

Supplementary information from H. Merienne et al., “Walking kinematics in the polymorphic seed harvester ant *Messor barbarus*: influence of body size and load carriage”

I - Supplementary Tables

Table S1: Relationship between morphologic characters (length and mass of the three main body parts and legs) and body mass in *Messor barbarus* workers.

Each line gives the results of a power law model describing the influence of ant mass M (in mg) on each morphologic variables studied Y , expressed by the equation $Y = a * M^b$. The first column corresponds to the model prediction and 95% confidence interval for the mean value of ant mass (11.8 mg). The second column gives the value of the coefficient a and its 95% confidence interval, the third column the value of the coefficient b for ant mass and its 95% confidence interval, and the fourth column the adjusted R^2 for the model. * indicates that 0.33, i.e. the value that would be expected in absence of allometry between body part length and ant mass, is not included in the 95% confidence interval of the coefficient b for ant mass and † that 1, i.e. the value that would be expected in absence of allometry between body part mass and whole body mass, is not included in the 95% confidence interval. $N = 45$ ants for data on body part mass and length. $N = 65$ ants for leg length, data from Felden et al., (2014).

Variable	Model prediction for mean(ant mass) [CI]	Coefficient a [CI]	Coefficient b for ant mass [CI]	Adj R^2
Head length (mm)	2.11 [2.07;2.16]	0.845 [0.801;0.892]	0.369 [0.346; 0.392] *	0.96
Thorax length (mm)	3.28 [3.23;3.32]	1.664 [1.601;1.730]	0.272 [0.256; 0.289] *	0.96
Gaster length (mm)	2.27 [2.23;2.32]	1.047 [0.992;1.104]	0.312 [0.289; 0.335]	0.94
Body length (mm)	7.66 [7.60;7.72]	3.542 [3.469;3.618]	0.310 [0.301; 0.319] *	0.99
Head mass (mg)	4.57 [4.48;4.65]	0.224 [0.213;0.236]	1.213 [1.191; 1.235] †	0.99
Thorax mass (mg)	3.04 [2.96;3.12]	0.306 [0.286;0.328]	0.923 [0.893; 0.952] †	0.99
Gaster mass (mg)	3.49 [3.37;3.61]	0.391 [0.356;0.430]	0.880 [0.840; 0.920] †	0.98
Front leg length (mm)	3.97 [3.91;4.03]	1.889 [1.827;1.954]	0.310 [0.295; 0.325] *	0.96
Mid leg length (mm)	4.28 [4.23;4.34]	2.061 [2.001;2.122]	0.305 [0.292; 0.319] *	0.97
Hind leg length (mm)	5.67 [5.58;5.75]	2.878 [2.781;2.979]	0.283 [0.267; 0.298] *	0.95

II - Supplementary Figures

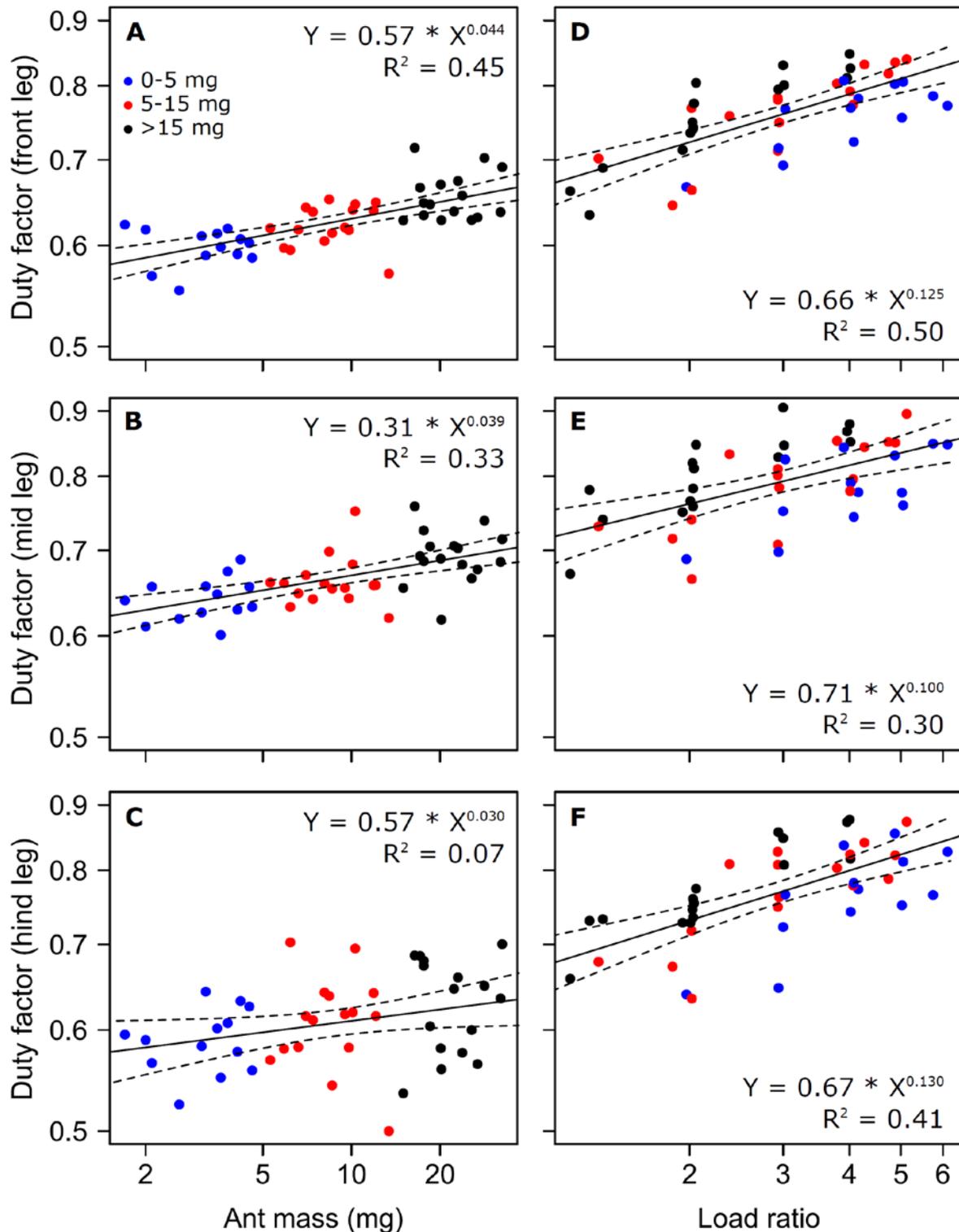


Figure S1: A-C: Duty factor as a function of ant mass for unloaded (A-C) and as a function of load ratio for loaded ants (D-F) for the front (A and D), mid (B and E) and hind (C and F) legs. The straight lines give the predictions of a power law model and the dotted lines the 95% confidence interval of the slope of the regression line. In the loaded condition (D-F), the model does not consider the influence of ant mass on duty factor as it is negligible (see Table 2). The points represent tested ants. $N = 45$ ants.

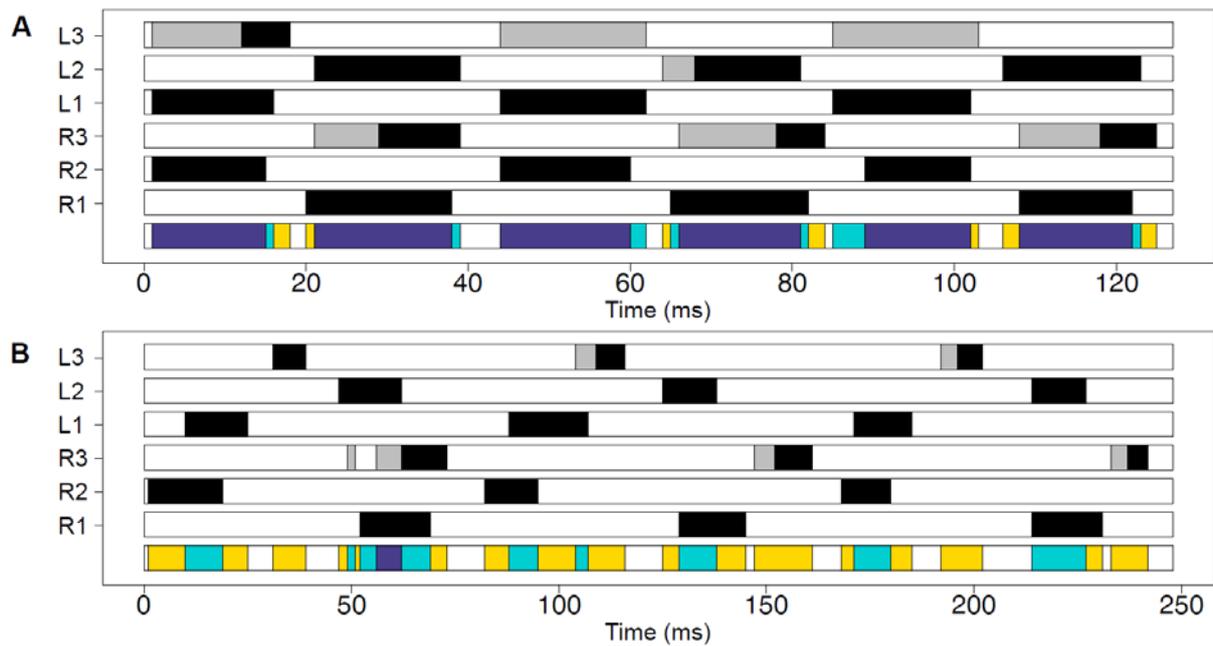


Figure S2: Example of inter-leg coordination for one ant (ant mass = 3.1 mg) during unloaded (A) and loaded (B) locomotion (Load Ratio = 4.9). R1, R2, R3: right front leg, mid leg and hind leg; L1, L2, L3: left front leg, mid leg and hind leg. Black bars represent swing phases, white bars represent stance phases while grey bars represent dragging. The bottom line represents the number of legs in contact with the ground (including dragged legs): six (white), five (yellow), four (light blue) or three (purple).

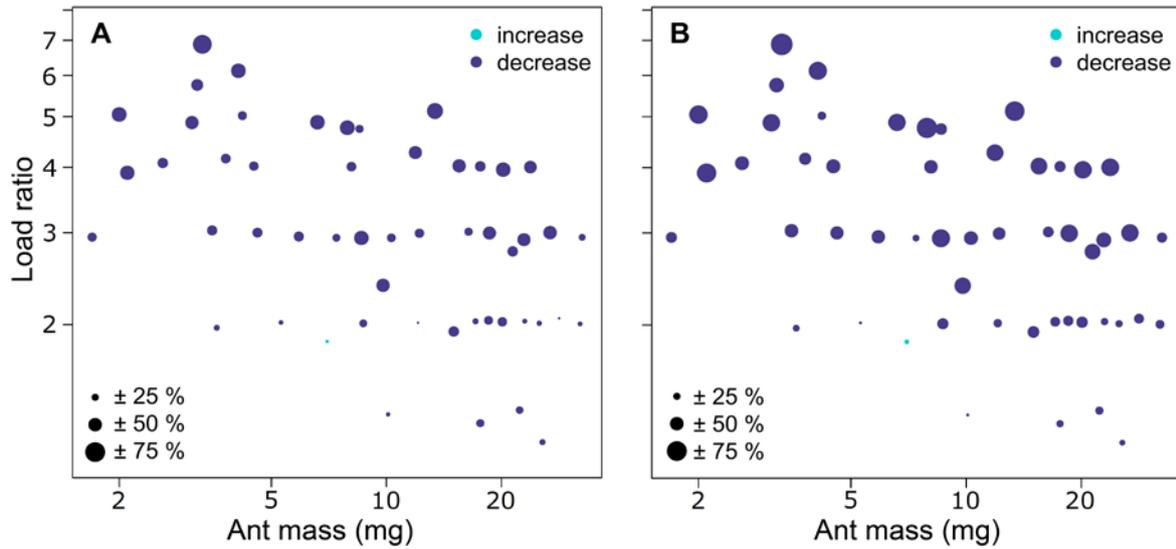


Figure S3: Relative change between unloaded and loaded conditions in stride frequency (A) and in speed (B) as a function of ant mass and load ratio. The size of the points is proportional to the relative change (positive: increase or negative: decrease) in (A) stride frequency and (B) speed between unloaded and loaded conditions. $N=55$ ants

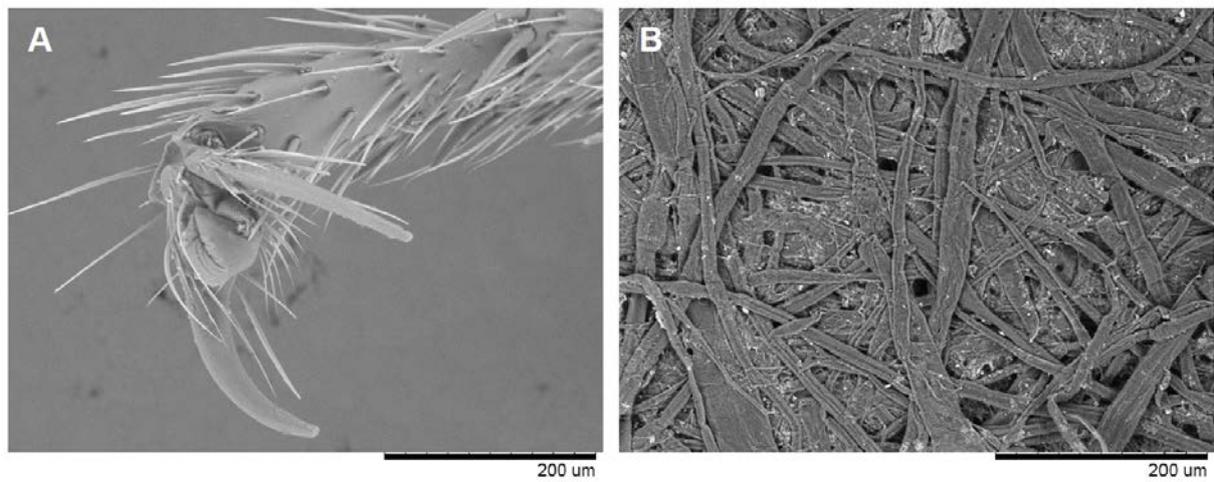


Figure S4: Scanning electron microscope photograph (Hitachi TM-1000 Tabletop Microscope). **A:** Image of a *Messor barbarus* hind leg tarsus showing the claws and the adhesive pad (arolium) between the claws. Dry specimen was put without treatment in the microscope chamber; **B:** Image of the paper substrate on which the ants performed locomotion.

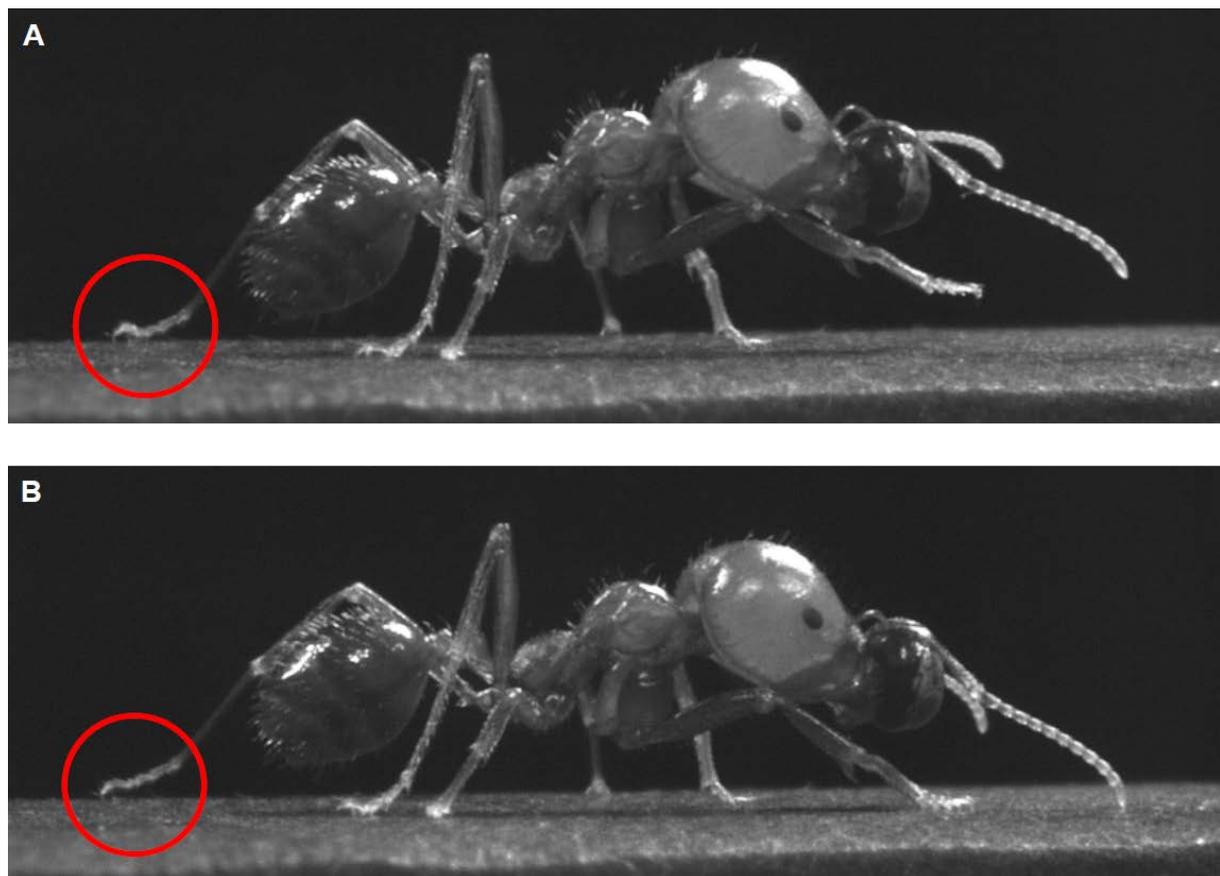
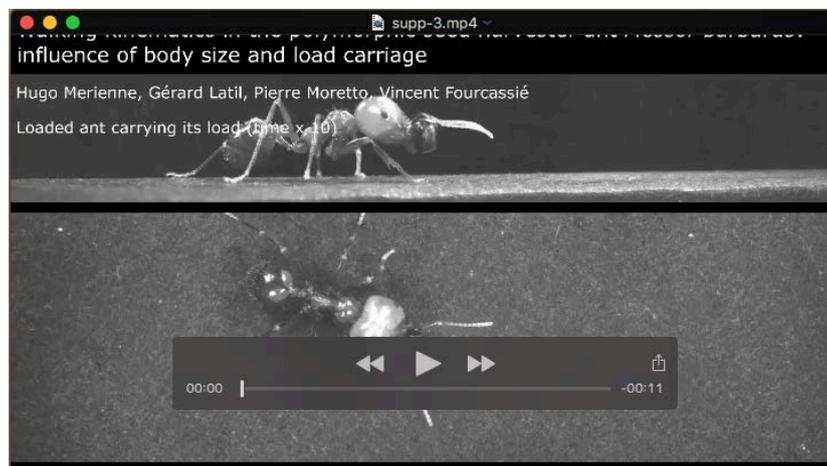


Figure S5: Left hind leg position during stance phase. A: first part of the stance phase, the tarsi is on “heels”; **B:** second part of the stance phase, the tarsi is on “toes”.

III - Movies



Movie 1: Unladen ant walking. Ant mass = 32.1 mg.



Movie 2: Loaded ant carrying its load. Ant mass = 32.1 mg. Load mass = 32.3 mg.



Movie 3: Loaded ant pushing its load. Ant mass = 15.1 mg. Load mass = 78.7 mg.