

**Paving Behavior in Ants and its Potential Application in Monitoring Two  
Urban Pest Ants, *Solenopsis invicta* and *Tapinoma melanocephalum***

**Supplementary Materials**

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**Table S1:** Location and basic information of field experiments.

No.	Location	GPS	Habitat Type	Monitoring Method	Date (yyyy/mm/dd)	Weather
1	Tianlu Lake, Huangpu District	23.252° N 113.411° E	Nursery	Baiting	2021/04/21	Cloudy
				Taping	2021/04/23	
2	Campus of South China Agricultural University (SCAU), Tianhe District	23.162° N 113.355° E	Green Space	Baiting	2021/07/22	Sunny
				Taping	2021/07/24	
3	Zengcheng Teaching and Research Bases, SCAU, Zengcheng District	23.239° N 113.633° E	Roadside and green belts along the road	Baiting	2021/10/26	Cloudy
				Taping	2021/10/28	
				Pitfall Trapping	2021/10/31	
4	Furong Travel Resort, Huadu District	23.512° N 113.234° E	Forestry Land	Baiting	2021/11/02	Sunny
				Taping	2021/11/04	
5	Qilingbei Research Station, SCAU, Tianhe District	23.169° N 113.366° E	Roadside and green belts along the road	Baiting	2021/11/11	Sunny
				Taping	2021/11/13	
6	River bank of Qilingbei Research Station, SCAU, Tianhe District	23.166° N 113.361° E	Grass Land	Baiting	2021/11/12	Sunny
				Taping	2021/11/14	
7	Songmao Nursery, Baiyun District	23.367° N 113.396° E	Agricultural land	Baiting	2021/12/09	Cloudy
				taping	2021/12/13	
8	Seedling nursery near Institute of Gardening of Guangzhou, Baiyun District	23.261° N 113.302° E	Nursery	Baiting	2021/11/18	Overcast Sky
				Taping	2021/11/21	
9	Around the Sports Ground of South China Agricultural University (SCAU), Tianhe District	23.161° N 113.369° E	Bush	Baiting	2021/11/17	Overcast Sky
				Taping	2021/11/19	
10	Shangdongkeng Village, Baiyun District	23.270° N 113.436° E	Roadside and green belts along the road	Baiting	2021/12/03	Sunny
				Taping	2021/12/12	
11	Xuhui Housing Estate, Baiyun District	23.370° N 113.387° E	Roadside and green belts along the road	Baiting	2021/12/10	Cloudy
				Taping	2021/12/15	
12		23.261° N	Nursery	Taping	2021/12/01	Sunny

	Institute of Gardening of Guangzhou (Dongping Bases), Baiyun District	113.304° E		Baiting	2021/12/06	
13	Zhongluotan Nursery, Baiyun District	23.364° N 113.440° E	Nursery	Taping	2021/12/02	Overcast Sky
				Baiting	2021/12/07	
				Pitfall Trapping	2021/12/17	
14	Yingchun Road, Huadu District	23.353° N 113.251° E	Roadside and green belts along the road	Taping	2021/11/31	Sunny
				Baiting	2021/12/04	
15	Longda Village, Baiyun District	23.392° N 113.388° E	Agricultural Land	Taping	2022/03/08	Sunny
				Baiting	2022/03/12	
16	Maofeng Mountain, Baiyun District	23.270° N 113.443° E	Roadside and Bush	Taping	2022/03/13	Sunny
				Baiting	2022/03/15	
17	Shimen National Forest Park, Conghua District	23.622° N 113.787° E	Roadside and Forestry land	Taping	2022/07/12	Sunny
				Baiting	2022/07/14	
18	Baiyun Mountain, Baiyun District	23.198° N 113.299° E	Forestry land and grass land	Taping	2022/07/24	Sunny
				Baiting	2022/07/26	
19	Wudantian, Zengcheng District	22.921° N 113.511° E	Nursery	Taping	2022/09/17	Sunny
				Baiting	2022/09/20	
20	Zhonglyu Mangrove Nursery, Panyu District	23.386° N 113.589° E	Nursery and Roadside	Taping	2022/09/25	Sunny
				Baiting	2022/09/27	

**Table S2.** ANOVA summary of the linear regression model with particle size as dependent variable and head width and ant species as independent variables.

	DF	Sum Sq	Mean Sq	<i>F</i> -value	<i>P</i> -value
Head width	1	81.23	81.23	227.66	<0.001
Ant species	3	15.43	5.14	14.41	<0.001
Head width $\times$ Ant species	3	3.21	1.07	3	0.03
residuals	561	200.17	0.36		



10	200	50 a	46 a	44 a	-	B vs SA	0.2500
						B vs PA	0.1892
						PA vs SA	0.2500
11	199	109 a	100 b	100 b	-	B vs SA	0.0414
						B vs PA	0.0414
						PA vs SA	1.0000
12	200	60 a	58 a	54 a	-	B vs SA	0.6291
						B vs PA	0.1435
						PA vs SA	0.0625
13	200	69 a	67 a	65 a	70 a	B vs SA	0.4531
						B vs PA	0.1797
						PA vs SA	0.2500
						B vs PT	0.6875
						SA vs PT	0.2891
						PA vs PT	0.1094
14	200	75 a	74 a	72 a	-	B vs SA	0.8238
						B vs PA	0.5235
						PA vs SA	0.2500
15	195	62 a	60 a	52 b	-	B vs SA	0.6636
						B vs PA	0.0347
						PA vs SA	0.0078
16	198	66 b	78 a	77 a	-	B vs SA	0.0192
						B vs PA	0.0290
						PA vs SA	1.0000
17	196	0 a	0 a	0 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
18	196	2 a	2 a	2 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
19	191	93 a	99 a	99 a	-	B vs SA	0.0654
						B vs PA	0.0654
						PA vs SA	1.0000
20	181	95 a	99 a	97 a	-	B vs SA	0.2265
						B vs PA	0.5811
						PA vs SA	0.2500

**Table S4.** Number of monitors (bait, tape, or pitfall trap) detecting *Tapinoma melanocephalum* at each location. “-” indicates pitfall traps were not tested in the location. Different letters within the same row indicate significant differences ( $p < 0.05$ ).

		Number of sites detecting <i>Tapinoma melanocephalum</i>				Statistical Results	
No.	No. of sites	Taping			Pitfall Trapping (PT)	Comparisons	Mid- <i>P</i>
		Baiting (B)	Determined by ant infestation on the sausage (SA)	Determined by tape paving (PA)			
1	224	6 a	2 a	2 a	-	B vs SA	0.0625
						B vs PA	0.0625
						PA vs SA	1.0000
2	224	92 a	82 a	82 a	-	B vs SA	0.0576
						B vs PA	0.0576
						PA vs SA	1.0000
3	199	98 a	85 b	85 b	97 a	B vs SA	0.0385
						B vs PA	0.0385
						PA vs SA	1.0000
						B vs PT	0.8957
						SA vs PT	0.0919
						PA vs PT	0.0919
4	200	0 a	0 a	0 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
5	199	0 a	0 a	0 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
6	197	19 a	18 a	18 a	-	B vs SA	0.8036
						B vs PA	0.8036
						PA vs SA	1.0000
7	200	2 a	2 a	2 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
8	200	14 a	16 a	16 a	-	B vs SA	0.3750
						B vs PA	0.3750
						PA vs SA	1.0000
9	199	19 a	17 a	17 a	-	B vs SA	0.4531
						B vs PA	0.4531
						PA vs SA	1.0000

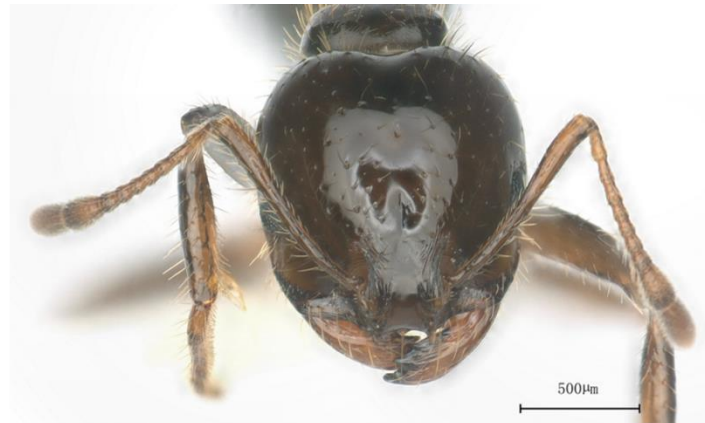
10	200	0 a	0 a	0 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
11	199	33 a	38 a	37 a	-	B vs SA	0.2101
						B vs PA	0.3323
						PA vs SA	0.5000
12	200	2 a	1 a	1 a	-	B vs SA	0.5000
						B vs PA	0.5000
						PA vs SA	1.0000
13	200	8 a	6 a	6 a	5 a	B vs SA	0.3750
						B vs PA	0.3750
						PA vs SA	1.0000
						B vs PT	0.4531
						SA vs PT	0.1797
						PA vs PT	0.1797
14	200	17 a	15 a	15 a	-	B vs SA	0.4231
						B vs PA	0.4231
						PA vs SA	1.0000
15	195	7 a	7 a	7 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
16	198	17 a	6 b	5 b	-	B vs SA	0.0005
						B vs PA	0.0002
						PA vs SA	1.0000
17	196	0 a	0 a	0 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
18	196	9 a	9 a	9 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
19	191	2 a	2 a	2 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	1.0000
20	181	5 a	5 a	4 a	-	B vs SA	1.0000
						B vs PA	1.0000
						PA vs SA	0.5000





10	200	114 a	124 a	2 b	-	B vs SA	0.0989
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
11	199	24 a	31 a	0 b	-	B vs SA	0.0768
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
12	200	43 a	41 a	0 b	-	B vs SA	0.6636
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
13	200	95 a	104 a	5 b	99 a	B vs SA	0.0872
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
						B vs PT	0.4421
						SA vs PT	0.2632
						PA vs PT	< 0.0001
14	200	45 b	53 a	0 c	-	B vs SA	0.0225
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
15	195	78 a	80 a	0 b	-	B vs SA	0.7201
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
16	198	47 b	70 a	3 c	-	B vs SA	0.0056
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
17	196	182 a	175 a	148 b	-	B vs SA	0.0768
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
18	196	120 b	130 a	74 c	-	B vs SA	0.0127
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
19	191	19 a	17 a	0 b	-	B vs SA	0.2500
						B vs PA	< 0.0001
						PA vs SA	< 0.0001
20	181	51 a	45 a	5 b	-	B vs SA	0.0923
						B vs PA	< 0.0001
						PA vs SA	< 0.0001

**Front View**



**Side View**



**Back View**



**Figure S1.** Front view, side view, and vertical view of the red imported fire ant, *Solenopsis invicta* Buren (Formicidae: Myrmicinae).

**Front View**



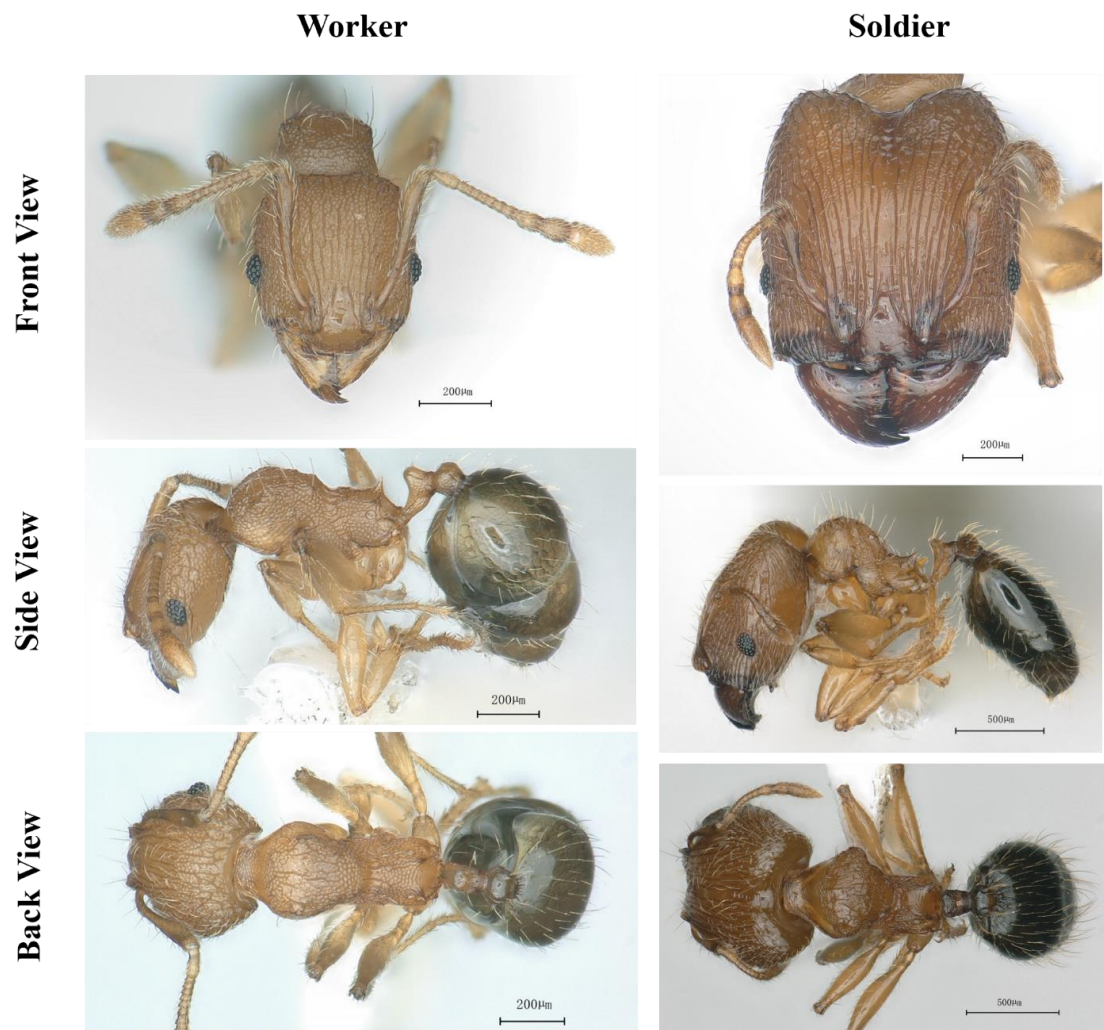
**Side View**



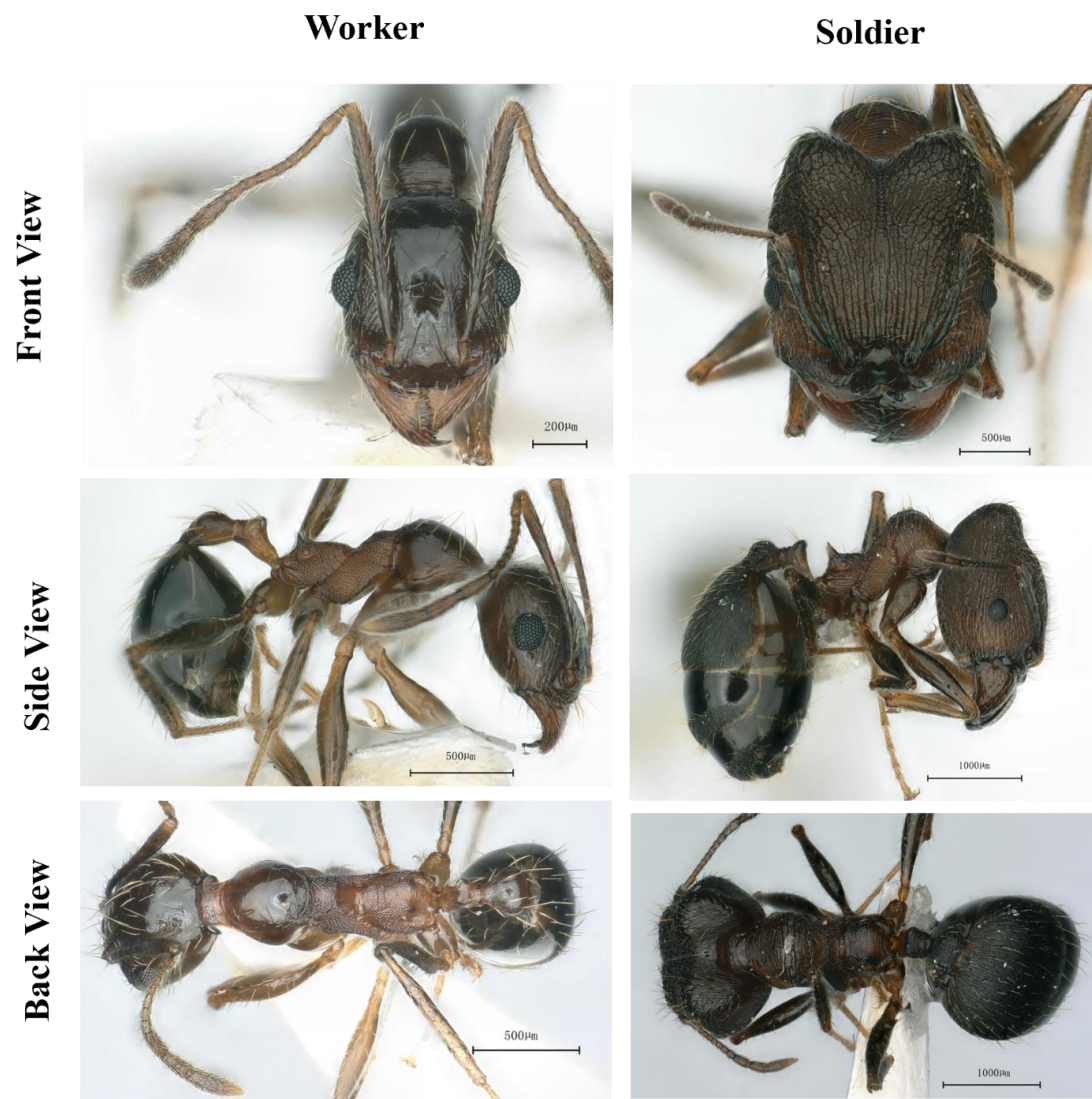
**Back View**



**Figure S2.** Front view, side view, and vertical view of the ghost ant, *Tapinoma melanocephalum* (Fabricius) (Formicidae: Dolichoderinae).

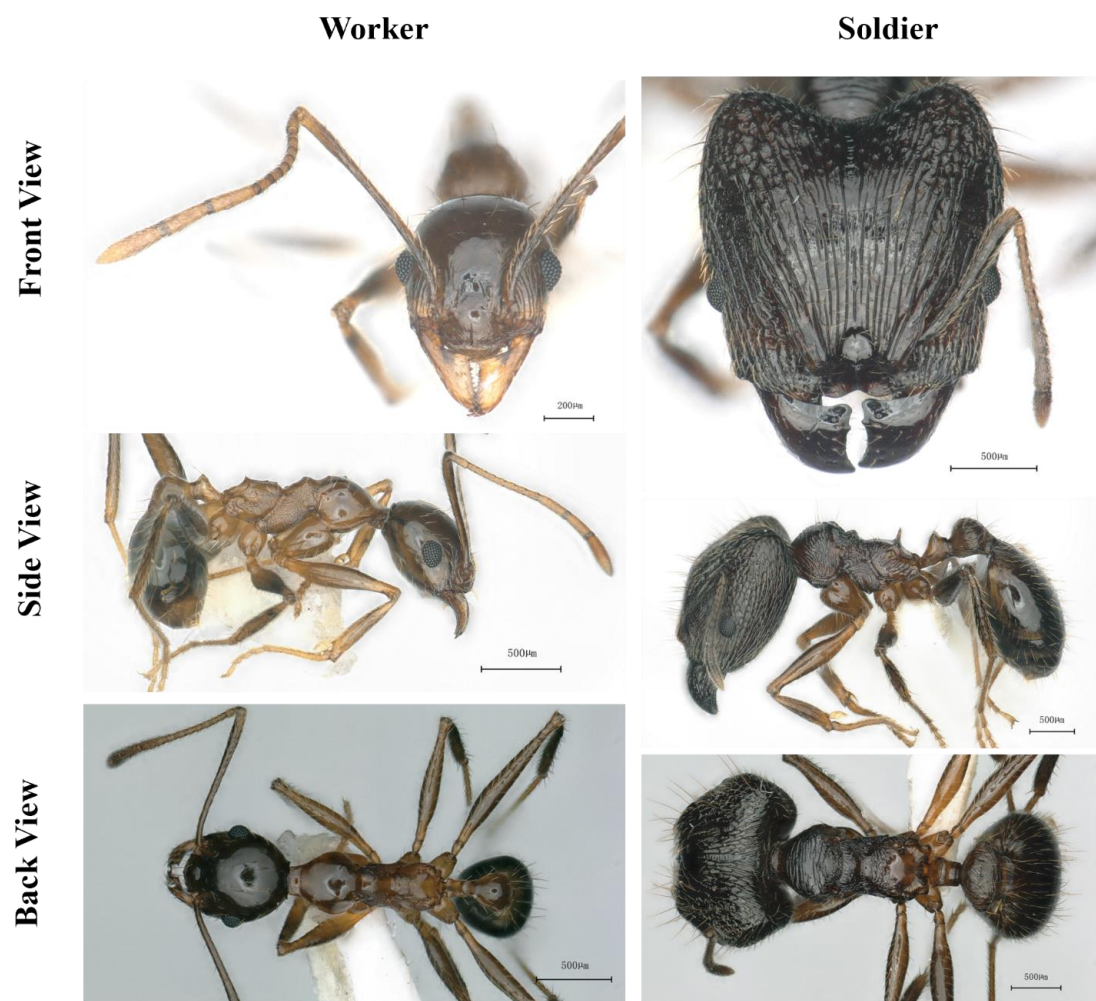


**Figure S3.** Front view, side view, and vertical view of *Pheidole parva* Mayr (Formicidae: Myrmicinae).

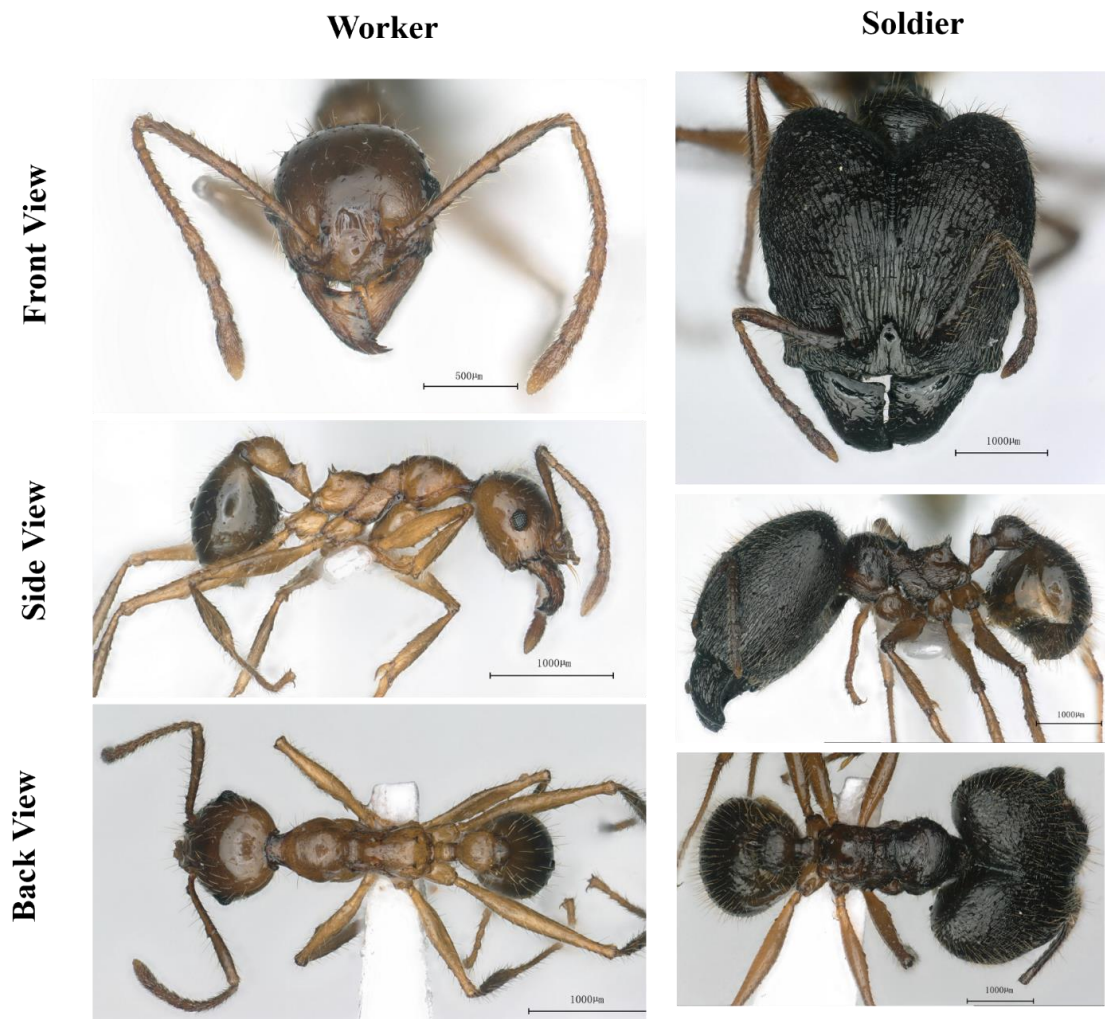


**Figure S4.** Front view, side view, and vertical view of *Pheidole yeensis* Forel (Formicidae: Myrmicinae).



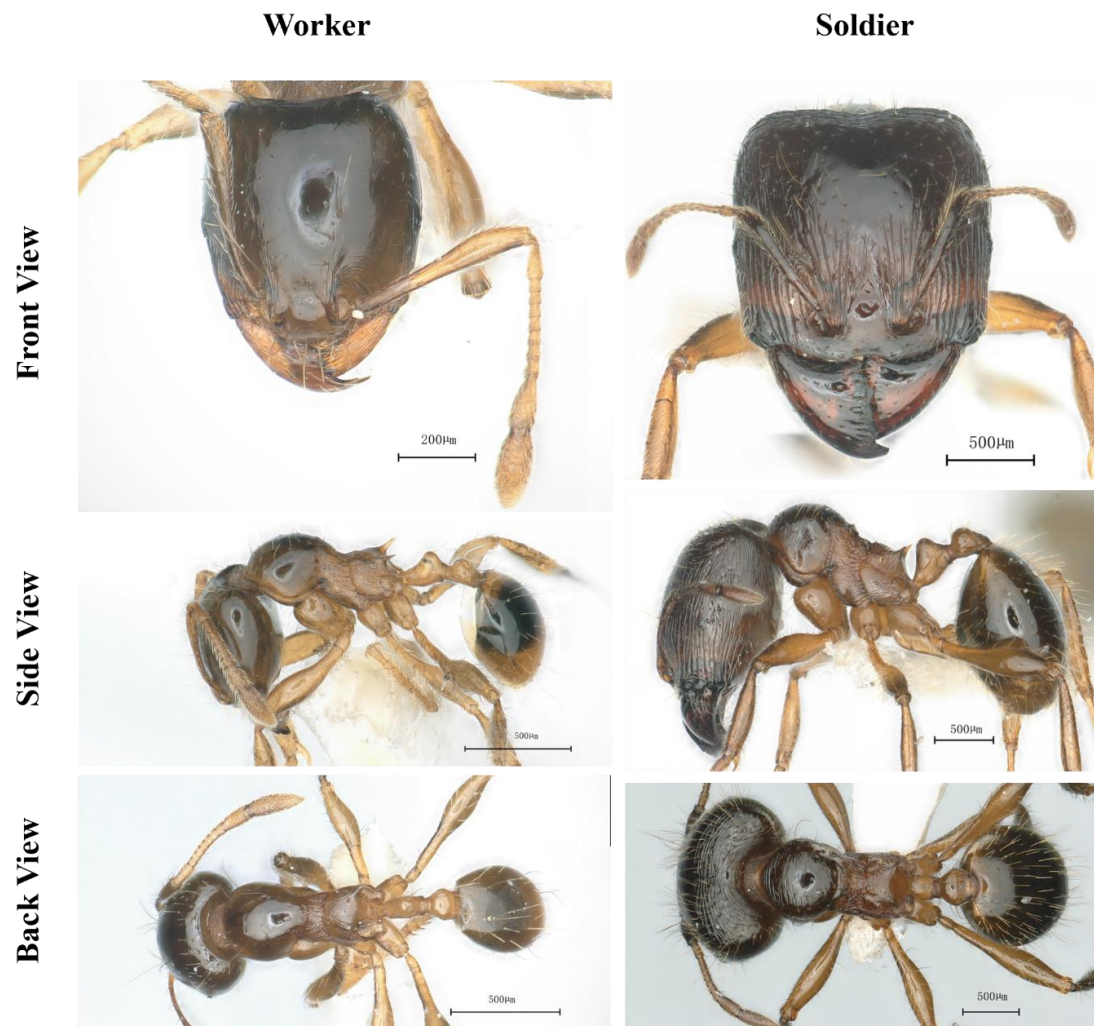


**Figure S5.** Front view, side view, and vertical view of *Pheidole nodus* Smith (Formicidae: Myrmicinae).



**Figure S6.** Front view, side view, and vertical view of *Pheidole sinica* Wu & Wang (Formicidae: Myrmicinae).





**Figure S7.** Front view, side view, and vertical view of *Carebara affinis* (Jerdon) (Formicidae: Myrmicinae).

**Front View**



**Side View**



**Back View**



**Figure S8.** Front view, side view, and vertical view of *Odontoponera transversa* (Smith) (Formicidae: Ponerinae).

**Front View**



**Side View**



**Back View**



**Figure S9.** Front view, side view, and vertical view of *Camponotus nicobarensis* Mayr (Formicidae: Formicinae).

### Key of ant species that paved adhesive tapes in this study

1 Petiole only (waist consisting of one node) or not obvious .....	2
- Postpetiole exist (waist consisting of two nodes) .....	4
2 (1). Petiole not obvious, short hairs on thorax, color of antenna is brighter than that of head.....	<i>Tapinoma melanocephalum</i>
- Petiole obvious, erect and long hairs on thorax, color of antenna is the same or darker than that of head.....	3
3 (2). Head, thorax, and abdomen were black; obvious striate sculpture on head and thorax.....	<i>Odontoponera transversa</i>
- Head, thorax, and part of the abdomen were dark orange; smooth body surface.....	<i>Camponotus nicobarensis</i>
4 (1). 3-segmented apical club.....	<i>Pheidole</i>
- Last two antennal segments enlarged.....	5
5 (4). Thorax with a pair of spines .....	<i>Carebara affinis</i>
- Thorax without spine.....	<i>Solenopsis invicta</i>

**Figure S10.** A key of tape-paving ant species (*Solenopsis invicta*, *Tapinoma melanocephalum*, *Pheidole* spp., *Carebara affinis*, *Camponotus nicobarensis*, and *Odontoponera transversa*) in this study.