

Supplementary Information

Table S1. Surface free energy, its dispersive and polar components ($n = 3$) as well as contact angles of 1- μl large droplets of three fluids ($n = 9$ per fluid) obtained on elytra of three female beetles *Chrysolina americana* and on three glass slides, which were used as test substrates in the pull-off experiments (mean \pm sd)

	elytra	glass
FSE [mN m^{-1}]	18.5 ± 1.8	55.7 ± 0.5
dispersive component [mN m^{-1}]	14.8 ± 1.5	18.8 ± 1.6
polar component [mN m^{-1}]	3.7 ± 2.8	36.9 ± 2.0
static contact angle		
Aqua Millipore water [$^{\circ}$]	95.8 ± 10.0	32.1 ± 2.4
diiodomethane [$^{\circ}$]	86.9 ± 4.1	44.2 ± 4.8
ethylene glycol [$^{\circ}$]	75.7 ± 3.4	30.2 ± 6.6

See Bräuer et al. 2017 *APIS* **11**, 171–192 (doi:10.1007/s11829-016-9478-0) for the detailed measurement procedure.

Table S2. Number of tarsal adhesive setae having different terminal shape, exemplarily for a male and a female leaf beetle *Chrysolina americana* ($n = 1$ foreleg)

	discoid	tapered/lanceolate	spatulae	total
male				1236
tarsomere 1	206	208		
tarsomere 2		174		
tarsomere 3	98	36	514	
female				1787
tarsomere 1		632		
tarsomere 2		177		
tarsomere 3		12	966	

Table S3. Leg length in male and female leaf beetles *Chrysolina americana*

length [μm]	male	female
fore leg total	6179.4 \pm 351.0	5799.2 \pm 325.0
fore leg trochanter	738.9 \pm 195.6	805.6 \pm 66.0
fore leg femur	1850.6 \pm 203.0	1751.3 \pm 115.8
fore leg tibia	1749.8 \pm 102.0	1602.8 \pm 112.8
fore leg tarsus	1840.1 \pm 119.8	1639.5 \pm 121.8
tarsomere 1	465.3 \pm 70.0	397.9 \pm 46.3
tarsomere 2	316.4 \pm 41.8	285.9 \pm 34.2
tarsomere 3	323.6 \pm 52.0	309.2 \pm 23.9
tarsomere 5	734.8 \pm 65.8	646.5 \pm 89.8
mid leg total	5286.8 \pm 191.2	6232.3 \pm 249.2
mid leg trochanter	646.1 \pm 96.2	847.2 \pm 125.9
mid leg femur	1589.7 \pm 109.3	1861.7 \pm 119.7
mid leg tibia	1447.1 \pm 87.1	1707.2 \pm 86.9
mid leg tarsus	1604.0 \pm 103.7	1816.2 \pm 148.2
tarsomere 1	401.6 \pm 52.7	484.5 \pm 52.9
tarsomere 2	305.0 \pm 36.5	324.8 \pm 24.7
tarsomere 3	290.5 \pm 43.1	308.9 \pm 37.0
tarsomere 5	606.8 \pm 65.6	698.1 \pm 105.2
hind leg total	6081.1 \pm 286.7	7022.7 \pm 369.5
hind leg trochanter	941.1 \pm 51.9	1206.2 \pm 280.6
hind leg femur	1734.4 \pm 129.7	2023.8 \pm 135.3
hind leg tibia	1737.8 \pm 95.2	1934.5 \pm 168.8
hind leg tarsus	1667.7 \pm 149.3	1858.3 \pm 146.4
tarsomere 1	442.2 \pm 44.5	468.2 \pm 39.7
tarsomere 2	276.6 \pm 29.6	313.4 \pm 47.5
tarsomere 3	300.0 \pm 31.7	355.2 \pm 48.8
tarsomere 5	648.9 \pm 100.1	721.4 \pm 86.5

mean \pm sd, N_{♂♂} = 3 pooled together, N_{♀♀} = 3 pooled together, n = 10 per parameter

Table S4. Dimensions of claws of leaf beetles *Chrysolina americana*. Fore, mid, and hind leg, as well as N = 3 ♂♂ and 3 ♀♀ pooled together

	mean	sd	n
claw tip diameter [μm]	10.3	2.3	10
claw curvature diameter [μm]	121.6	35.2	5
claw length [μm]	226.8	8.2	5

sd, standard deviation; n = sample size

Table S5. Dimensions of tarsal adhesive setae having different terminal shape in male and female leaf beetles *Chrysolina americana*. Fore, mid, and hind leg, as well as N = 5 ♂♂ and 5 ♀♀ pooled together; except for discoid: N = 5 ♂♂

	mean	sd	n
spatulate seta's terminal width [μm]	8.7	0.5	20
spatulate seta's length [μm]	90.0	9.8	20
angle of spatulate seta on tarsomer 3	33.7	8.4	10
lanceolate seta's terminal width [μm]	3.3	0.3	20
lanceolate seta's length [μm]	98.0	8.8	20
discoid seta's terminal width [μm]	8.9	0.6	20
discoid seta's length [μm]	90.0	9.8	20
shaft base width of all seta types [μm]	3.8	0.7	20
shaft width of the tapered part close to the terminal [μm]	1.6	0.6	5
spatules' length [μm]	1.7	0.2	20

sd, standard deviation; n = sample size

Table S6. Pull-off forces [mN] measured in five males (n = 15 per individual) and five females (n = 5 per individual) on female elytra and a glass plate, mean \pm sd

♂♂	female elytra	glass plate	♀♀	female elytra	glass plate
1	30.1 \pm 10.0	9.3 \pm 4.3	1	16.7 \pm 5.0	0.7 \pm 0.3
2	25.0 \pm 10.8	6.5 \pm 2.8	2	15.7 \pm 5.3	1.0 \pm 0.3
3	33.6 \pm 5.0	5.4 \pm 1.6	3	21.1 \pm 6.0	0.8 \pm 0.3
4	14.9 \pm 12.5	8.6 \pm 1.6	4	22.3 \pm 2.7	2.3 \pm 0.5
5	31.2 \pm 6.1	7.5 \pm 2.4	5	13.8 \pm 6.5	1.0 \pm 0.4

Table S7. Safety factors measured in five males (n = 15 per individual) and five females (n = 5 per individual) on female elytra and a glass plate, mean ± sd

♂♂	female elytra	glass plate	♀♀	female elytra	glass plate
1	44.4 ± 14.6	12.1 ± 5.6	1	22.3 ± 6.7	0.9 ± 0.3
2	37.4 ± 16.2	9.7 ± 4.2	2	20.3 ± 6.7	1.3 ± 0.4
3	65.8 ± 9.8	10.6 ± 3.1	3	28.9 ± 8.2	1.1 ± 0.5
4	24.8 ± 20.8	14.3 ± 2.7	4	29.4 ± 3.5	3.0 ± 0.6
5	52.9 ± 10.3	12.7 ± 4.1	5	18.1 ± 8.5	0.5 ± 0.5

Table S8. Pull-off forces [mN] and safety factors pooled for five males (n = 15 per individual) and five females (n = 5 per individual) on female elytra and a glass plate, mean ± sd

substrate	male		female	
	pull-off force	safety factor	pull-off force	safety factor
elytra	27.0 ± 11.3	45.0 ± 20.1	22.4 ± 9.1	29.7 ± 12.2
glass	7.5 ± 3.0	11.9 ± 4.3	1.1 ± 0.7	1.5 ± 0.9

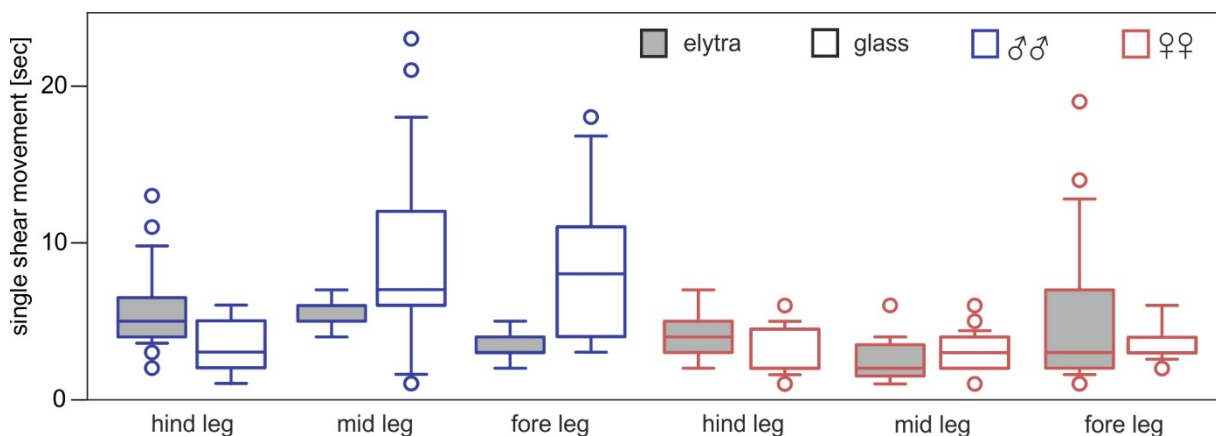


Figure S9. Box plots, representing the duration of shear movements in single legs of males and females (n = 25 counts per leg, surface and sex; 5 individuals per sex pooled together). The ends of the boxes define the 25th and 75th percentiles, with a line at the median and error bars defining the 10th and 90th percentiles; circles are outliers

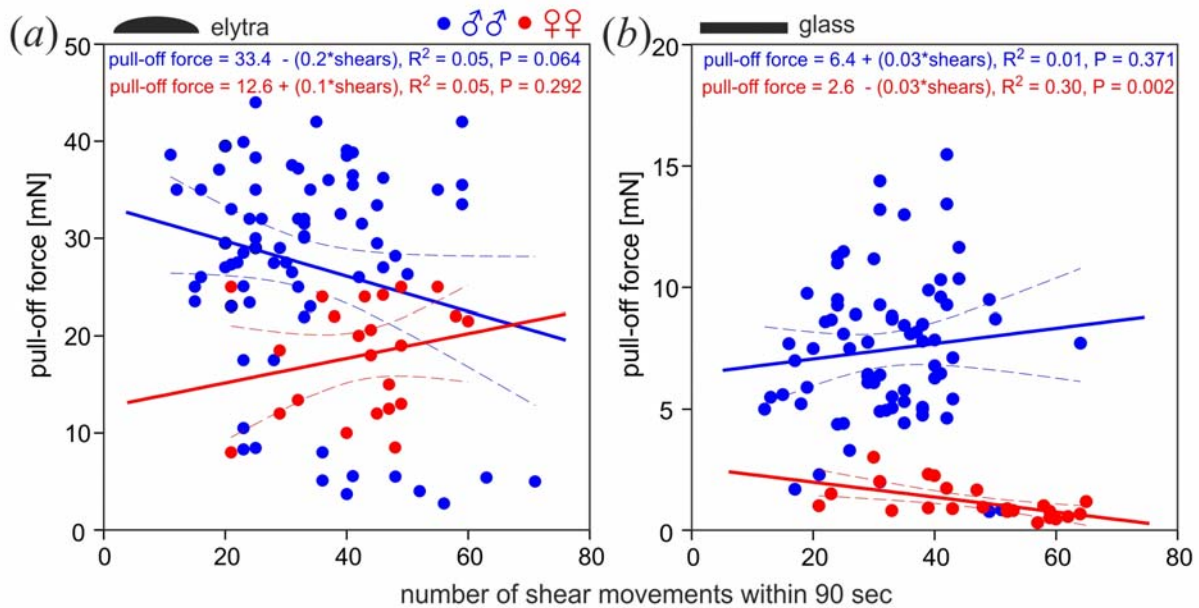


Figure S10. Pull-off force vs number of shear movements within 90 sec on elytra (a) and glass (b) ($N_{\text{♂♂}} = 5$, $n_{\text{♂♂}} = 15$, $N_{\text{♀♀}} = 5$, $n_{\text{♀♀}} = 5$). The line indicates linear regressions; dashed lines specify the confidence bands at 95% default confidence level; dots are data points, blue: male, red: female

Movie S11. A male set in contact with female elytra, shearing its legs for about 90 s before pull-off test. It can be clearly seen that mid legs are pulled/sheared rather perpendicularly to the body axis, while hind legs pull and push in almost any direction. The chain of hind tarsomeres is curved at times.

Movie S12. A male set in contact with female elytra, shearing its legs for about 90 s before pull-off test. The movements of the right hind leg are shown in detail.

Movie S13. A male set in contact with female elytra, not shearing its legs for about 90 s before pull-off test.

Movie S14. A female set in contact with flat glass, shearing its legs for about 90 s before pull-off test. The movements of the self-aligning sample holder becomes apparent.

Movie S15. A female set in contact with female elytra, distinctly shearing its legs for about 90 s before pull-off test.