

Supplementary material 1. One-way analysis of variance to test the difference in isothermal, wetness, greenness and imperviousness among nine sampling areas distributed within and surrounding metropolitan Seoul.

		Sum of Squares	<i>df</i>	Mean Square	F	<i>P</i>
Isothermal	Between groups	0.141	8	0.018	965.283	< 0.001
	Within groups	< 0.001	18	< 0.001		
	Total	0.142	26			
Wetness	Between groups	0.006	8	0.001	0.773	0.631
	Within groups	0.017	18	0.001		
	Total	0.023	26			
Greenness	Between groups	0.032	8	0.004	2.509	0.050
	Within groups	0.029	18	0.002		
	Total	0.061	26			
Imperviousness	Between groups	0.092	8	0.012	1.316	0.297
	Within groups	0.158	18	0.009		
	Total	0.250	26			

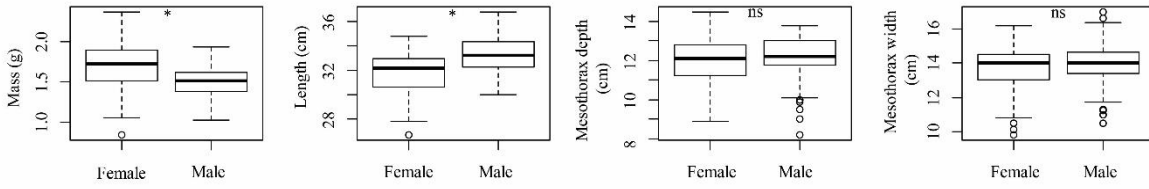
6 **Supplementary material 2.** List of sampling areas and the sample size of each species collected at each area. Minimum and
7 maximum temperatures refer to the average minimum and maximum ambient temperatures in summer from 2010 to 2015,
8 respectively.

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Category	Location	Latitude	Longitude	Minimum temperature (°C)	Maximum temperature (°C)	<i>C. atrata</i>		<i>H. fuscata</i>	
						Male (n)	Female (n)	Male (n)	Female (n)
Hottest temperature	Seochon	37.5021° N	127.0205° E	22.3	30.7	12	29	20	27
	Gwangjin	37.5359° N	127.0714° E	22.5	30.2	21	9	18	22
	Yeongdeungpo	37.5340° N	126.9058° E	22.6	29.8	12	20	11	9
	Gwangmyeong	37.477° N	126.8736° E	22.0	29.6	0	0	21	22
	Namyangju	37.6583° N	127.1455° E	20.0	29.5	0	0	10	10
	Nowon	37.6308° N	127.0669° E	20.3	29.4	4	14	17	7
	Soha	37.4550° N	126.8853° E	20.9	29.3	21	8	0	0
	Jookyo	37.6632° N	126.8392° E	21.6	29.1	2	3	20	11
	Gwanak	37.4833° N	126.9105° E	20.2	28.6	1	2	17	16
Coollest temperatures									



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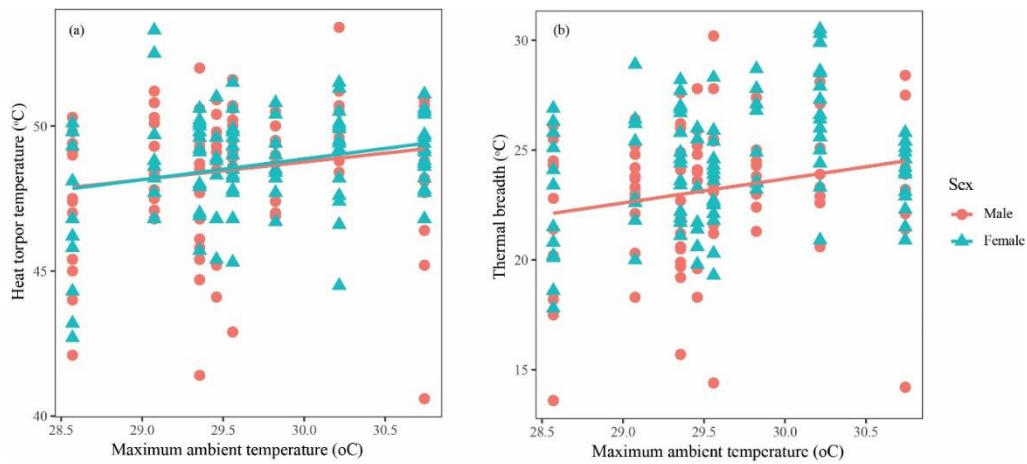


Supplementary material 3. Intersexual differences in morphological characters of *H. fuscata*. A *t*-test was performed for mass, and Kruskal-Wallis tests were performed for length, depth and width. Asterisks denote significant differences, ns: not significant.

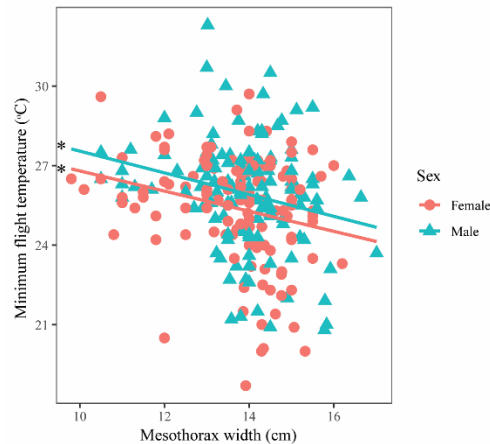
Supplementary material 4. Linear regression analysis to assess the effect of T_a Max and Width on thermal responses of males and females *H. fuscata* obtained from the mesonotum.

Dependent variable	Independent variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>P</i>
Male					
MFT	Intercept	43.70	8.81	4.96	< 0.001
	T_a Max	-0.44	0.29	-1.51	0.134
	Width	-0.38	0.16	-2.30	0.023
MVT	Intercept	44.96	8.60	5.23	< 0.001
	T_a Max	-0.13	0.29	-0.45	0.651
	Width	-0.32	0.16	-1.97	0.052
HTT	Intercept	23.66	11.37	2.08	0.040
	T_a Max	0.55	0.38	1.45	0.150
	Width	0.614	0.211	2.90	0.005
TB	Intercept	-20.04	15.15	-1.32	0.189
	T_a Max	1.0	0.51	1.97	0.052
	Width	0.99	0.28	3.52	0.001
Female					
MFT	Intercept	28.90	8.73	3.31	0.001
	T_a Max	-0.06	0.30	-0.20	0.841
	Width	-0.20	0.15	-1.36	0.176
MVT	Intercept	36.42	7.64	0.30	< 0.001

HTT	T_a Max	0.08	0.27	0.30	0.768
	Width	-0.20	0.13	-1.51	0.134
	Intercept	27.14	8.01	3.39	0.001
	T_a Max	0.55	0.28	1.97	0.051
	Width	0.37	0.14	2.75	0.007
TB	Intercept	-1.76	11.48	-0.15	0.879
	T_a Max	0.61	0.40	1.53	0.129
	Width	0.58	0.19	2.96	0.004



Supplementary material 5. Intersexual variation in thermal responses of *H. fuscata* obtained from the mesonotum according to T_a Max. Correlation between (a) heat torpor temperature and T_a Max, and (b) thermal breadth and T_a Max.



28 **Supplementary material 6.** Relationship between thermal responses of *H. fuscata* obtained
29 from the mesonotum and Width. Asterisks denote significant linear regressions.