SUPPORTING INFORMATION

Pillars of Life: Is There a Relationship between Lifestyle Factors and the Surface Characteristics of Dragonfly Wings?

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Supplementary Results and Discussion

Movies S1-S7. Bouncing Water Droplet Behavior on the Wings of Seven Species of Dragonfly**. (S1)** *Austrothemis nigrescens,* **(S2)** *Orthetrum chrysostigma,* **(S3)** *T. annulata*, **(S4)** *S. fonscolombii*, **(S5)** *Anax parthenope,* **(S6)** *Anax imperator*, **(S7)** *Onychogomphus forcipatus*.

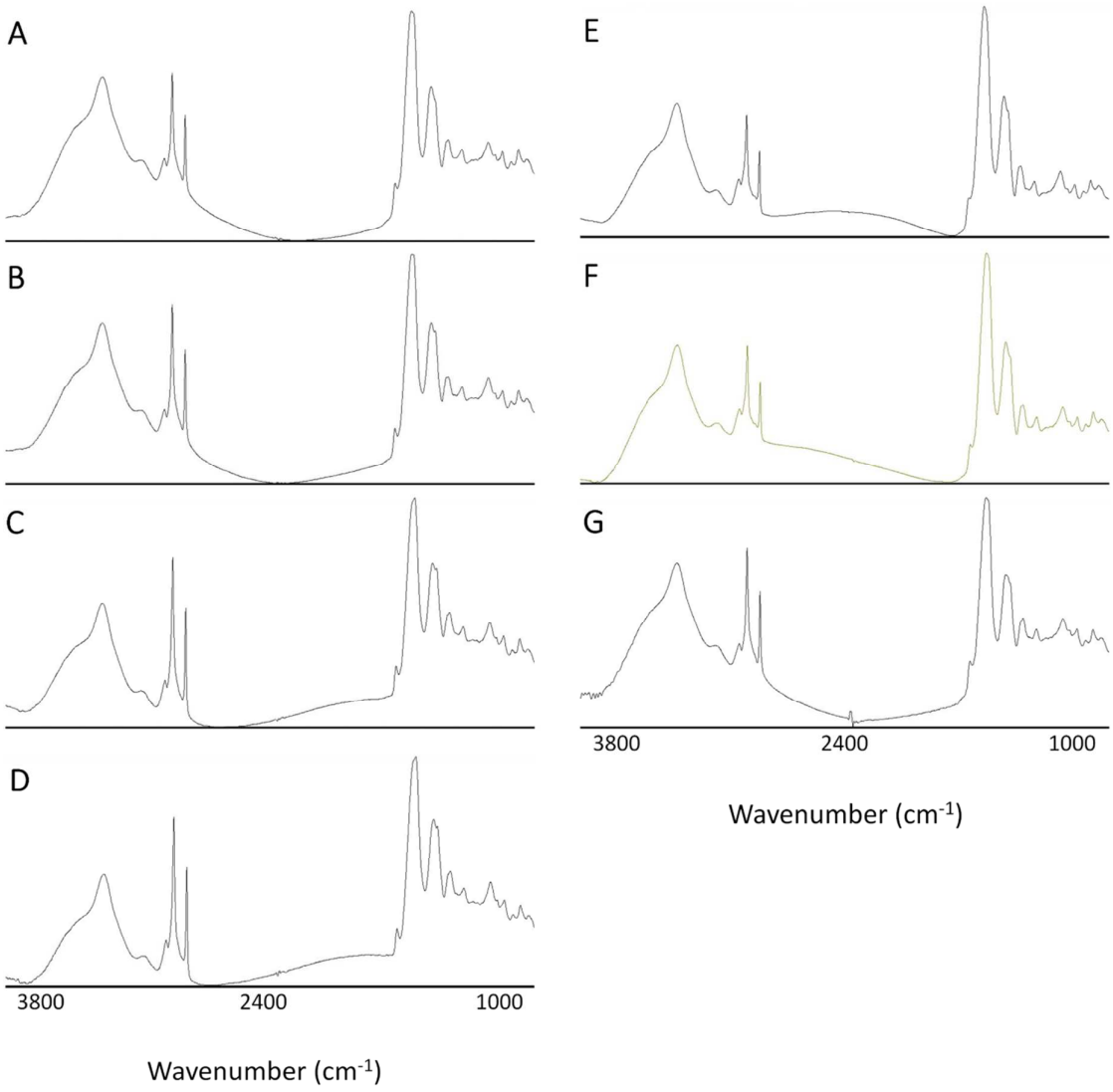

Figure S1. Average IR spectra of an area of the wing membrane of seven dragonfly species from three families **(A)** *Austrothemis nigrescens,* (**B)** *Orthetrum chrysostigma,* **(C)** *T. annulata,* **(D)** *S. fonscolombii*, **(E)** *Anax parthenope* **(F)** *imperator*, **(G)** *Onychogomphus forcipatus*.

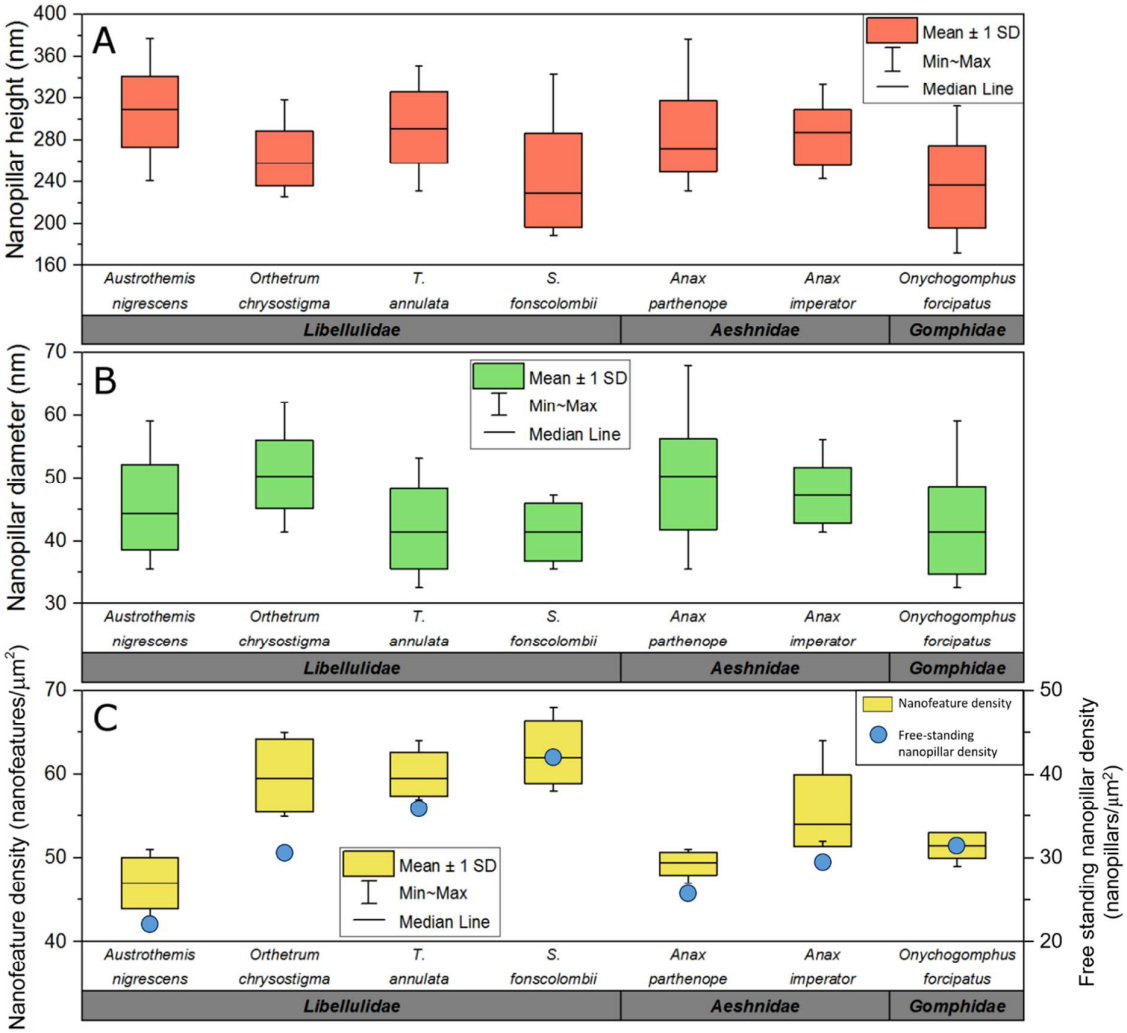

Figure S2. The comparative distributions of nanopillar **(A)** heights, **(B)** diameters and **(C)** densities on the wings of seven species of dragonfly from three families. For **(A)**, tilted SEM images were used to measure 17 nanopillars from three different areas of the wing for each specimen. For **(B)**, Top-view SEM images were used to measure the tip diameter of 17 free-standing nanopillars from two different areas of the wing for each specimen. For **(C),** particle analysis was used on top-view SEM images from six areas of the wing to determine the nanofeature density (yellow), inclusive of free-standing and clustering nanopillars, and neural network analysis was used to detect the free-standing pillar density (blue). Figure created using OriginPro 2015 (OriginLab Corporation, Northampton, MA).

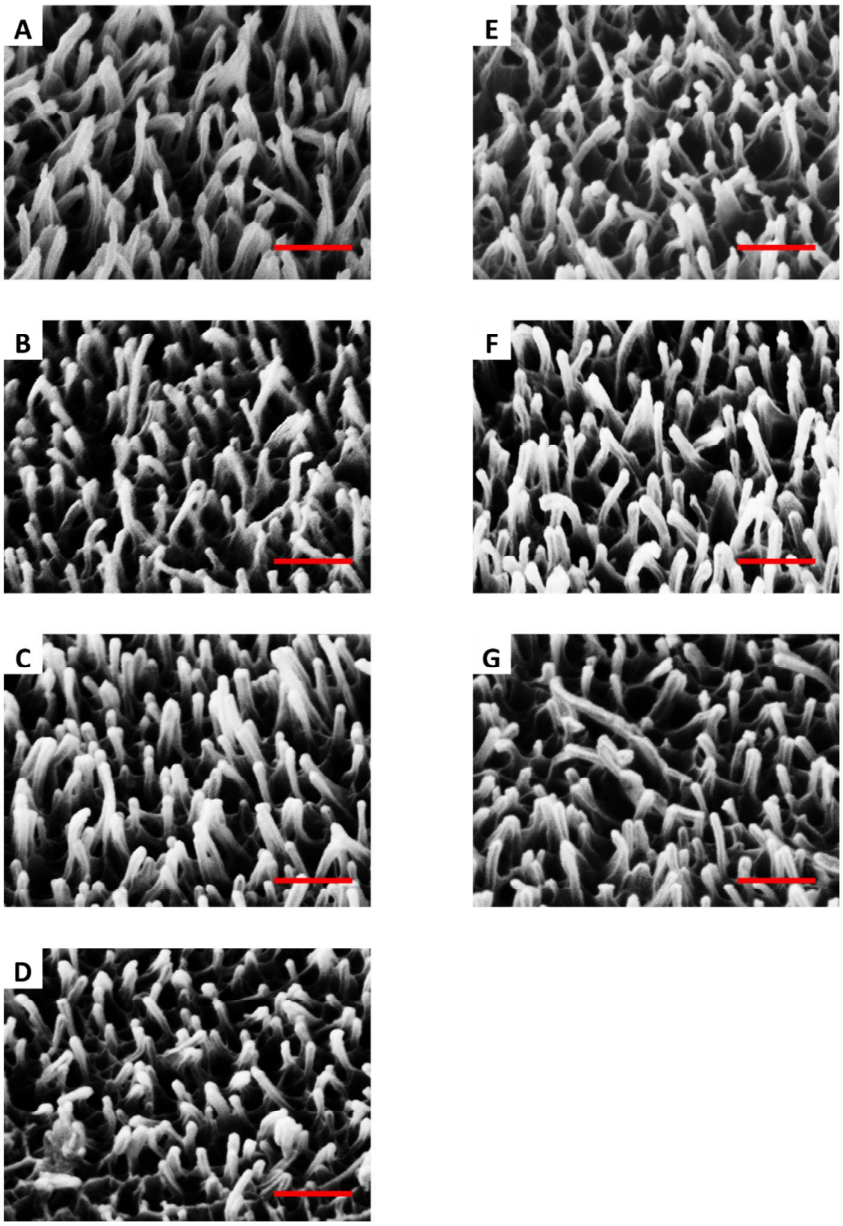

Figure S3. Nanopillar arrangement on the wing epicuticle of seven species of dragonfly from three families. Tilted scanning electron micrographs of **(A)** *Austrothemis nigrescens,* **(B)** *Orthetrum chrysostigma,* **(C)** *T. annulata*„ **(D)** *S. fonscolombii*, **(E)** *Anax parthenope,* **(F)** *Anax imperator*, **(G)** *Onychogomphus forcipatus* wings. Scale bar represents 200 nm.

Table S1. The Proportion of Variance Attributed to Interspecies Variation

	water contact angle	nanopillar height	free standing nanopillar diameter	density of nanofeatures
interspecies variance component	3.99	628.45	12.32	33.44
intraspecies variance component	40.73	1197.40	36.75	10.05
proportion of variation between species	8.9%	34%	25%	77%

Table S2. Summary of Bouncing Droplets on Wing Surfaces Including Bounce Directionality and Contact Time.

species	directional bounce[a]	contact time (ms)
Austrothemis nigrescens	both	18.7 ± 1.4
Orthetrum chrysostigma	both	14.6 ± 0.5
T. annulata	both	15.5 ± 0.2
S. fonscolombii	both	13.4 ± 0.9
Anax parthenope	lateral	16.3 ± 0.8
Anax imperator	both	15.4 ± 0.8
Onychogomphus forcipatus	both	15.8 ± 1.4

[a]Lateral refers to droplet bouncing in the anterior ⟷ posterior direction.
Both refers to bouncing in the proximal ⟷ distal direction in addition to anterior ⟷ posterior.

Table S3. Nanopillar Height, Density and Diameter of Seven Species of Dragonfly by Taxonomy, Behaviour and Physical Characteristics[a]

	nanopillar height (nm)			free standing nanopillar diameter (nm)			nanofeature density (nanofeatures/μm^2)		
	number of measures	mean ± std dev (95% CI)	*t*-value (*p*-value) [b]	number of measures	mean ± std dev (95% CI)	*t*-value (*p*-value) [b]	number of measures	mean ± std dev (95% CI)	*t*-value (*p*-value) [b]
total	119	272 ± 42 (265,280)		119	45 ± 7 (44,47)		42	55 ± 6 (53,57)	
taxonomy[c]									
Libellulidae	68	276 ± 46 (266,286)	0.394	68	45 ± 7 (43,46)	-0.364	24	57 ± 7 (54,60)	1.166
Austrothemis nigrecens	17	307 ± 34 (290,325)		17	45 ± 7 (42,49)		6	47 ± 3 (44,50)	
Orthetrum chrysostigma	17	263 ± 26 (249,276)		17	51 ± 5 (48,53)		6	60 ± 4 (55,64)	
Trithemis annulata	17	292 ± 34 (275,309)		17	42 ± 6 (39,45)		6	60 ± 3 (57,63)	
Sympetrum fonscolombii	17	242 ± 45 (219,265)		17	41 ± 5 (39, 44)		6	63 ± 4 (59,66)	
Aeshnidae	34	283 ± 30 (273,294)	0.656	34	48 ± 6 (46,50)	1.336	12	53 ± 4 (50,55)	-0.701
Anax parthenope	17	284 ± 34 (266,301)		17	49 ± 7 (45,53)		6	49 ± 1 (48,51)	
Anax imperator	17	283 ± 26 (269,296)		17	47 ± 4 (45, 50)		6	56 ± 4 (51,60)	
Gomphidae	17	236 ± 39 (216,256)	-1.716 (0.147)	17	42 ± 7 (38, 45)	-1.079	6	52 ± 2 (50,53)	-0.622
Onychogomphus forcipatus	17	236 ± 39 (216,256)		17	42 ± 7 (38, 45)		6	52 ± 2 (50,53)	
geography			-1.604 (0.170)			-0.019			1.675 (0.155)
australian	17	307 ± 34 (290,325)		17	45 ± 7 (42,49)		6	47 ± 3 (44,50)	
european	102	266 ± 40 (259,274)		102	45 ± 7 (44, 47)		36	56 ± 6 (55,58)	
habitat preference[d]									
slow/still water			1.716 (0.147)			1.079			0.622
likes	102	278 ± 39 (271,286)		102	46 ± 7 (45,47)		36	56 ± 7 (54,58)	
dislikes	17	236 ± 39 (216,256)		17	42 ± 7 (38,45)		6	52 ± 2 (50,53)	
running water			-0.495			-1.873 (0.120)			0.160
likes	34	264 ± 46 (248,280)		34	42 ± 7 (39,44)		12	56 ± 5 (53,59)	
dislikes	85	276 ± 40 (267,284)		85	47 ± 7 (45,48)		30	55 ± 7 (52,57)	
migration			0.300			-0.298			0.905
migratory	68	275 ± 40 (265,285)		68	45 ± 7 (43,46)		24	57 ± 6 (54,59)	
non-migratory	51	269 ± 44 (256,281)		51	46 ± 7 (44,48)		18	53 ± 6 (50,56)	
foraging			-0.226			0.331			0.271
hawker	51	269 ± 40 (258,281)		51	46 ± 6 (44,48)		18	56 ± 6 (53,59)	
percher	68	274 ± 43 (264,285)		68	45 ± 7 (43,47)		24	55 ± 6 (52,57)	

[a]The characteristics considered and their groupings were: families (*Libellulidae, Aeshnidae* or *Gomphidae*); geographical origin (Australian or European); preferred habitat (like or dislike of still or slow water and running water); migratory behaviours (migratory or non-migratory) and foraging behaviours (hawkers or perchers). [b]*t*-values were calculated from exploratory analysis using a hierarchical linear model. *p*-values are reported where the *t*-value approaches ±2 and were calculated from a final estimation of fixed effects. [c]Each family was recoded as a binary variable and compared to the combined other two families. [d]*T. annulata* likes both types of habitats and was included in both groups