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Title: Jumping without slipping: leafhoppers (Hemiptera: Cicadellidae) possess special tarsal structures for jumping from smooth surfaces

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Table 1: Results of single leg force measurements at different sliding velocities for *Aphrodes bicinctus/makarovi* leafhoppers and *Philaenus spumarius* froghoppers (slides with a normal force of 5 mN; values are mean \pm s.e.m. (N))

		Sliding velocity [mm/s]	0.1	0.2	0.5	0.7	1.0	2.0	3.0	5.0
<i>Aphrodes bicinctus/makarovi</i>	Pushing direction	Friction [mN]	0.64 \pm 0.05(4)	0.71 \pm 0.07(4)	0.90 \pm 0.02(4)	1.04 \pm 0.03(4)	1.39 \pm 0.13(4)	2.47 \pm 0.17(4)	3.35 \pm 0.27(4)	5.01 \pm 0.48(4)
		Contact area [μm^2]	1591.3 \pm 279.2(4)	1669.9 \pm 234.6(4)	2032.8 \pm 284.6(4)	2406.5 \pm 311.7(4)	2868.4 \pm 481.7(4)	3799.3 \pm 533.6(4)	4448.6 \pm 678.9(4)	4595.8 \pm 595.5(4)
		Shear stress [kPa]	456.9 \pm 120.6(4)	474.5 \pm 115.6(4)	475.6 \pm 85.4(4)	447.5 \pm 45.0(4)	533.0 \pm 87.1(4)	672.6 \pm 61.8(4)	785.7 \pm 76.5(4)	1110.5 \pm 72.1(4)
		Friction coefficient μ	0.13	0.14	0.18	0.21	0.28	0.49	0.67	1.00
		Minimal take-off angle α [deg]	82.7	81.9	79.8	78.3	74.5	63.7	56.2	44.9
Pulling direction	Friction [mN]	0.62 \pm 0.06(4)	0.59 \pm 0.09(4)	0.70 \pm 0.09(4)	0.70 \pm 0.12(4)	0.83 \pm 0.06(4)	1.06 \pm 0.07(4)	1.22 \pm 0.15(4)	1.44 \pm 0.22(4)	
	Contact area [μm^2]	1187.8 \pm 183.7(4)	1221.4 \pm 179.6(4)	1194.5 \pm 180.2(4)	1187.5 \pm 251.1(4)	1175.1 \pm 153.7(4)	1051.8 \pm 208.2(4)	1150.1 \pm 223.5(4)	905.2 \pm 168.3(4)	
	Shear stress [kPa]	606.4 \pm 187.8(4)	544.3 \pm 164.8(4)	661.9 \pm 186.7(4)	705.1 \pm 209.2(4)	837.5 \pm 161.0(4)	1105.3 \pm 201.3(4)	1152.7 \pm 236.3(4)	1725.0 \pm 276.6(4)	
<i>Philaenus spumarius</i>	Pushing direction	Friction [mN]	0.67 \pm 0.09(5)	0.67 \pm 0.09(5)	0.74 \pm 0.07(5)	0.80 \pm 0.09(5)	0.87 \pm 0.07(5)	1.01 \pm 0.09(5)	1.15 \pm 0.13(5)	1.28 \pm 0.21(5)
		Contact area [μm^2]	2720.4 \pm 568.0(5)	2166.1 \pm 473.9(5)	2428.5 \pm 530.8(5)	2377.6 \pm 649.5(5)	2474.5 \pm 438.3(5)	2394.0 \pm 402.7(4)	1842.1 \pm 419.1(5)	2218.2 \pm 566.9(4)
		Shear stress [kPa]	322.0 \pm 99.7(5)	365.9 \pm 85.7(5)	367.4 \pm 90.5(5)	495.0 \pm 198.1(5)	455.2 \pm 103.7(5)	446.4 \pm 63.4(4)	749.8 \pm 175.9(5)	619.0 \pm 158.9(4)
		Friction coefficient μ	0.13	0.13	0.15	0.16	0.17	0.20	0.23	0.26
		Minimal take-off angle α [deg]	82.4	82.4	81.6	80.9	80.1	78.6	77.0	75.6
Pulling direction	Friction [mN]	0.64 \pm 0.06(5)	0.65 \pm 0.07(5)	0.72 \pm 0.10(5)	0.77 \pm 0.09(5)	0.79 \pm 0.09(5)	0.91 \pm 0.12(5)	0.97 \pm 0.15(5)	1.14 \pm 0.19(5)	
	Contact area [μm^2]	2200.3 \pm 464.4(5)	2094.1 \pm 474.0(5)	1854.3 \pm 420.9(5)	1715.8 \pm 362.0(5)	1953.0 \pm 327.7(5)	1184.3 \pm 169.6(5)	1138.2 \pm 251.5(4)	954.7 \pm 170.3(5)	
	Shear stress [kPa]	357.9 \pm 89.6(5)	354.1 \pm 56.2(5)	442.6 \pm 61.8(5)	511.3 \pm 84.7(5)	512.0 \pm 63.7(5)	784.5 \pm 53.9(5)	966.2 \pm 85.9(4)	1241.8 \pm 168.7(5)	

Table 2: Results of single leg force measurements at different sliding velocities for *Aphrodes bicinctus/makarovi* leafhoppers and *Philaenus spumarius* froghoppers (slides with a normal force of 3 mN; values are mean \pm s.e.m. (N))

		Sliding velocity [mm/s]	1.0	3.0	5.0
<i>Aphrodes bicinctus/makarovi</i>	Pushing direction	Friction [mN]	1.03 \pm 0.17(4)	2.83 \pm 0.44(4)	4.15 \pm 0.44(4)
		Contact area [μm^2]	2492.8 \pm 518.0(4)	3750.0 \pm 611.4(4)	4040.3 \pm 495.0(4)
		Shear stress [kPa]	441.9 \pm 57.5(4)	764.7 \pm 33.3(4)	1037.6 \pm 35.5(4)
		Friction coefficient μ	0.34	0.94	1.39
		Minimal take-off angle α [deg]	71.2	47.6	36.4
	Pulling direction	Friction [mN]	0.61 \pm 0.07(4)	0.84 \pm 0.13(4)	1.12 \pm 0.23(4)
		Contact area [μm^2]	764.4 \pm 51.1(4)	1110.1 \pm 399.0(4)	788.4 \pm 116.1(4)
		Shear stress [kPa]	799.0 \pm 58.4(4)	923.5 \pm 190.3(4)	1385.7 \pm 153.3(4)
<i>Philaenus spumarius</i>	Pushing direction	Friction [mN]	0.70 \pm 0.10(5)	0.91 \pm 0.15(5)	1.03 \pm 0.20(5)
		Contact area [μm^2]	2604.4 \pm 557(4)	2276.6 \pm 681.5(4)	1972.6 \pm 691.9(4)
		Shear stress [kPa]	352.6 \pm 76.2(4)	552.8 \pm 116.9(4)	1303.5 \pm 779.6(4)
		Friction coefficient μ	0.23	0.30	0.34
		Minimal take-off angle α [deg]	76.9	73.3	71.3
	Pulling direction	Friction [mN]	0.62 \pm 0.08(5)	0.77 \pm 0.13(5)	0.86 \pm 0.13(5)
		Contact area [μm^2]	1869.3 \pm 511.2(4)	1082.0 \pm 358.4(4)	1002.5 \pm 247.2(4)
		Shear stress [kPa]	428.9 \pm 96.0(4)	884.5 \pm 116.2(4)	1130.1 \pm 240.0(4)

Table 3: Results of single leg force measurements at different sliding velocities for *Aphrodes bicinctus/makarovi* leafhoppers and *Philaenus spumarius* froghoppers (slides with a normal force of 1 mN; values are mean \pm s.e.m. (N))

		Sliding velocity [mm/s]	1.0	3.0	5.0
<i>Aphrodes bicinctus/makarovi</i>	Pushing direction	Friction [mN]	0.81 \pm 0.13(3)	2.08 \pm 0.24(3)	2.87 \pm 0.46(3)
		Contact area [μm^2]	2419.3 \pm 463.9(3)	3082.9 \pm 278.5(3)	2992.0 \pm 456.7(3)
		Shear stress [kPa]	340.2 \pm 23.2(3)	672.8 \pm 18.3(3)	957.3 \pm 44.6(3)
		Friction coefficient μ	0.81	2.08	2.86
		Minimal take-off angle α [deg]	51.6	26.1	20.0
	Pulling direction	Friction [mN]	0.36 \pm 0.06(3)	0.63 \pm 0.12(3)	0.75 \pm 0.13(3)
		Contact area [μm^2]	903.9 \pm 97.1(3)	866.7 \pm 184.0(3)	762.2 \pm 271.7(3)
		Shear stress [kPa]	837.5 \pm 161.0(3)	1105.3 \pm 201.3(3)	1152.7 \pm 236.3(3)
<i>Philaenus spumarius</i>	Pushing direction	Friction [mN]	0.40 \pm 0.08(5)	0.62 \pm 0.15(5)	0.71 \pm 0.16(5)
		Contact area [μm^2]	2076.3 \pm 709.5(4)	1863.2 \pm 540.1(4)	1776.1 \pm 681.5(4)
		Shear stress [kPa]	311.3 \pm 111.6(4)	450.1 \pm 73.4(4)	713.3 \pm 229.8(4)
		Friction coefficient μ	0.40	0.62	0.71
		Minimal take-off angle α [deg]	68.8	59.6	56.3
	Pulling direction	Friction [mN]	0.36 \pm 0.07(5)	0.46 \pm 0.08(5)	0.50 \pm 0.07(5)
		Contact area [μm^2]	1699.9 \pm 567.5(4)	893.1 \pm 189.7(4)	1265.8 \pm 531.8(4)
		Shear stress [kPa]	320.0 \pm 88.0(4)	625.8 \pm 77.2(4)	787.5 \pm 321.4(4)