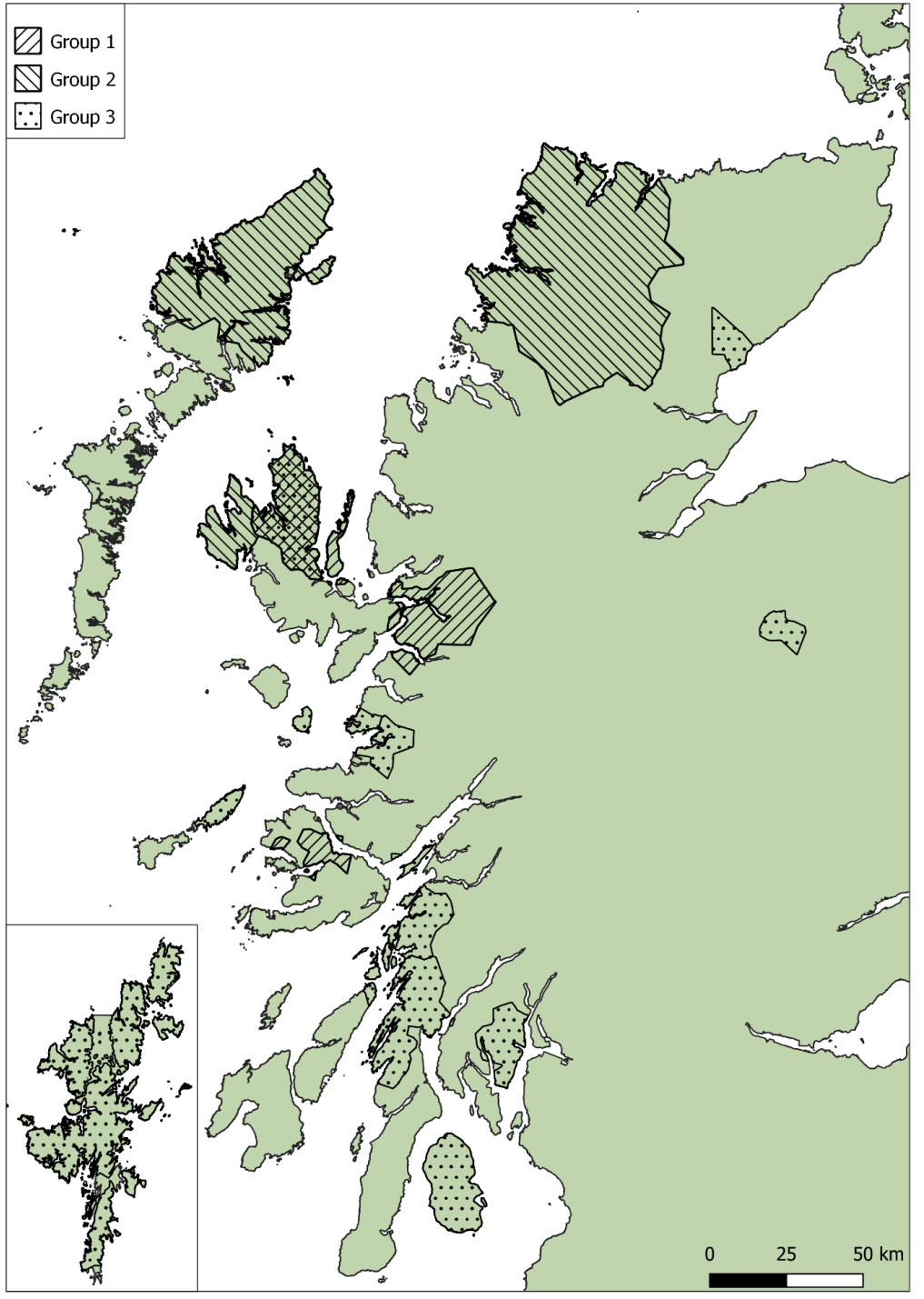
- Silhouette width used to determine number of clusters

- Dendrograms and heatmaps were created, separating each respondent into their assigned clusters



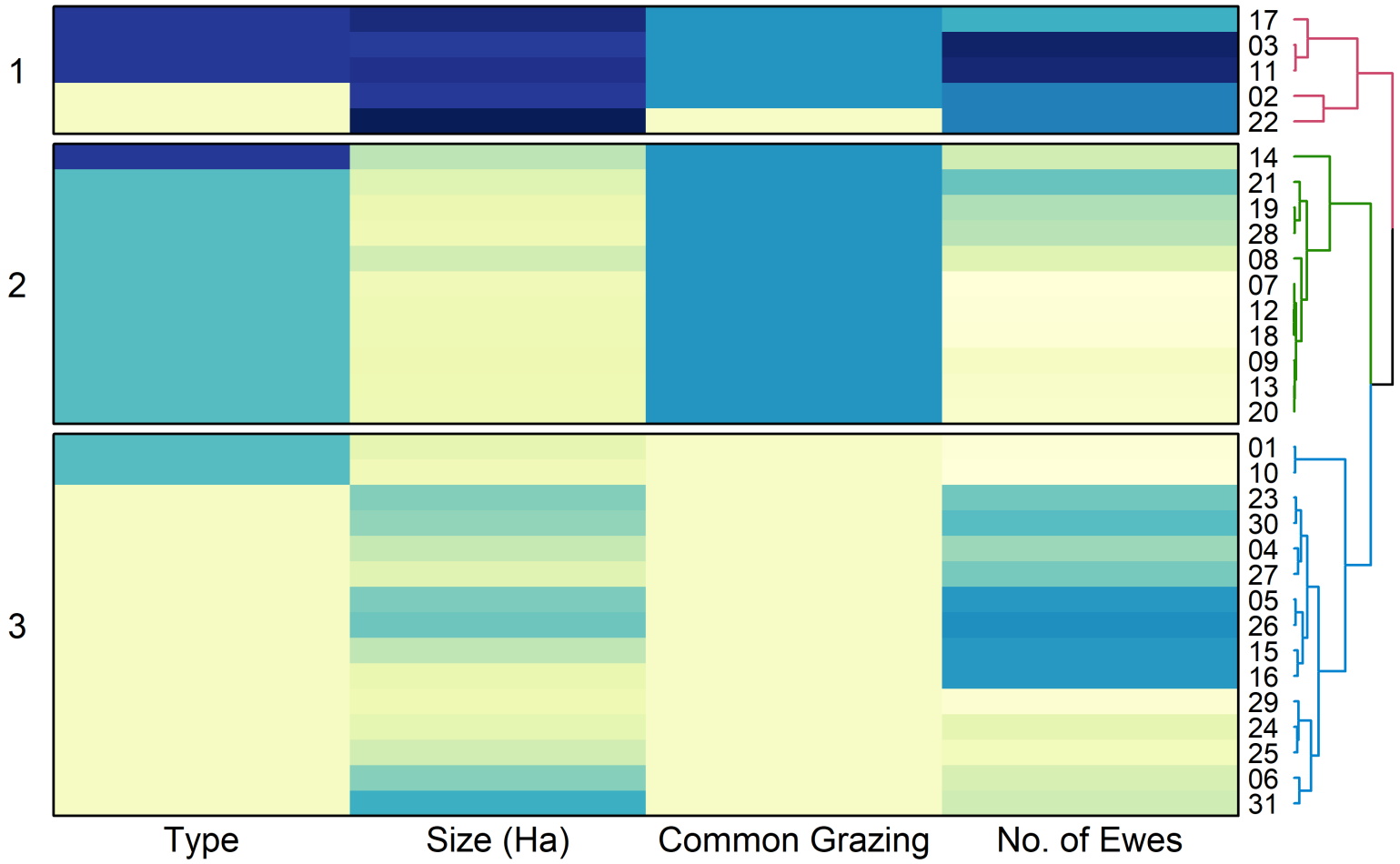
Cluster Group Analysis

- Further exploration- whether the clusters differed in how they manage their flocks, their experiences of blackloss, lamb health issues and predation challenges



Results- Cluster Groups

- Group 1: Traditional extensive
  - 2 farms + 3 SSC
  - most access common grazing.
  - Median size of 2820 Ha
  - 1000 breeding ewes.
- Group 2: Smallholdings
  - 10 crofts + 1 SSC
  - all access common grazing.
  - Median size of 45 Ha
  - 120 breeding ewes.
- Group 3: Medium enterprises
  - 13 farms + 2 crofts,
  - none access common grazing.
  - Median size 530 Ha
  - 500 ewes.



Results- Blackloss

- Group 1 respondents reported consistently higher losses of 11-20% than either Group 2 or 3 (1-10%)

- Causes:
  - Group 1- hypothermia/exposure, predators, parasites, trace element deficiencies and accidents
  - Group 2- predators
  - Group 3- mismothering, predators and parasites

- Consequences:
  - Group 1- financial loss and productivity loss were significantly more severe than either Group 2 or 3, and also considered their own stress a more severe consequence than Group 2 did

Question	Unit	Item	Test	1	2	3	p-value	Sig.
The most important causes of blackloss on your holding?	0= Unknown, 1= Not important, 2= Slightly important, 3= Important	Mismothering		1	0	2	0.17	NS
		Hypothermia/ Exposure		2	0	1	0.05	
		Starvation		0	1	1	0.05	
		Predators		3	3	3	0.19	NS
		Parasites (worms, fluke, ticks)		3	1	2	0.26	NS
		Plochteach		2	1	1	0.03	<0.05
		Trace element deficiencies		2	1	1	0.14	NS
		Accidents		2	1	1	0.16	NS
		Theft		1	0	0	0.47	NS
The main consequences of blackloss on your holding?	0= Unknown, 1= None, 2= Mild, 3= Severe	Loss of productivity		3	2	2	0.02	<0.05
		Farmer/ crofter stress		3	2	2	0.04	<0.05
		Impact on animal welfare		3	2	2	0.28	NS
		Financial loss		3	2	2	0.01	<0.05
		Loss of breeding potential		3	2	2	0.05	
		Poor sustainability		3	2	1	0.08	<0.1

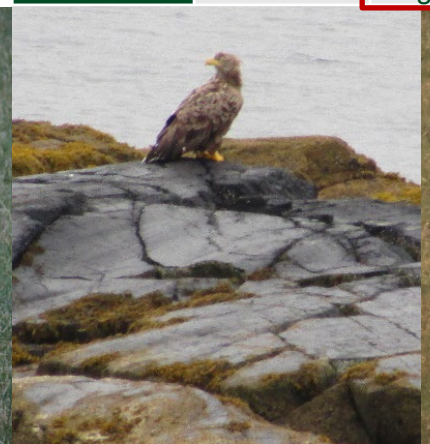
Results- Predators

- The groups shared similar perceptions of the impacts of predators on lambs that are less than 10 days old, and also on older lambs.

- Group 1 which perceived white-tailed eagles to have a significantly higher impact on young lambs than respondents in Group 3 (no impact).

- Group 1 also felt WTE have a high impact on older lambs, whilst Group 3 felt the impact was low. Group 1 felt GE's have a low impact, Group 2 thought they had no impact

Question	Unit	Item	1	2	3	p-value	Sig.
Impact predators have on lambs which are less than 10 days old	0 = NA 1 = None 2 = Low 3 = Medium 4 = High	Foxes	1	3	3	0.31	NS
		Badgers	0	0	1	0.06	NS
		Ravens	3	4	3	0.82	NS
		Crows	3	3	2	0.07	NS
		Black-backed gulls	2	3	2	0.64	NS
		White tailed eagles	4	2	1	0.02	<0.05
		Golden eagles	2	1	1	0.06	NS
Impact predators have on lambs which are more than 10 days old	0 = NA 1 = None 2 = Low 3 = Medium 4 = High	Foxes	1	3	2	0.29	NS
		Badgers	0	0	1	0.12	NS
		Ravens	2	2	2	0.77	NS
		Crows	2	2	1	0.13	NS
		Black-backed gulls	1	2	1	0.86	NS
		White tailed eagles	4	3	2	<0.001	<0.001
		Golden eagles	2	1	0	0.03	<0.05



Results- Attitudes

- Although the groups are themselves significantly distinct, they shared similar attitudes when it comes to blackloss.

- Although many of the respondents felt that blackloss is inevitable and that predators pose a large threat to lambs, most agreed that reducing these losses is important and that understanding the causes would enable them to do so.

Question	Unit	Item	1	2	3	p-value	Sig.
The extent to which you agree or disagree with each of the following statements:	0 = Unknown 1 = Strongly disagree 2 = Disagree 3 = Neither 4 = Agree 5 = Strongly agree	Blackloss is an inevitable part of hill sheep systems.	3	4	4	0.94	NS
		Understanding the causes of blackloss would help me to reduce lamb losses.	4	4	4	0.24	NS
		Reducing blackloss on my holding is important to me.	5	4	4	0.08	<0.1
		The threat to lambs from predators on my holding is low.	1	2	2	0.04	<0.05

Conclusions

- Up to 17.5% of lambs are lost between the marking to weaning period.
- This study adds to our understanding of the perceived causes and consequences of blackloss
- Further detailed studies of lamb health challenges and losses were undertaken on recruited farms and crofts for this PhD

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RESEARCH ARTICLE

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Abstract

Hill sheep farming is an important component of Scottish agriculture and comprises a significant land use in much of the Highlands and Islands. However it faces significant challenges due to the natural constraints of the landscape. Hill sheep farming uses hardy traditional breeds, such as the Scottish blackface and North Country Cheviot to graze extensive areas, where the sheep are not housed and tend to lamb on the open hill. Flocks are gathered several times a year for stock checks, husbandry, and health treatments. Between these handling events, stock will disappear and be unaccounted for. These unexplained losses are known as blackloss in the Highlands and Islands. Previously reported figures for annual lamb blackloss give an average of 18.6%. These losses are in addition to the known losses of lambs and represent a significant welfare and sustainability issue. High parasite burdens, predation, a photosensitisation disease known as plochteach or yellowses, and poor nutrition are often given as presumed reasons for blackloss. A questionnaire was developed to assess the experiences, impacts and understanding flock managers have of blackloss. Typology analysis using partitioning around medoids was used to cluster respondents into three distinct groups: 1- very large extensive farms and Sheep Stock Clubs, 2- medium sized farms, and 3- small-scale crofts. The responses of these groups were subsequently analysed to see if their experiences and perceptions of blackloss differed with relation to lamb health challenges and predation impacts. The groups reported similar health challenges, apart from Group 1 which had a significantly higher plochteach challenge. In terms of predators, Group 1 also perceived white-tailed eagles (*Haliaeetus albicilla*) as a much higher threat to their lambs than the other groups. It was observed that many of the respondents believed blackloss is inevitable and that predators pose a large threat to lambs. However, most agreed that reducing these losses is important and that understanding the causes would enable them to do so.

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