

Figure S1 | Relationship between body size (determined as alitrunk length) and leg length in *Cataglyphis* ants. Data are represented as log-log plots for front (A), middle (B) and hind (C) legs for *Cataglyphis bombycina* (lilac, n=86), and *Cataglyphis fortis* (grey, n= 100, data kindly provided by Sommer and Wehner (2012)). Comparing absolute size values, *C. bombycina* was smaller in all size parameters measured. Independent of allometric relationships, leg length increased characteristically from the first to the second to the third leg pair (see Fig. 2), which is in accord with previous findings in a number of other desert ant species (Sommer and Wehner, 2012).

Species	y	a	b	R ²
<i>Cataglyphis bombycina</i>	Front leg	1.6943	1.0383	0.929
	Middle leg	2.1672	0.9694	0.928
	Hind leg	2.9465	0.9254	0.948
<i>Cataglyphis fortis</i>	Front leg	1.8694	1.0286	0.982
	Middle leg	2.2553	1.0115	0.979
	Hind leg	3.1557	0.9403	0.975

Table S1 | Leg allometry values. Values were calculated for the data shown in Figure S1 in the ant species *Cataglyphis bombycina* (n=86) and *Cataglyphis fortis* (n= 100). Parameter estimates are given for the allometric equation $y = a * x^b$, with y and x representing leg length and alitrunk length, respectively. Parameters a and b denote scaling factor and allometric exponent, respectively; R² coefficient of determination. To convert the power function into a linear equation we used log₁₀-transformations (i.e. $\log y = \log a + b \cdot \log x$, note also logarithmic scaling on ordinates and abscissae in Fig. S1 (Warton et al., 2006*)). Allometric coefficient '**b**' indicates the slope of the regression line in Fig. S1, capturing the size ratio of leg length and alitrunk lengths. Both *Cataglyphis* species have b-values near 1 (between 0.93 and 1.04), demonstrating isometric scaling between leg and alitrunk lengths within species. That means, smaller individuals have proportionally smaller legs. Parameter '**log a**', represents the intercept of the regression line in Fig. S1. Differences in the intercept between *C. bombycina* and *C. fortis* indicate differences in the proportion between leg and alitrunk lengths. Hence, even in equally sized individuals, leg length would still be smaller in *C. bombycina* than in *C. fortis*.

* Warton, D. I., Wright, I. J., Falster, D. S., and Westoby, M. (2006). Bivariate line-fitting methods for allometry. *Biological Reviews* **81**, 259-291.

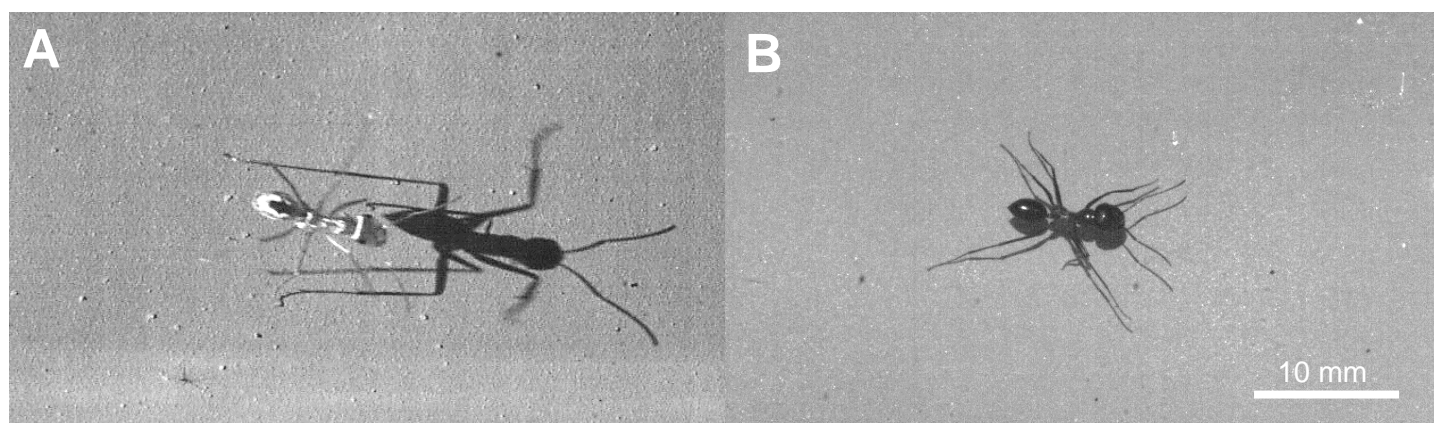


Figure S2 | Sample images from highspeed videos. (A) *C. bombycina* (supplementary video V1, recorded with 500 Hz) and (B) *C. fortis* (supplementary video V2, recorded with 1000 Hz) during locomotion. Scale bar equal for (A) and (B); videos are also available on research gate website ((A) DOI: 10.13140/RG.2.2.21093.45282 (B) DOI: 10.13140/RG.2.2.12704.84488)

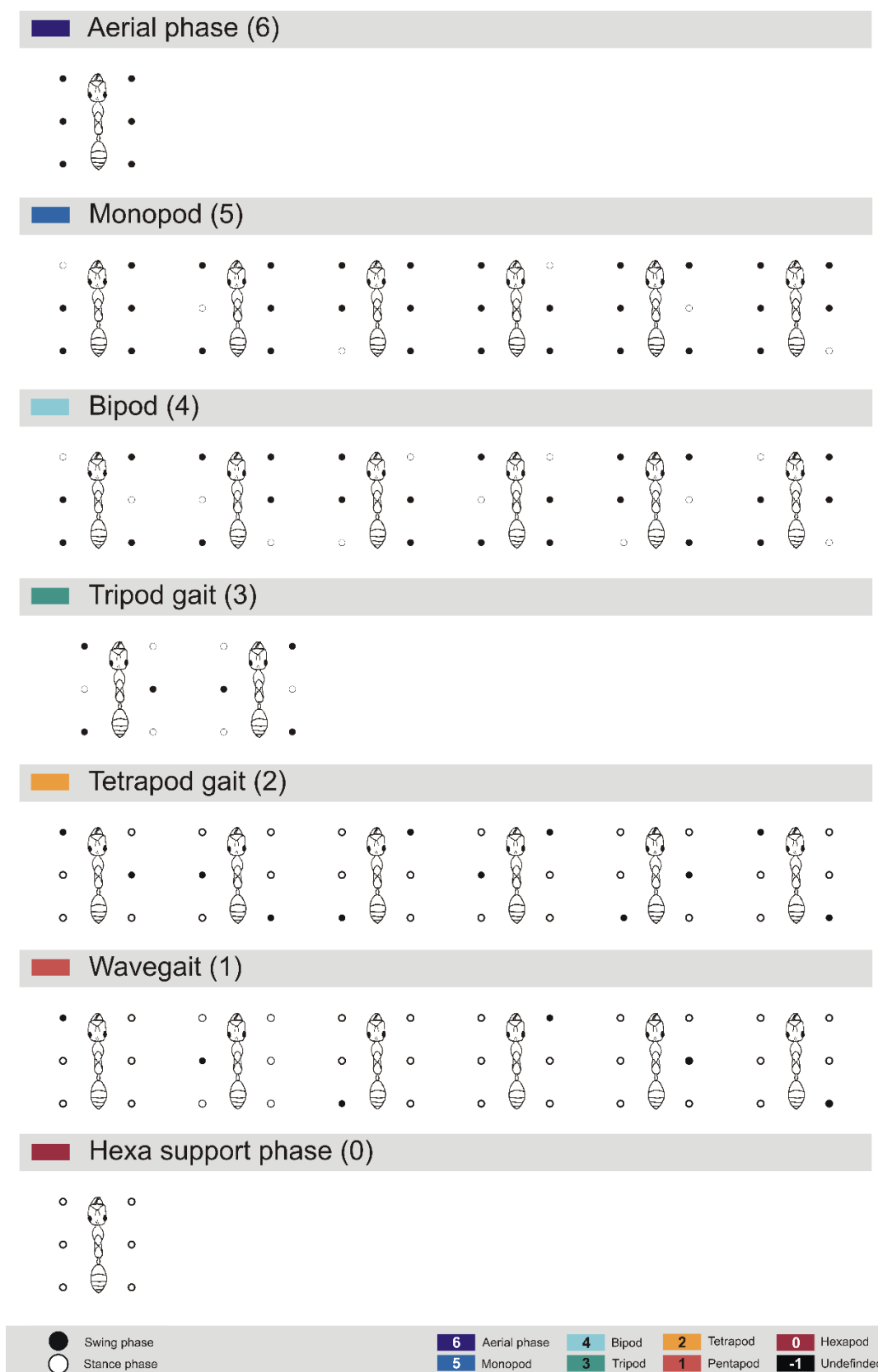


Figure S3 | Gait Patterns. According to the combination of legs in stance and swing phase (white and black dots, respectively), a video frame was assigned a certain leg coordination pattern (marked by colour or number). If none of the combinations depicted above was applicable, the frame was assigned category 'undefined' (black, -1). Note that these walking patterns are not defined by the mere number of legs in swing or stance phase, but are defined by a certain combination of specific legs in swing or in stance phase.

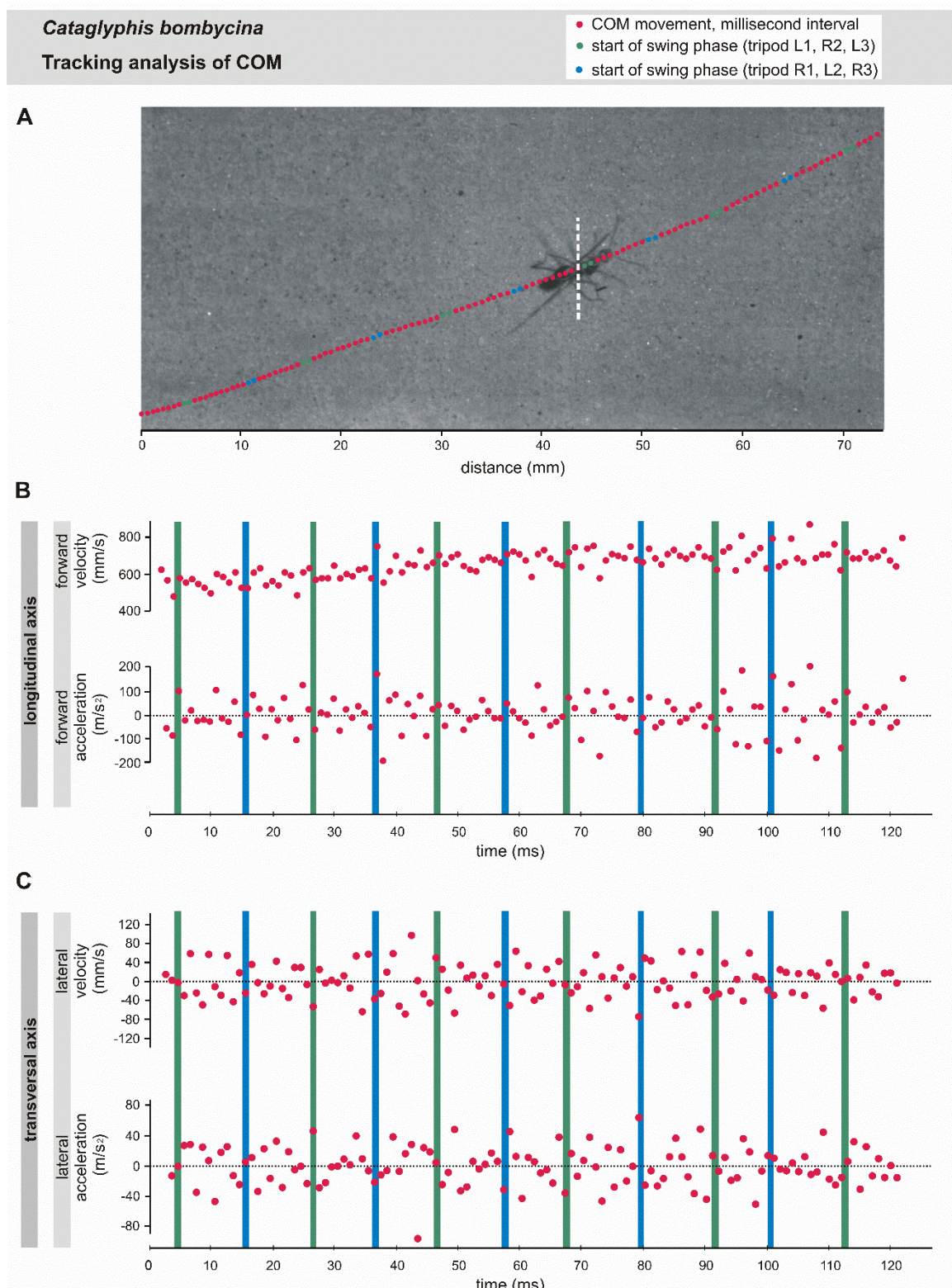


Figure S4 | Tracking of movement of the centre of mass (COM) in the horizontal plane during fast walking (653 mm/s) in *C. bombycina*. (A) The petiole was taken as proxy for the COM (Reinhardt and Blickhan, 2014) and tracked frame by frame for a given video recording. The top view provided in our video recordings allowed analysis of movement only in the horizontal plane. Each data point represents the petiole position in a 1 ms video frame (white dashed line marks petiole position in the depicted video frame); green data points indicate start of swing phase in one tripod (L1, R2, L3), blue data points start of swing in the other tripod (R1, L2, R3). (B) Forward velocity

and acceleration (along the longitudinal axis), (C) lateral velocity and acceleration of petiole movement (i.e. in the transversal axis), calculated from the sample recording in (A).

Walking dynamics and stability during insect locomotion can be described by sagittal and horizontal spring-mass-models, where rhythmic oscillations of COM are considered (Blickan and Full 1993, Schmitt et al. 2002^{**}, Weihmann 2013^{***}). We thus analysed speed and acceleration of fast-moving desert ants to assess the applicability of this model to the desert ant locomotion, with regard to horizontal movements. However, note that there is no apparent variation in speed or acceleration in the rhythm of the step cycle, neither for longitudinal nor for transversal movement of COM. Here, COM movement is dominated by straight translational movement in the posterior-anterior direction (average forward displacements during 1 ms interval is 0.65 mm in *C. bombycina*). Transversal fluctuations of the COM are minimal and appear to be dominated by measurement noise (lateral distance of COM to straight regression line on average 0.015 mm in *C. bombycina*).

^{**} **Schmitt, J., Garcia, M., Razo, R. C., Holmes, P., and Full, R. J.** (2002). Dynamics and stability of legged locomotion in the horizontal plane: a test case using insects. *Biological cybernetics* **86**, 343-353.

^{***} **Weihmann, T.** (2013). Crawling at high speeds: steady level locomotion in the spider *Cupiennius salei* — global kinematics and implications for centre of mass dynamics. *PLoS One*, **8**, e65788.

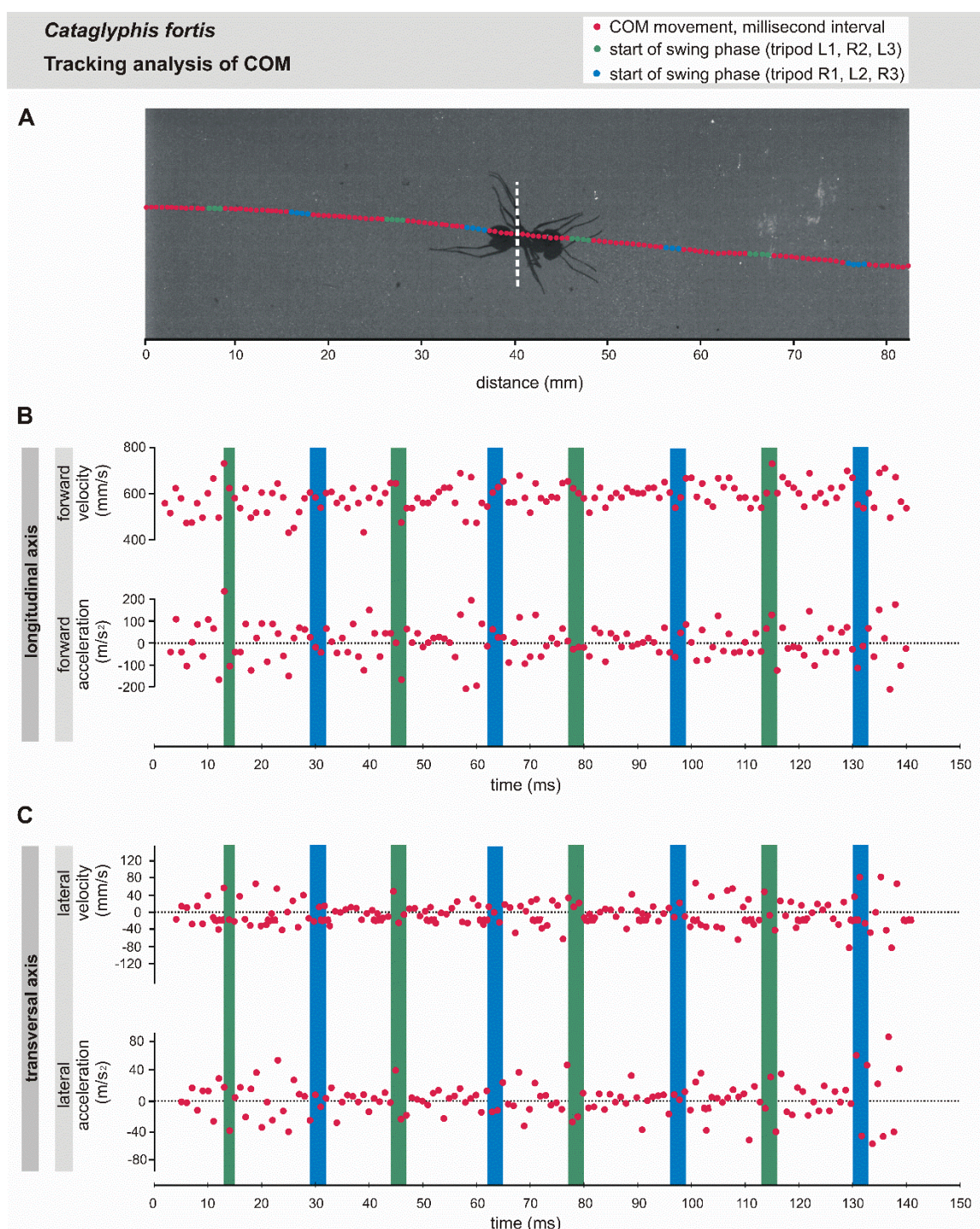


Figure S5 | Tracking of movement of the centre of mass (COM) in the horizontal plane during fast walking (591 mm/s) in *C. fortis*. Presentation of data as in Fig. S4, (A) to (C). Average forward displacements during 1 ms interval in *C. fortis* is 0.58 mm, lateral distance of COM to straight regression line on average is 0.016 mm (compare figure legend of Fig. S4).