Figure S1. Single color *in situ* hybridization for obp1 and Orco on the palps. **A1-A3** Three independent neuronal labeling for obp1 expressing support cells (arrow). **B** Two cell clusters were marked by Orco antisense probes. Each cluster contains multiple sensory neurons (arrow). All bars indicate 36 µm.

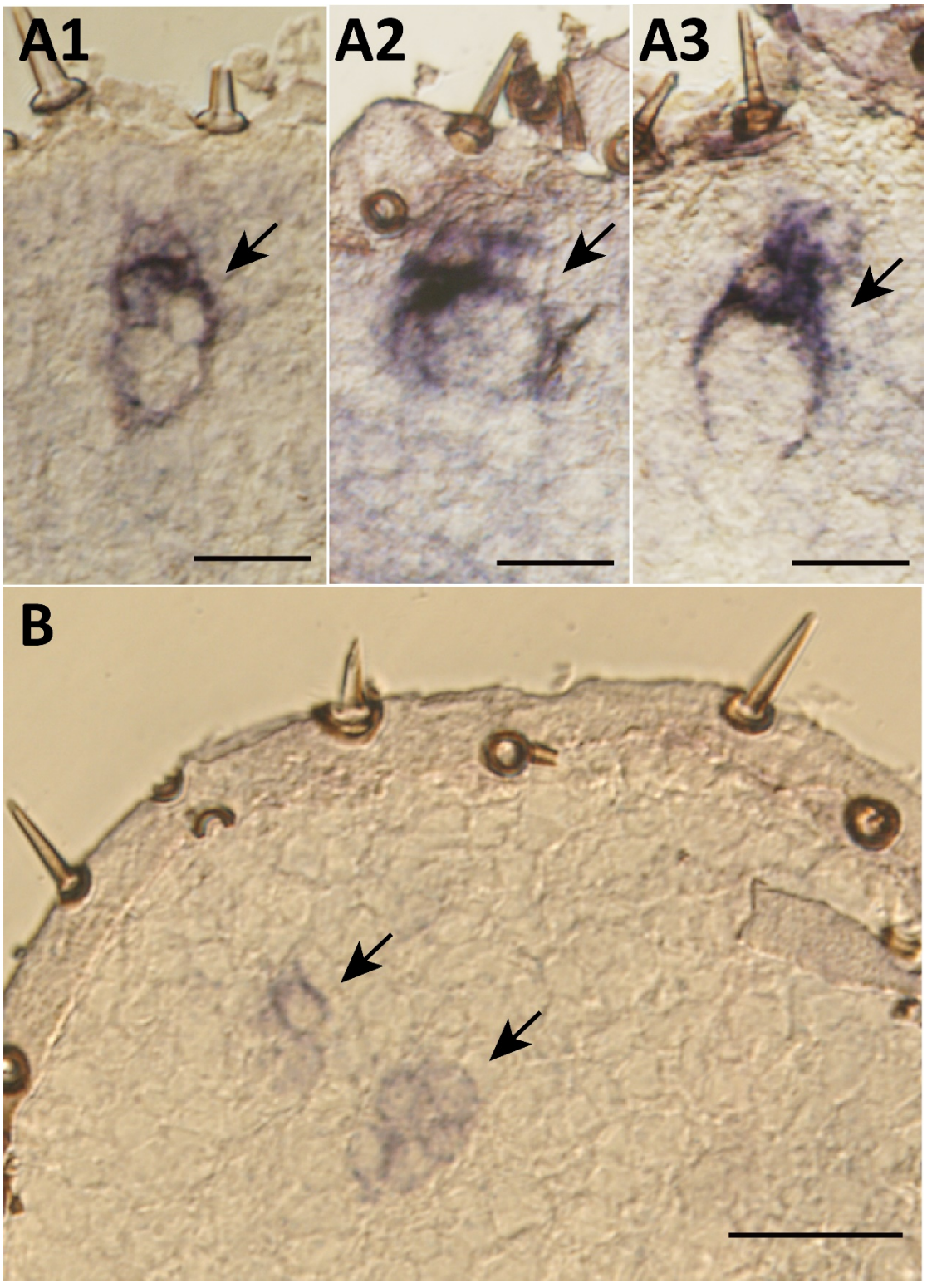

Table S1. List of primer pairs sequence included in the paper. Online tool Primer 3 (http://bioinfo.ut.ee/primer3/) was used for design. Red characters mean T7 promoter

Primer name	**Primer sequence**	**Purpose**
LmigIR8a-For	TTCACCGACTGGGACTGG	*in situ* hybridization
LmigIR8a-Rev	GGAAAACGGAGATGTACGAAACT	*in situ* hybridization
Lmigobp1-For	TGAACCCACCGAAGATGAG	*in situ* hybridization
Lmigobp1-Rev	AGGGCAATGTCAAACTCTG	*in situ* hybridization
Lmigobp2a-For	TTATTCTGACGGTTGCTGC	*in situ* hybridization
Lmigobp2a-Rev	GGGATGATGGCGTTGAAA	*in situ* hybridization
LmigOR2-For	ATGGGTGAGCGTGGAGAGGC	*in situ* hybridization
LmigOR2-Rev	GGTCATCGCTGTGGACGTGG	*in situ* hybridization
LmigOrco-For	CTCGTCTGACAGCGTAACTCAC	*in situ* hybridization
LmigOrco-Rev	AAGACGCAGAAGAGGAAGACCT	*in situ* hybridization
T7-LmigOR2-For	GGATCCTAATACGACTCACTATAGGCACCTACCACCTGCTGTACG	RNAi template

T7-LmigOR2-Rev	GGATCCTAATACGACTCACTATAGGCTACTGTGATCTCCACCGGC	RNAi template
T7-LmigOrco-For	GGATCCTAATACGACTCACTATAGGTCGAGCGCCACAAGCACGTT	RNAi template
T7-LmigOrco-Rev	GGATCCTAATACGACTCACTATAGGGCCTCCATCACCGACGAGCTCT	RNAi template
T7-LmigIR8a-For	GGATCCTAATACGACTCACTATAGGAGTCTGGCATCTCTATCGTGAT	RNAi template
T7-LmigIR8a-Rev	GGATCCTAATACGACTCACTATAGGAACATCTCTCCAACCTCAGTCA	RNAi template
T7-Lmigobp2a-For	GGATCCTAATACGACTCACTATAGGACAAGGAGGAGGCGAAGAA	RNAi template
T7-Lmigobp2a-Rev	GGATCCTAATACGACTCACTATAGGTGAGCACAGAGCAGTACAGATA	RNAi template
T7-Lmigobp1-For	GGATCCTAATACGACTCACTATAGGGAGAGACGTGAACATGAAACTT	RNAi template
T7-Lmigobp1-Rev	GGATCCTAATACGACTCACTATAGGGAGAGTCACCAATGGTTGCAT	RNAi template
q-LmigOR2-For	CCACCTACCACCTGCTGTA	RT-PCR for RNAi silencing effects
q-LmigOR2-Rev	GGCTGCGATATTCTCGTTCAA	RT-PCR for RNAi silencing effects
q-LmigOrco-For	CGCTCCGCCATCAAGTAC	RT-PCR for RNAi silencing effects
q-LmigOrco-Rev	CGTCCACCGAGTCAATCTTG	RT-PCR for RNAi silencing effects
q-LmigIR8a-For	CCAGAGCCGCATCAACTAC	RT-PCR for RNAi

		silencing effects
q-LmigIR8a-Rev	CCCATACCCTGTACCTAGACTG	RT-PCR for RNAi silencing effects
q-Lmigobp2a-For	CGCAGCAACCGTCAGAAT	RT-PCR for RNAi silencing effects
q-Lmigobp2a-Rev	TGAGCACAGAGCAGTACAGATA	RT-PCR for RNAi silencing effects
q-Lmigobp1-For	CACATGCCGCTCATCTACTG	RT-PCR for RNAi silencing effects
q-Lmigobp1-Rev	GCCTTCTTCCTTTATTTCTGGAGG	RT-PCR for RNAi silencing effects

Table S2. List of chemical compounds included in the paper.

Odorant	Molecular Formula	CAS	Lot Number
Alcohol			
1-Pentanol	$C_5H_{12}O$	71-41-0	P0055, TCI
3-Methyl-1-butanol	$C_5H_{12}O$	123-51-3	309435-100ML, SIGMA-ALDRICH
cis-3-Hexen-1-ol	$C_6H_{12}O$	928-96-1	H12900-10G, ALDRICH
Cyclohexanol	$C_6H_{12}O$	108-93-0	C/9000/PB08, ACROS ORGANICS
Benzyl alcohol	C_7H_8O	100-51-6	30020692, Sinopharm Chemical Reagent
DL-1-Phenethylalcohol	$C_8H_{11}O$	98-85-1	304280250, ACROS ORGANICS

1-Nonanol	$C_9H_{20}O$	143-08-8	N0292, TCI
Linalool	$C_{10}H_{18}O$	78-70-6	L260-2, ALDRICH
1-Decanol	$C_{10}H_{22}O$	112-30-1	A17288, ALFA AESAR
Phytol (3,7,11,15-Tetramethyl-2-hexadecen-1-ol)	$C_{20}H_{40}O$	7541-49-3	139912-10G, ALDRICH
Ester			
Butyl acetate	$C_6H_{12}O_2$	123-86-4	287725-100ML, SIGMA-ALDRICH
Methyl isovalerate	$C_6H_{12}O_2$	556-24-1	36492-1ML, Fluka
iso-amyl acetate	$C_7H_{14}O_2$	123-92-2	10003192, Sinopharm Chemical Reagent
cis-3-Hexenyl acetate	$C_8H_{14}O_2$	3681-71-8	A0888, TCI
Ethyl heptanoate	$C_9H_{18}O_2$	106-30-9	112364-199ml, ALDRICH
Ethyl caprylate	$C_{10}H_{20}O_2$	106-32-1	112321-5G, ALDRICH
Ethyl nonanoate	$C_{11}H_{22}O_2$	123-29-5	112348-25ML, ALDRICH
Ethyl caprate	$C_{12}H_{24}O_2$	110-38-3	148970-5ML, ALDRICH
Ethyl dodecanoate	$C_{14}H_{28}O_2$	106-33-2	61630-100ML, ALDRICH
Lauryl methacrylate	$C_{16}H_3O_2$	142-90-5	291811-100ML, ALDRICH
Ethyl myristate	$C_{16}H_{32}O_2$	124-06-1	70090-100ML, ALDRICH
Dibutyl phthalate	$C_{16}H_{22}O_4$	84-74-2	36736-1G, Fluka
Bis(2-ethylhexyl) phthalate	$C_{24}H_{38}O_4$	117-81-7	36735-1G, Fluka
Ketone			
2-Hexanone	$C_6H_{12}O$	591-78-6	02473-5ML, Fluka
2-Heptanone	$C_7H_{14}O$	110-43-0	114001000, ACROS ORGANICS
6-Methyl-5-hepten-2-one	$C_8H_{14}O$	110-93-0	M48805-100ML, ALDRICH
2,2,6-Trimethylcyclohexanone	$C_9H_{16}O$	2408-37-9	B21111, ALFA AESAR
2,6,6-Trimethyl-2-cyclohexene-1,4-dione	$C_9H_{12}O_2$	1125-21-9	334530250, ACROS ORGANICS
D(+)-Carvone	$C_{10}H_{14}O$	2244-16-8	22070-25ML, Fluka

Geranyl acetone	$C_{13}H_{22}O$	3796-70-1	250716-25G, ALDRICH
Acid			
Butyric acid	$C_4H_8O_2$	107-92-6	B10350-0, ALDRICH
Aldehyde			
trans-2-Hexenal	$C_6H_{10}O$	6728-26-3	158130250, ACROS ORGANICS
Hexanal (Caproaldehyde)	$C_6H_{12}O$	66-25-1	H0133, TCI
Benzaldehyde	C_7H_6O	100-52-7	B1334-250ML, SIGMA-ALDRICH
Octanal (Octly aldehyde）	$C_8H_{16}O$	124-13-0	O560-8, ALDRICH
β-Cyclocitral	$C_{10}H_{16}O$	432-25-7	87097KJ, SAFC
Decanal	$C_{10}H_{20}O$	112-31-2	D7384-25G, SIGMA
Dodecyl aldehyde	$C_{12}H_{24}O$	112-54-9	D222003-2G, ALDRICH
Others			
2,5-Dimethylpyrazine	$C_6H_8N_2$	123-32-0	D1526, TCI
Phenylacetonitrile	C_8H_7N	140-29-4	13300-250ml, Fluka
Guaiacol	$C_7H_8O_2$	90-05-1	120192500-250G, ACROS ORGANICS

Video S1. Emesis response was caused by 50% (v/v in paraffin oil) E-2-Hexenal. Yellow bulb was used to illustrate the start and end of odor stimulation.

Video S2. No emesis response was observed by paraffin oil. Yellow bulb was used to illustrate the start and end of odor stimulation.

Video S3. POR was caused by 5% (v/v in paraffin oil) 2-Heptanone. During approaching and continuous stimulation, no contact was made between filter paper and locust mouthparts

Video S4. No POR was observed by paraffin oil. During approaching and continuous stimulation, no contact was made between filter paper and locust mouthparts