Ambio

Electronic Supplementary Material

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Title: "Generality of mis-fit"? The real-life difficulty of matching scales in an interconnected world

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S1: Table S1 - Socio-administrative and ecological drivers influencing decision making in reindeer husbandry

Figure 1 in the main text illustrates the main drivers of ecological and socio-administrative origin that affect reindeer husbandry across several levels. These have been identified from the literature, often referred to also later in our manuscript. Below, we specify which references specifically address the identified topic and helped us to develop Fig. 1.

Table S1: Main drivers affecting reindeer husbandry across several levels

Socio-administrative drivers	**References**
EU regulations	Johansson 2008, Keskitalo 2008a
Legislation of trans-border grazing	Brännlund & Axelsson 2011, Lantto 2010
Mobility across landscapes / borders	Lantto 2010, Brännlund & Axelsson 2011, Horstkotte *et al.* 2014
Certification schemes	Keskitalo 2008b, Johansson 2014
Land use legislation	Sandström *et al.* 2003, Widmark 2009
Land use planning	Sandström *et al.* 2003, Herrmann *et al.* 2014
Power distribution	Sandström *et al.* 2006, Ulvevadet 2008, Löf 2014
Self-determination	Axelsson & Sköld 2006, Allard 2014
Siida decision making	Sara 2009, 2011
Reindeer management	Tyler *et al.* 2007, Forbes *et al.* 2006

Ecological drivers	**References**
Availability / accessibility of grazing resources	Helle 1984, Kivinen *et al.* 2010, Skarin *et al.* 2010
Weather dynamics	Helle & Kojola 2008, Kumpula & Colpaert 2009
Plant community composition	Eskelinen & Oksanen 2006, Bråthen *et al.* 2007
Density dependency of reindeer condition	Kumpula *et al.* 2000, Tveraa *et al.* 2007, Bårdsen & Tveraa 2012

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S2: Reindeer habitat selection in Norrbottens winter grazing area in dependence of forest age

To support our hypothesis of the generality of misfit, we conducted analyses on reindeer habitat selection at the landscape level in Norrbotten, Northern Sweden.

To analyse the forest variables (age and area), we extracted information about forest stand variables from the Swedish Agricultural University's database at http://skogskarta.slu.se/. These stand level data, including mean age, volume, species composition, area of the stand etc. are derived from a combination of satellite imagery (SPOT 4 and SPOT 5 taken in the year 2005, with a resolution of 25 m x 25 m). These are combined with field inventories from the Swedish National Forest Inventory (NFI). NFI reference plots are used to calculate stand variables for each pixel according to the k nearest neighbour method (kNN) (Reese *et al.* 2002). Our analysis is based on a segmented version of the kNN data set with 25 x 25 m pixels.

Land use data pertaining to reindeer husbandry are available at http://projektwebbar.lansstyrelsen.se/gis/Sv/Pages/nationella-geodata.aspx. We accessed the data files on "trivselland", i.e. areas preferred by reindeer over a longer time period, and calculated their spatial extent in a GIS.

Selective use of a resource or a habitat implies that the item is exploited disproportionately to its availability. For habitat selection at the landscape level, selection indices have been developed to describe the degree of preference and usage for a certain habitat class. These habitat classes are defined as forest age classes in our analysis (Fig. 3).

To analyze the preference for forest age classes *i*, we followed Manly *et al.* (2007). The whole winter grazing area was defined the as the *available area*, while "trivselland" was defined as *area used*.

For each forest age class *i* (< 10, 11 – 20, …, > 130) we calculated the spatial extent. Then, the *proportional availability* (A_i) of each forest age class was calculated by dividing its respective spatial extent by the whole area of analysis, i.e. the winter grazing area in Norrbotten. The availability of the forest age classes in % is also illustrated in Fig. 2a in the main text.

$$Ai = \frac{area\ of\ forest\ age\ class\ i}{area\ of\ winter\ grazing\ area}$$

Accordingly, we calculated the *proportion used* of each forest age class *i* (U_i) for stands included in the "trivselland":

$$Ui = \frac{area\ \ of\ forest\ age\ class\ i\ in\ \text{trivselland}}{area\ of\ trivselland}$$

These two proportions are used to calculate the selection index W_i for each forest class i:

$$Wi = \frac{Ui}{Ai}$$

Values of W_i greater than 1.0 represent a selective use, i.e. preference, for forest age class *i*, values less than 1.0 indicate avoidance or non-use of forest age class *i*. Results are presented in Table S2. W_i is illustrated in Fig. 2b in the main text.

The same data were used to analyze the spatial extent of forest stands in comparison to the area of "trivselland".

Table S2: Habitat selection of reindeer in Norrbottens winter grazing area: values for A_i, U_i and W_i

	Area available (A_i)		Area used (Ui)		Selection Index
Forest Age Class	Area (ha)	A_i	Area (ha)	U_i	W_i
< 10	84520	0.02	22146	0.02	1.00
11 - 20	240498	0.06	65898	0.06	1.05
21 - 30	444840	0.10	110390	0.10	0.95
31 - 40	502172	0.12	120181	0.11	0.92
41 - 50	493229	0.12	117044	0.10	0.91
51 - 60	611307	0.14	146502	0.13	0.92
61 - 70	767236	0.18	190130	0.17	0.95
71 - 80	659230	0.15	182306	0.16	1.06
81 - 90	340833	0.08	111097	0.10	1.25
91 -100	96264	0.02	35379	0.03	1.41
101 - 110	23408	0.01	10239	0.01	1.67
111 - 120	9869	0.00	4447	0.00	1.72
121 - 130	4849	0.00	2165	0.00	1.71
> 130	2030	0.00	1092	0.00	2.06
Sum	4280285			1119017	

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Manly, B. F. L., McDonald, L., Thomas, D., McDonald, T. L., & Erickson, W. P. 2007: *Resource selection by animals: statistical design and analysis for field studies*. Springer.