

1 *Supplementary Material*

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3 **Variation in abundance and life history traits of two congeneric Arctic wolf spider species,**
4 ***Pardosa hyperborea* and *Pardosa furcifera*, along local environmental gradients**

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15 **Context**

16 In the Arctic, it was recently shown that females of wolf spider species (Lycosidae) were able
17 to produce more than one clutch, or egg sac, in one active season (e.g. *Pardosa glacialis* in Høye et al.
18 2020). It seems to be the case for *Pardosa furcifera* (Thorell 1875) and *Pardosa hyperborea* (Thorell
19 1872), two species that present two distinct phases of egg sac production over the season. Clutches
20 from the second clutch peak are significantly smaller than clutches from the first one (Viel et al. 2022).

21 In the context of studying the influence of environmental factors (here elevation and habitat) on such
22 life-history trait, we used the method in Viel et al. (2022) to avoid mixing potentially smaller second
23 clutches with the larger first clutches, i.e. to only keep clutches from the first laying episode.

24 **Analyses**

25 Firstly, we plotted the frequency distribution of the clutch sizes (i.e. the number of eggs per
 26 clutch) according to elevation (Fig. 1), as in Høye et al. (2020), and obtained a clear bimodal distribution
 27 for *P. hyperborea*. More precisely, this species showed two distinct peaks of clutch size with a split at
 28 15 eggs at low elevation and at 13 eggs at high elevation. However, the clutch size distribution of *P.*
 29 *furcifera*, for which we gathered the clutches into size classes of five to reduce a potential noise effect
 30 from the wide range of eggs number (from 14 to 177 eggs per clutch), did not show any clear bimodal
 31 pattern at both elevations. Therefore, according to this method, *P. furcifera* has a single phase of clutch
 32 production in one active season.

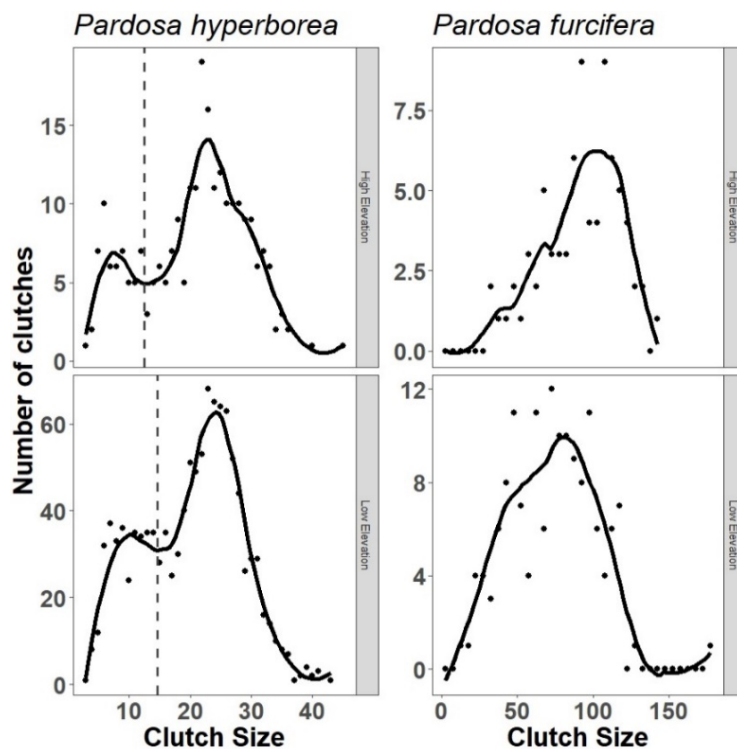


Fig.1 Frequency distribution of clutch sizes according to elevation in the wolf spiders *P. hyperborea* and *P. furcifera* with clutches grouped into size classes of five, across respectively 1393 and 229 clutches collected in pitfall traps at Narsarsuaq (Greenland) during the period 2015 – 2017. The solid lines represent locally weighted smoothing with span parameters = 0.5 and identifies in *P. hyperborea* a local minimum at a clutch size of 15 eggs at low elevation and at 13 eggs at high elevation, implying two laying episodes, as indicated by the grey vertical hatched line. No clear bimodal pattern was detected for *P. furcifera*, implying a unique laying episode across the season according to this method.

33 However, Viel et al. (2022) argue that the frequency distribution method would not be
 34 sufficiently precise to unravel intraspecific variations from a phenological trend, and that embryonic
 35 stage information of the pullis would be a more precise indicator. Therefore, we plotted the
 36 distribution of clutch size against the week of the year, i.e. against the week of collecting, according to
 37 elevation and to the embryonic stage (Fig. 2a,c): “A” when the prosoma was not visible or developing;
 38 “B” when the postembryonic individual was hatched within the egg sac (see Ameline et al. 2018).

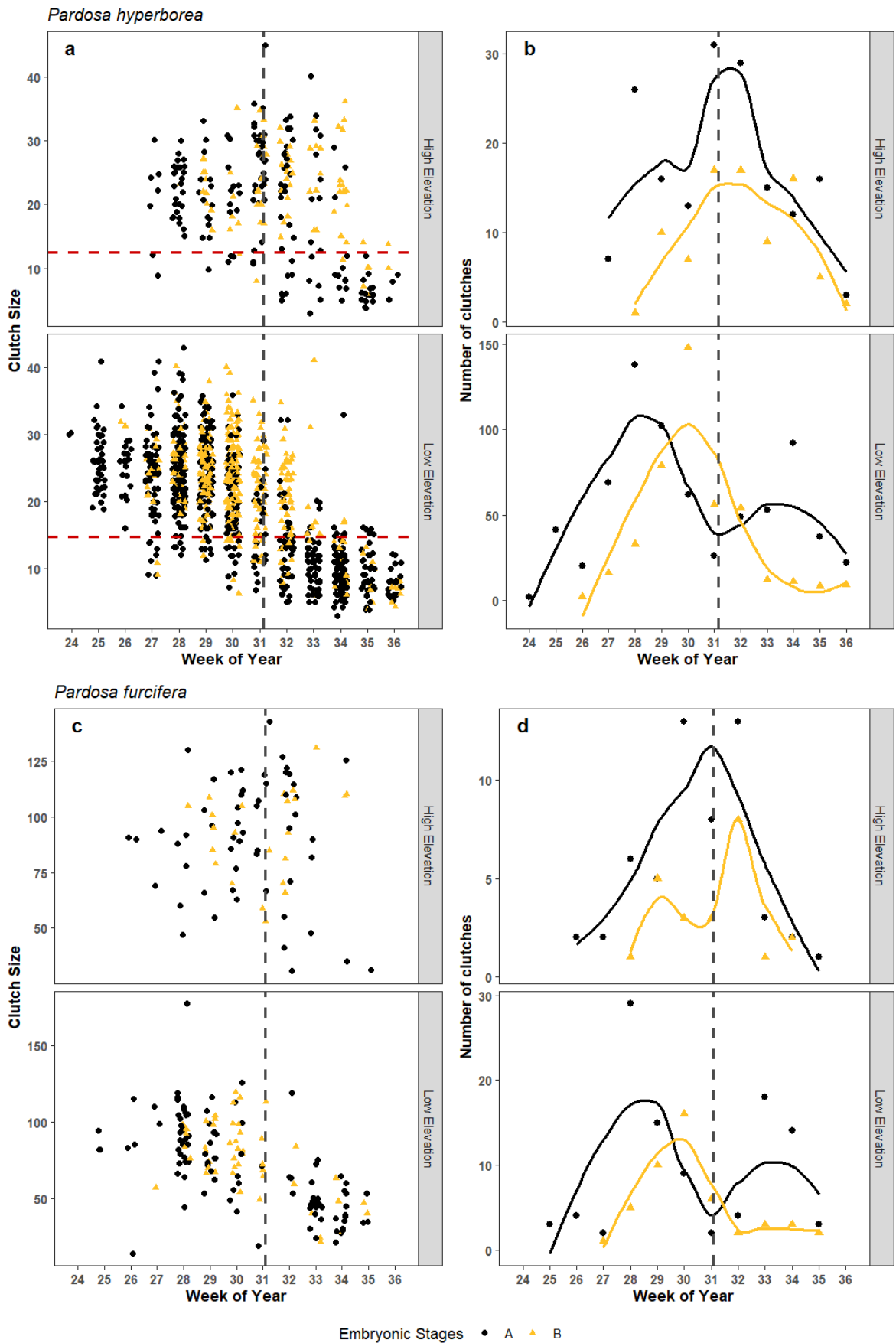


Fig.2 Clutch size distribution (**a, c**) and number of clutches (**b, d**) collected over weeks of year according to elevation and to the embryonic stage (black lines and dots for stage “A”; yellow lines and triangles for stage “B”) for the wolf spiders *P. hyperborea* and *P. furcifera*, from pitfall traps collected at Narsarsuaq (Greenland) during the period 2015–2017. The horizontal red hatched lines (**a, c**) represent thresholds defined by the frequency distribution method that would divide a first clutch peak above the lines from a second peak below the lines in *P. hyperborea*. The solid lines (**b, d**) represent locally weighted smoothing with default span parameters and identify for both species local minimums between weeks 31 and 32 at low elevation and for the embryonic stage A, implying two phases of clutch production over time as indicated by the grey vertical hatched lines.

40 As in Viel et al. (2022), two trends could be underlined from these panels for both species, especially
41 at low elevation. Firstly, the distribution across the season indicated a trend towards smaller clutches
42 near the end of the sampling period. Secondly, a relatively clear pattern appeared when looking at
43 embryonic stages for both species: (i) the plots showed a majority of early embryonic stage clutches
44 (i.e. stage A), followed by a period of late embryonic stage clutches (i.e. stage B), itself followed by a
45 second occurrence of early embryonic stage clutches.

46 Furthermore, to clarify what seemed to be two phases of clutch production without invoking a
47 separation based on the clutch size (Viel et al. 2022), we plotted the number of clutches collected over
48 time according to elevation and drew smoothing curves (*Fig. 2b,d*). For both species, the smoothing
49 curves of the early embryonic stage (i.e. stage A) supported the idea of two laying episodes, in
50 particular at low elevation. Thus, there would be a split between week 31 and 32. At high elevation
51 however, as well as for the late embryonic stage at both elevations, no intelligible pattern was
52 observed.

53 Therefore, although the context appears similar between elevations, in particular in *Fig. 2a,c* where
54 patterns at high elevation tend to mirror those at low elevation, we could not clearly identify specific
55 thresholds at high elevation or for embryonic stages B. In order to keep the splitting method simple,
56 reproducible and consistent, we choose to apply the low elevation thresholds at high elevation in both
57 species, for the embryonic stage A (*Fig. 3*). Thereby, we obtained two distinct clutch peaks at both
58 elevations: (i) a first laying episode between the weeks 24–31 and 25–31 for *P. hyperborea* and *P.*
59 *furcifera*, respectively. And (ii) a second laying episode between the weeks 32–36 and 32–35 for *P.*
60 *hyperborea* and *P. furcifera*, respectively.

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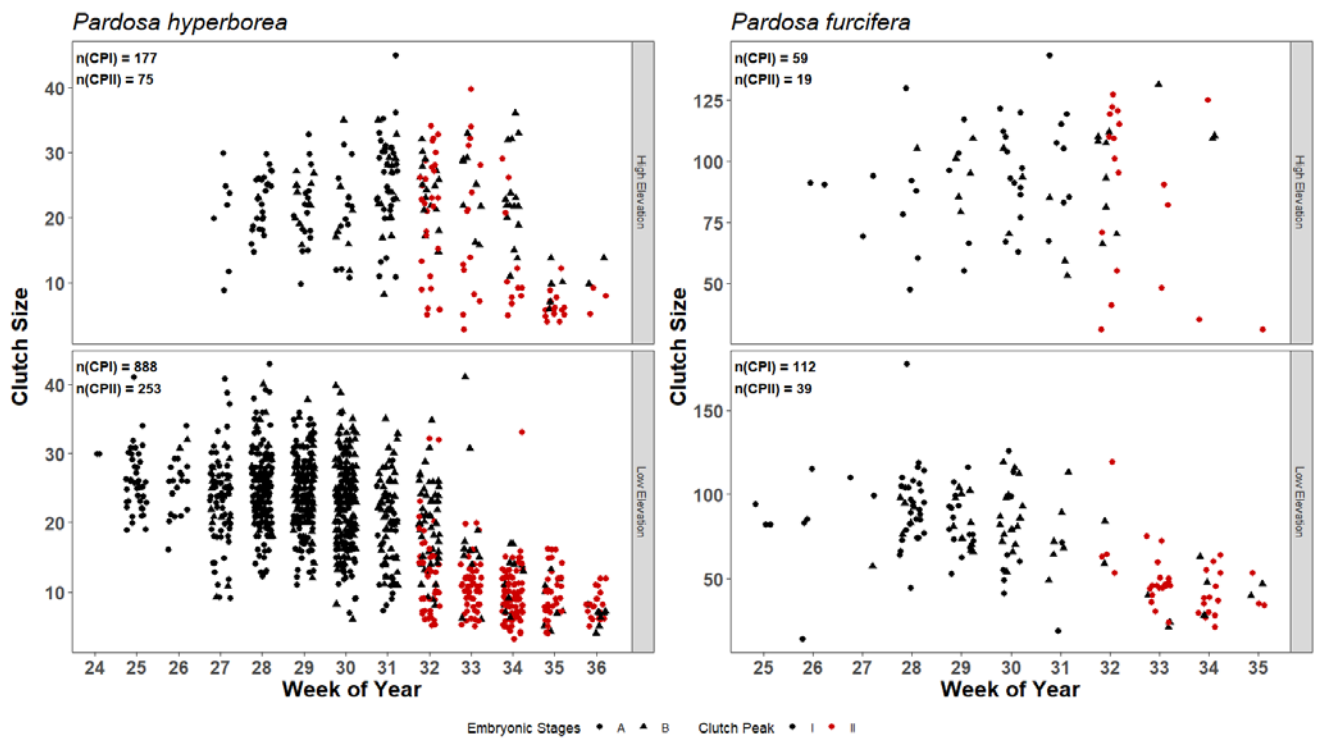


Fig.3 Clutch size distribution over weeks of year according to elevation, to the embryonic stage (dots for stage “A”; triangles for stage “B”), and to the defined clutch peak (black dots for first peak clutches; red dots for second peak clutches) for the wolf spiders *P. hyperborea* and *P. furcifera*, from pitfall traps collected at Narsarsuaq (Greenland) during the period 2015–2017. The number of clutches (n) according to clutch peak (CP) and elevation is indicated in each panel. Thresholds defined at low elevation have been applied to high elevation as a compromise between feasibility and accuracy.

62 References

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