Supplementary material for article: HIGHLY DIVERSE CUTICULAR HYDROCARBON PROFILES BUT NO EVIDENCE FOR AGGRESSION TOWARDS NON-KIN IN THE AMBROSIA BEETLE *Xyleborinus saxesenii*

Published in Journal of Chemical Ecology,

By: MELET A. *, LEIBOLD V., SCHMITT T. AND BIEDERMANN P.H.W.

Corresponding author: antoine.melet@forento.uni-freiburg.de

Chair of Forest Entomology and Protection, Faculty of Environment and Natural Resources, Albert-Ludwigs-Universität, Freiburg, Germany

Table S1: Ethogram of the observed behaviors of larvae (L) and adult females (F) and males (M). Modified from Biedermann and Taborsky (2011)

Behaviour	Shown by	Description
Blocking	F	Blocking of the entrance tunnel using the whole body
Resting	L, F, M	Stayin inactive in a tunnel or the brood chamber
Feeding	L, F, M	Grazing on the fruiting bodies, or the fungal layer covering nest walls with the maxillae and/or the mandibles
Cleaning	L, F, M	Grazing on the wall of the plastic tube with the maxillae and/or the mandibles
Digging	L, F	Enlarging the brood chamber or tunnels by chewing into fungus-infested substrate
Shuffling	F	Moving sawdust and faeces with the body (larvae) or the hind legs (adults)
Balling	L	Forming balls of sawdust and faeces by repeated ventral body contractions. Only larvae display this behaviour
Walking	L, F, M	Locomotion within the nest
Cannibalising	L, F, M	Cannibalising nestmates (usually killing and feeding on larvae)
Allogrooming	L, F, M	Cleaning of nestmates using mouthparts
Copulating	F, M	Mating with nestmate
Out of view	L, F, M	Being obscured from view. Recorded only during focal observations.

Table S2: Behaviour of the introduced individuals during the 30 min focal observations (control treatment N = 20, intrapopulation treatment N = 20, interpopulation treatment N =22).

Behaviour	Parameter	Coeff ± S.E	z	p
Rest	Mean	-0.73281 ± 0.01817	-40.338	**< 0,001**
	Intrapopulation	-0.15520 ± 0.02485	-6.247	**< 0,001**
	Interpopulation	1.08380 ± 0.02350	46.121	**< 0,001**
Walk	Mean	-0.39986 ± 0.01735	-23.042	**< 0,001**
	Intrapopulation	0.18291 ± 0.02327	7.862	**< 0,001**
	Interpopulation	-0.54920 ± 0.02385	-23.026	**< 0,001**
Dig	Mean	-1.53696 ± 0.02229	-68.960	**< 0,001**
	Intrapopulation	0.02401 ± 0.02996	0.801	0.423
	Interpopulation	-0.49840 ± 0.03200	-15.576	**< 0,001**
Feed	Mean	-2.24985 ± 0.02896	-77.69	**< 0,001**
	Intrapopulation	-0.68917 ± 0.04563	-15.10	**< 0,001**
	Interpopulation	-3.51561 ± 0.13466	-26.11	**< 0,001**
Clean	Mean	-22.01 ± 310.83	-0.071	0.944
	Intrapopulation	17.78 ± 310.83	0.057	0.954
	Interpopulation	16.88 ± 310.83	0.054	0.957
Shuffle	Mean	-26.01242 ± 2296.72139	-0.011	0.991
	Intrapopulation	0.02958 ± 3078.11284	0.000	1.000
	Interpopulation	19.27562 ± 2296.72140	0.008	0.993
Groom	Mean	-6.3542 ± 0.2043	-31.102	**< 0,001**
	Intrapopulation	1.1158 ± 0.2303	4.845	**< 0,001**
	Interpopulation	1.5769 ± 0.2196	7.179	**< 0,001**
Cannibalise	Mean	-24.01242 ± 844.91658	-0.028	0.977
	Intrapopulation	19.61538 ± 844.91658	0.023	0.981
	Interpopulation	-0.04646 ± 1127.21759	0.000	1.000

Table S3: Behaviour of the receiver adult females, in adopting nests from the control group, during scan observations. (N = 20 nests).

Behaviour	Parameter	Coeff ± S.E.	z	p
Rest	Adults	0.1106 ± 0.1583	0.699	0.48468
	Larvae	-0.2604 ± 0.1550	-1.679	0.0931
Walk	Adults	-0.1158 ± 0.1894	-0.611	0.541
	Larvae	0.1166 ± 0.1822	0.64	0.522
Dig	Adults	1.885 ± 1.083	1.741	0.0818
	Larvae	1.642 ± 1.121	1.465	0.143
Feed	Adults	-0.2568 ± 0.2167	-1.185	0.236
	Larvae	-0.08403 ± 0.18648	-0.451	0.652
Clean	Adults	-0.2227 ± 0.3510	-0.635	0.526
	Larvae	0.2008 ± 0.2294	0.875	0.381
Shuffle	Adults	2.033e-02 ± 4.831e+04	0.000	1.000
	Larvae	0.1858 ± 48025.7609	0.000	1.000
Groom	Adults	-0.3720 ± 0.3416	-1.089	0.276
	Larvae	0.6645 ± 0.5326	1.248	0.212
Copulate	Adults	0.07829 ± 0 .58275	0.134	0.893
	Larvae	NA	NA	NA
Cannibalise	Adults	0.9666 ± 0.4064	2.378	**0.0174**
	Larvae	1.642 ± 1.121	1.465	0.143

Table S4: Behaviour of the receiver adult females in adopting nests during scan (control treatment N = 20, intrapopulation treatment N = 20, interpopulation treatment N =22, interspecies treatment N = 20).

Behaviour	Parameter	Coeff ± S.E.	z	p
Rest	Mean	-0.21165 ± 0.11368	-1.862	0.06263
	Intrapopulation	-0.45654 ± 0.15354	-2.973	**0.00295**
	Interpopulation	-0.20852 ± 0.14876	-1.402	0.16098
	Interspecies	-0.06838 ± 0.15372	-0.445	0.65643
Walk	Mean	-1.319734 ± 0.138564	-9.524	**<0,001**
	Intrapopulation	0.359591 ± 0.176412	2.038	**0.04151**
	Interpopulation	0.003549 ± 0.180028	0.020	0.98427
	Interspecies	0.481169 ± 0.177919	2.704	**0.00684**
Dig	Mean	-3.93509 ± 0.41222	-9.546	**<0,001**
	Intrapopulation	-0.29660 ± 0.58225	-0.509	0.610
	Interpopulation	-0.08579 ± 0.54513	-0.157	0.875
	Interspecies	-0.90119 ± 0.71125	-1.267	0.205
Feed	Mean	-1.8105 ± 0.1626	-11.134	**<0,001**
	Intrapopulation	0.3353 ± 0.2054	1.633	0.1026
	Interpopulation	0.3424 ± 0.2023	1.693	0.0905
	Interspecies	-0.4806 ± 0.2406	-1.997	**0.0458**
Clean	Mean	-2.9890 ± 0.2646	-11.296	**<0,001**
	Intrapopulation	-0.5349 ± 0.3947	-1.355	0.175
	Interpopulation	0.1880 ± 0.3329	0.565	0.572
	Interspecies	-0.1383 ± 0.3678	-0.376	0.707
Shuffle	Mean	-2.465e+01 ± 7.729e+03	-0.003	0.997
	Intrapopulation	1.862e+01 ± 7.729e+03	0.002	0.998
	Interpopulation	-1.305e-01 ± 1.033e+04	0.000	1.000
	Interspecies	-5.801e-02 ± 1.057e+04	0.000	1.000
Groom	Mean	-2.98904 ± 0.26462	-11.296	**<0,001**
	Intrapopulation	-0.23730 ± 0.36743	-0.646	0.518
	Interpopulation	-0.03717 ± 0.34634	-0.107	0.915
	Interspecies	-0.52656 ± 0.40451	-1.302	0.193
Copulate	Mean	-3.93509 ± 0.41222	-9.546	**<0,001**
	Intrapopulation	-0.70690 ± 0.64987	-1.088	0.277
	Interpopulation	0.03424 ± 0.53224	0.064	0.949
	Interspecies	-0.61086 ± 0.65006	-0.940	0.347
Cannibalise	Mean	-2.63223 ± 0.22593	-11.651	**<0,001**
	Intrapopulation	0.48949 ± 0.27647	1.770	0.0766
	Interpopulation	-0.05256 ± 0.29644	-0.177	0.8593
	Interspecies	0.27654 ± 0.29021	0.953	0.3406

Table S5: Behaviour of the receiver larvae in adopting nests during scan observations (control treatment N = 20, intrapopulation treatment N = 20, interpopulation treatment N =22, interspecies treatment N = 20).

Behaviour	Parameter	Coeff ± S.E.	z	p
Rest	Mean	-0.51427 ± 0.11737	-4.382	**<0,001**
	Intrapopulation	0.21643 ± 0.17764	1.218	0.223
	Interpopulation	0.18137 ± 0.14953	1.213	0.225
	Interspecies	-0.04217 ± 0.17679	-0.239	0.811
Walk	Mean	-1.1956 ± 0.1345	-8.889	**<0,001**
	Intrapopulation	-0.3931 ± 0.2213	-1.776	0.0757
	Interpopulation	-0.2012 ± 0.1767	-1.138	0.2549
	Interspecies	-0.3060 ± 0.2128	-1.438	0.1503
Dig	Mean	-4.3373 ± 0.5033	-8.618	**<0,001**
	Intrapopulation	-17.1434 ± 1846.9413	-0.009	0.993
	Interpopulation	-1.8323 ± 1.1204	-1.635	0.102
	Interspecies	-0.4708 ± 0.8703	-0.541	0.588
Feed	Mean	-1.3663 ± 0.1411	-9.680	**<0,001**
	Intrapopulation	0.2560 ± 0.2080	1.231	0.218
	Interpopulation	0.1794 ± 0.1777	1.010	0.313
	Interspecies	0.3780 ± 0.2010	1.881	0.060
Clean	Mean	-1.85332 ± 0.16595	-11.168	**<0,001**
	Intrapopulation	0.03079 ± 0.25267	0.122	0.903
	Interpopulation	-0.20979 ± 0.22002	-0.953	0.340
	Interspecies	-0.05158 ± 0.25187	-0.205	0.838
Shuffle	Mean	-2.763e+01 ± 3.446e+04	-0.001	0.999
	Intrapopulation	1.509e-01 ± 5.063e+04	0.000	1.000
	Interpopulation	-3.188e-01 ± 4.737e+04	0.000	1.000
	Interspecies	-4.776e-02 ± 5.244e+04	0.000	1.000
Groom	Mean	-3.50989 ± 0.33828	-10.376	**<0,001**
	Intrapopulation	-0.81645 ± 0.67244	-1.214	0.225
	Interpopulation	-0.85745 ± 0.53218	-1.611	0.107
	Interspecies	-0.02484 ± 0.51133	-0.049	0.961
Cannibalise	Mean	-4.3373 ± 0.5033	-8.618	**<0,001**
	Intrapopulation	-1.0964 ± 1.1214	-0.978	0.328
	Interpopulation	0.5867 ± 0.5885	0.997	0.319
	Interspecies	0.2305 ± 0.7123	0.324	0.746

Fig. S1: Shaking a nest out of the plastic tube. a) artificial medium is halfway shaken inside the tube, foam cap is still on. b) artificial medium is being removed from the tube. c) artificial medium is out of the tube and two beetles are collected from the nest.

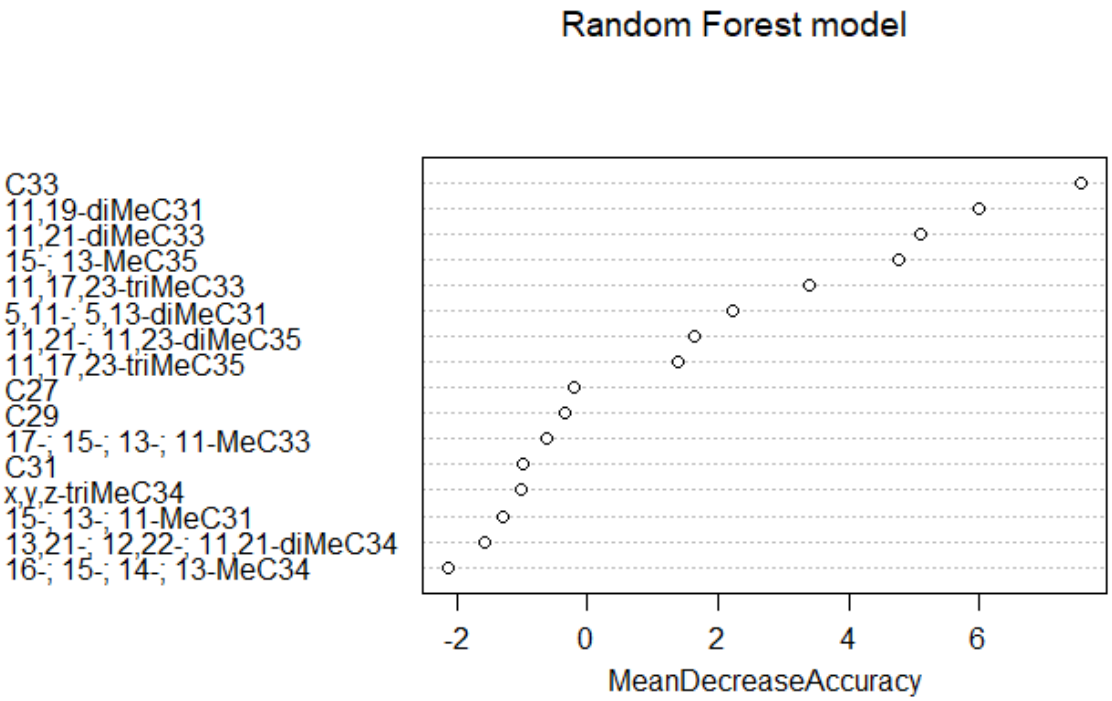

Fig. S2: Relative importance of individual cuticular hydrocarbons for the differentiation of the two populations. Cuticular hydrocarbons playing a large part in inter-population differentiation are ordered from top down.

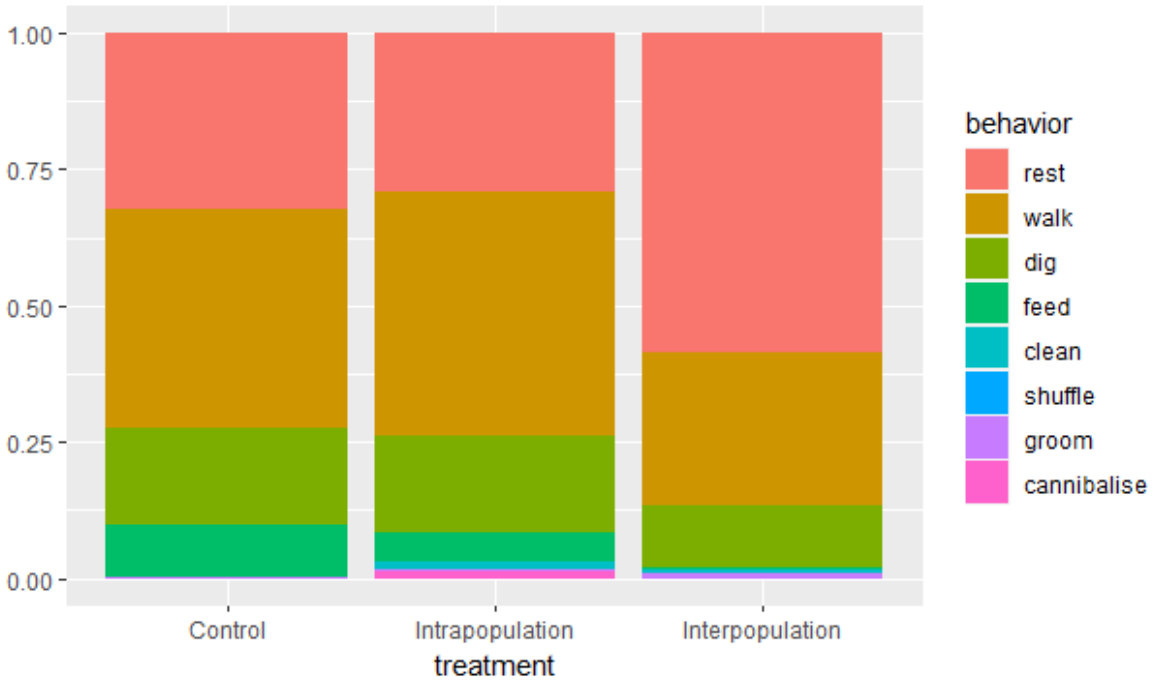

Fig. S3: Behavior of the introduced adult females during the focal observations. Behaviors are expressed as proportion of the total behaviors observed

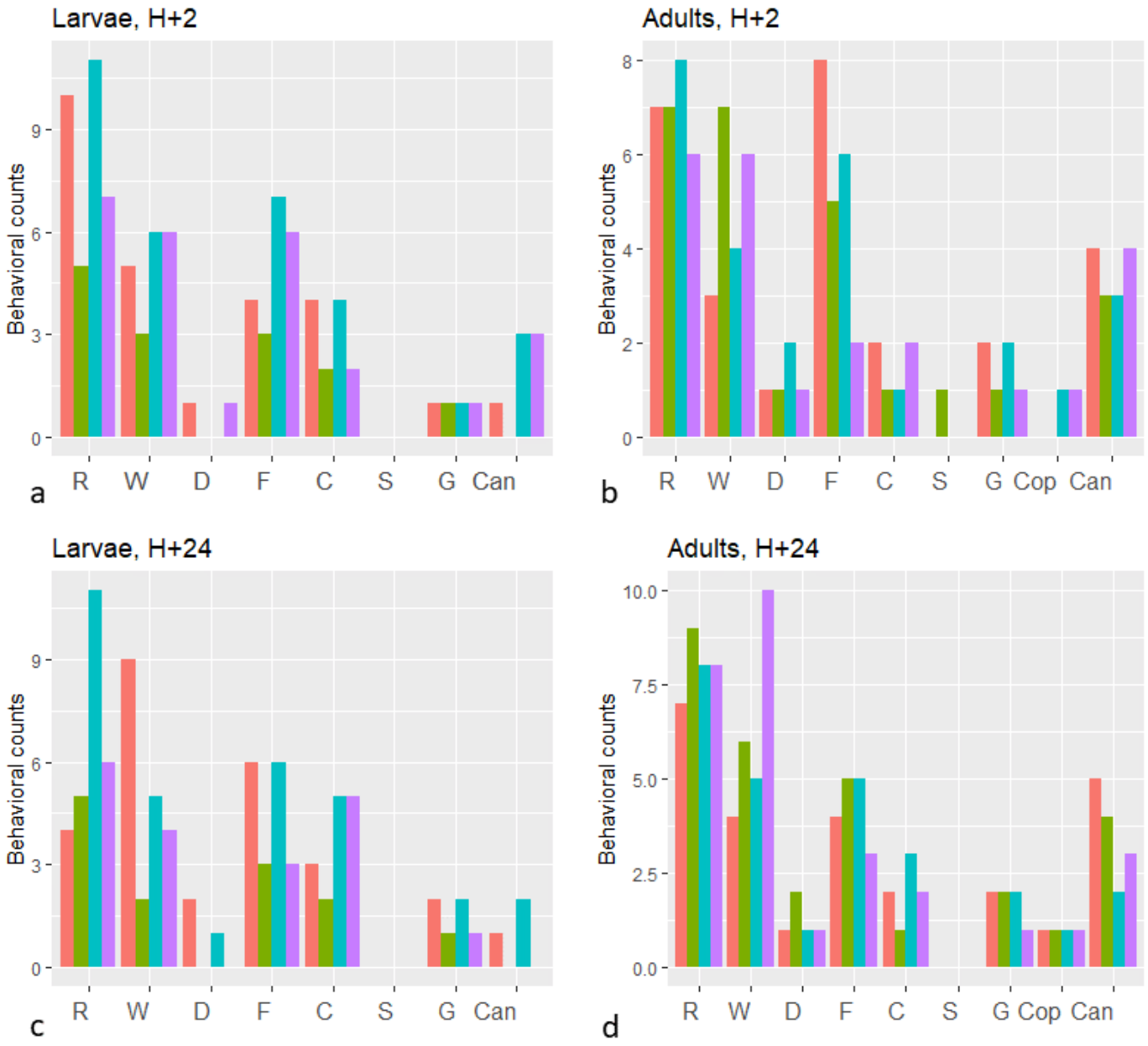

Fig. S4: Behavior of the adopting larvae (a, c) and adult females (b, d) during the scan observations two (a, b) or 24 hours after the manipulation (c, d). Individual behaviors are designated by the code: R = rest, W = walk, D = dig, F = feed, C = clean, S = shuffle, G = groom, Cop = copulate and Can = cannibalise. Colors represent the four treatment groups: red = control treatment, green = intrapopulation treatment, blue = interpopulation treatment, purple = interspecies treatment