Cuticular Hydrocarbons of Chagas Disease Vectors in Mexico

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Capillary gas-liquid chromatography was used to analyse the cuticular hydrocarbons of three triatomine species, Triatoma dimidiata, T. barberi and Dipetalogaster maxima, domestic vectors of Chagas disease in Mexico. Mixtures of saturated hydrocarbons of straight and methyl-branched chains were characteristic of the three species, but quantitatively different. Major methylbranched components mostly corresponded to different saturated isomers of monomethyl, dimethyl and trimethyl branched hydrocarbons ranging from 29 to 39 carbon backbones. Sex-dependant, quantitative differences in certain hydrocarbons were apparent in T. dimidiata.

Key words: Triatoma - Dipetalogaster - cuticular hydrocarbons - gas chromatography - chemotaxonomy - Mexico

Chagas disease (American trypanosomiasis), is widespread in the Americas, with the causative parasite, Trypanosoma cruzi, usually transmitted to humans in the faecal droppings of large blood-sucking insects of the subfamily Triatominae (Hemiptera, Reduviidae). In Mexico, over 30 species of Triatominae have been reported, mainly Triatoma species of the protracta and phyllosoma complex (Zeledón 1981, Zárate & Zárate 1985, Salazar Schettino et al. 1988, Schofield 2000). Most of them are actual or potential vectors of the disease, and Mexican authorities are currently carrying out surveys for Chagas disease vectors and implementing control trials in order to evaluate risk areas. As part of a larger study, the Latin American Network for Research on the Biology and Control of Triatominae is contributing to these efforts by evaluating the distribution and classification of domiciliated Triatominae using morphological, morphometric, molecular and biochemical techniques. Within this framework, we report here a study of the cuticular hydrocarbons of representative Mexican species of Triatominae, designed to evaluate the use of hydrocarbon profiles for species characterization and phylogenetic studies.

MATERIALS AND METHODS

Insects - We analyzed hydrocarbons from wings of adult male and female individual specimens of *T. dimidiata*, collected from domestic and peridomestic locations from the municipalities of Tempoal, Citlaltepec and Chontla, in

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the State of Veracruz. The *T. barberi* specimens were collected from domestic habitats in the village of Joaquín Herrera, municipality of Villa Corregidora, State of Querétaro, and the *Dipetalogaster maxima* specimens were collected from houses in Colonia Roma, municipality of La Paz, State of Baja California Sur (Table I). Wings of each specimen were wrapped in aluminum foil and stored at room temperature prior to analysis.

Hydrocarbon analysis - Cuticular hydrocarbons were extracted as previously described (Juárez & Blomquist 1993, Juárez et al. 2001). Wings from each specimen were washed with redistilled water to remove any water soluble contaminants, transferred to a glass vial with Teflon-lined caps, and submerged in redistilled hexane (6 ml/g) overnight, to extract total lipids. The solvent was transferred to another vial, reduced in volume under nitrogen, then hydrocarbons were separated from other components by adsorption chromatography performed on a mini-column of activated Biosil A (10 mm x 5 mm I.D.), eluting with redistilled hexane (6 ml/mg hydrocarbon). This final extract then was evaporated to an appropriate volume for gas chromatography. Capillary gas chromatographic (CGC) analysis was performed using a Hewlett-Packard (HP) Model 6890 gas chromatograph equipped with a cool on-column injector port and autoinjector system, fitted with a non-polar fused silica (0.2 µm) HP-5 capillary column (30 m x 0.32 mm I.D.), the carrier gas was H₂ at a linear velocity of 40 cm/sec. The oven temperature was programmed from 60°C (hold time 2 min) to 180°C at 20°C/ min, then 180°C to 310°C at 3°C/min (hold 10 min). The flame ionization detector (FID) was held at 320°C. A PC based data system, Turbochrom 3 (Perkin Elmer, CA, USA) was used for data recording and quantification. Injection of n-alkane standards of 22 to 42 carbons was similarly performed for estimation of Kovat Indices (KI) (Kovats 1965). Numbers showed close agreement with the KI's calculated for other triatomines (Juárez & Blomquist 1993, Juárez et al. 2001), and prediction of methyl branching pattern was done as proposed by Carlson et al. (1998). The nomenclature used to describe hydrocarbons was (Cn) to describe the total number of carbons in the corre-

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	Triatominae sp. evaluated							
Insect	Locality	Municipality	State	N Latitude	W Longitud	Altitude (m)		
T. dimidiata	Los Cerritos	Citlaltepetl	Veracruz	21°20'	97°53'	220		
T. dimidiata	Tancolol	Chontla	Veracruz	21°18'	97°55'	260		
T. dimidiata	El Cantarito	Tempoal	Veracruz	21°31'	98°23'	50		
T. barberi	Joaquín Herrera	Villa Corregidora	Querétaro	20°32'	100°26'	1,940		
D. maxima	Col. Roma	La Paz	Baja California Sur	24°09'	110°17'	20		

TABLE I Friatominae sp. evaluate

T: Triatoma; D: Dipetalogaster

sponding hydrocarbon component; the location of methyl groups is indicated by (x-me) for monomethyl-alkanes, (x,x-dime) for dimethylalkanes and (x,x,x-trime) for trimethylalkanes.

RESULTS

T. dimidiata - Typical gas chromatographic profiles of hydrocarbons extracted from individual male and female wings of *T. dimidiata* are shown in Fig. 1 A-B. The straight

chain hydrocarbon components comprised saturated chains ranging from C22 up to 35 total carbons and accounted for 64.1% (males) and 50.4% (females) of the total wing hydrocarbon extract. Odd-chain components prevailed, with *n*-C31 accounting for 35.8% (males) and 20.9% (females) of the total hydrocarbon, followed by *n*-C29, *n*-C27 and *n*-C33; smaller amounts of even-numbered hydrocarbons, *n*-C22 through *n*-C30, were also detected (Table II).



Fig. 1: capillary gas chromatography profiles of the cuticular hydrocarbons of *Triatoma dimidiata*. A: adult females; B: adult males. Numbers indicating each hydrocarbon peak are indicated in A, and correspond to peak numbers from Table II.

Kovats Male Female Peak Hydrocarbon a° Indices % b° S.E. % S.E. nonome C22 2259 0.2 0.0 Uraces 0.0 1 n-C23 2300 0.4 0.1 0.2 0.1 5 internally branched monome C23 2332 0.2 0.0 Uraces 0.0 6 5-me C23 2354 0.2 0.1 0.2 0.1 7 unknown 2390 0.2 0.1 traces 0.0 9 n-C24 2400 0.6 0.2 0.3 0.22 10 internally branched monome C25 2557 0.2 0.1 0.1 0.1 11 n-C26 2600 0.8 0.2 0.7 0.0 12 n-C27 2700 5.4 0.4 7.4 1.3 13 x.xdime C27 2815 1.9 0.2 2.6 0.1 14	Percent hydrocarbons from selected components of <i>Triatoma aimidiata</i>								
Peak Hydrocarbon a^{o} Indices % b^{o} S.E. % S.E. 1 n. C22 2200 0,1 0,0 traces 0,0 3 n. C23 2300 0,4 0,1 0,2 0,1 4 internally branched monome C23 2332 0,2 0,0 traces 0,0 5 internally branched monome C23 2332 0,2 0,1 0,2 0,1 7 unknown 2390 0,2 0,1 traces 0,0 8 n.C24 2400 0,6 0,2 0,3 0,2 9 n.C25 2500 1,4 0,2 1,9 0,2 10 internally branched monome C25 2527 0,2 0,1 traces 0,0 11 n.C26 2600 0,8 0,2 0,7 0,0 12 n.C27 2759 0,3 0,1 traces 0,0 13 x,x,-dime C27 275			Kovats	Male		Female			
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2	monome- C22	2259	0,2	0,0	0,2	0,1		
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17 $n - C29$ 290013,30,712,82,018internally branched monome C2929240,10,00,50,219 $n - C30$ 30001,20,21,00,1203,x,x-trime C29 + monome C30303411,11,813,80,721 $x,x-dime C30$ 30580,10,00,30,122unknown3085traces0,00,20,223 $n - C31$ 310031,72,720,81,4245-me C313150traces0,00,20,227 $x,x-dime C31 + x,x,x,-$ trime C313180traces0,00,20,227 $x,x,x,r.$ trime C3131900,70,10,50,028 $3,x,x-$ trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,20,20,131internally branched monome C333329traces0,00,20,20,1334-me C343458traces0,00,20,20,237 $x,x-dime C35$ 35000,10,1traces0,00,20,237 $x,x-dime C35$ 3530traces0,00,20,20,234 $me C34$ 3458traces0,00,20,20,237 $x,x-dime C35$ 3553traces0,00,20,20,2<	16	internally branched monome C28	2832	traces	0.0	traces	0.0		
18internally branched monome C2929240,10,00,50,219 n -C3030001,20,21,00,120 $3,x,x$ -trime C29 + monome C30303411,11,813,80,721 x,x -dime C3030580,10,00,30,122unknown3085traces0,00,20,223 n -C31310031,72,720,81,4245-me C313150traces0,00,10,125 x,x -dime C313170traces0,00,20,226 x,x -dime C313180traces0,00,20,226 x,x -dime C31 + x,x,x -trime C313180traces0,00,20,227 x,x,x -trime C3131900,70,10,50,028 $3x,x$ -trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,130 n -C3333007,51,33,80,131internally branched monome C33329traces0,00,20,223 x,x -trime C3334474,20,74,30,3334- me C343458traces0,00,20,2353530traces0,00,20,20,2365- me C353553traces0,00,20,2 <tr< td=""><td>17</td><td><i>n</i>- C29</td><td>2900</td><td>13.3</td><td>0.7</td><td>12.8</td><td>2.0</td></tr<>	17	<i>n</i> - C29	2900	13.3	0.7	12.8	2.0		
10 $n \cdot C30$ $1,2$ $0,2$ $1,0$ $0,1$ 20 $3,x,x$ -trime C29 + monome C30 3034 $11,1$ $1,8$ $13,8$ $0,7$ 21 $x,x-dime C30$ 3058 $0,1$ $0,0$ $0,3$ $0,1$ 21 $x,x-dime C30$ 3058 $0,1$ $0,0$ $0,3$ $0,1$ 21 $x,x-dime C31$ 3058 $0,1$ $0,0$ $0,2$ $0,2$ 23 $n \cdot C31$ 3100 $31,7$ $2,7$ $20,8$ $1,4$ 24 $5-me C31$ 3170 traces $0,0$ $0,1$ $0,1$ 25 $x,x-dime C31 + x,x,x-trime C31$ 3180 traces $0,0$ $0,2$ $0,2$ 26 $x,x-dime C31 + x,x,x-trime C31$ 3190 $0,7$ $0,1$ $0,5$ $0,0$ 28 $3,x,x-trime C31 + moome C32$ 3237 $8,9$ $1,4$ $7,8$ $0,5$ 9unknown 3250 traces $0,0$ $0,1$ $0,1$ 30 $n \cdot C33$ 3300 $7,5$ $1,3$ $3,8$ $0,1$ 31internally branched monome C33 3329 traces $0,0$ $0,2$ $0,2$ 33 $4 - m C34$ 3458 traces $0,0$ $0,2$ $0,2$ $0,2$ 35 3500 $0,1$ $0,1$ $1,1$ traces $0,0$ 35internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 $5 - m C35$ 3553 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 <t< td=""><td>18</td><td>internally branched monome C29</td><td>2924</td><td>0.1</td><td>0.0</td><td>0.5</td><td>0.2</td></t<>	18	internally branched monome C29	2924	0.1	0.0	0.5	0.2		
20 $3,xx$ - trime C29 + monome C30 3034 $11,1$ $1,8$ $13,8$ $0,7$ 21 x,x - dime C30 3058 $0,1$ $0,0$ $0,3$ $0,1$ 21 $uxhnown$ 3085 traces $0,0$ $0,2$ $0,2$ 23 n - C31 3100 $31,7$ $2,7$ $20,8$ $1,4$ 24 5 -me C31 3150 traces $0,0$ $0,2$ $0,2$ 26 x,x - dime C31 3170 traces $0,0$ $0,2$ $0,2$ 27 $x,x,x,-$ trime C31 3180 traces $0,0$ $0,2$ $0,2$ 28 $3,x,x$ - trime C31 3190 $0,7$ $0,1$ $0,5$ $0,0$ 29unknown 3250 traces $0,0$ $0,1$ $0,1$ 30 n - C33 3300 $7,5$ $1,3$ $3,8$ $0,1$ 31internally branched monome C33 3329 traces $0,0$ $0,1$ $0,1$ 32 $3,x,x$ - trime C33 3447 $4,2$ $0,7$ $4,3$ $0,3$ 33 4 -me C34 3458 traces $0,0$ $0,1$ $0,1$ 34 n - C35 3530 traces $0,0$ $0,2$ $0,2$ 35 5 -me C35 3553 traces $0,0$ $0,2$ $0,2$ 36 5 - me C36 3645 $0,2$ $0,0$ $0,2$ $0,2$ 36 5 - me C36 3645 $0,2$ $0,0$ $0,2$ $0,2$ 36 5 - me C36 3645 $0,2$ $0,0$	19	<i>n</i> - C30	3000	1.2	0.2	1.0	0.1		
21x,x-dime C3030580,10,00,30,122unknown3085traces0,00,20,223 n - C31310031,72,720,81,4245-me C313150traces0,00,10,126x,x-dime C313170traces0,00,20,226x,x-dime C31 + x,x,x,-trime C313180traces0,00,20,227x,x,x,-trime C3131900,70,10,50,0283,x,x-trime C3131900,70,10,50,029unknown3250traces0,00,10,130 n - C3333007,51,33,80,131internally branched monome C333329traces0,00,10,131internally branched monome C3535000,10,10,10,1334- me C343458traces0,00,20,235internally branched monome C353530traces0,00,20,2365- me C353553traces0,00,20,20,237x,x- dime C36 (?)3651traces0,00,10,041x,x-trime C3636450,20,0traces0,043internally branched monome C3737280,30,10,40,2445- me C3737530,30,22,8<	20	3.x.x- trime C29 + monome C30	3034	11.1	1.8	13.8	0.7		
22unknown3085traces0,00,20,223 n -C313100 $31,7$ $2,7$ 20,81,4245-me C313150traces0,00,10,125 x,x -dime C313170traces0,00,20,226 x,x -dime C313170traces0,00,20,227 $x,x,x,x,-$ trime C313180traces0,00,20,227 $x,x,x,-$ trime C3131900,70,10,50,028 $3,x,x-$ trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,131internally branched monome C333329traces0,00,20,231 $3,x,x-$ trime C3334474,20,74,30,3334-me C343458traces0,00,10,134 n -C3535000,10,1traces0,035internally branched monome C353530traces0,00,20,2365-me C353550traces0,00,20,20,237 $x,x-$ dime C36 (?)3651traces0,00,20,239 $x-$ me C3636450,20,0uraces0,041 $x,x,x-$ trime C3636800,10,1uraces0,043internally branched monome C3737730,30,2	21	x.x- dime C30	3058	0.1	0.0	0.3	0.1		
23 $n \cdot C31$ 3100 $31,7$ $2,7$ $20,8$ $1,4$ 24 $5 \cdot mc C31$ 3150 traces $0,0$ $0,1$ $0,1$ 25 $x,x \cdot dime C31$ 3170 traces $0,0$ $0,2$ $0,2$ 26 $x,x,x, \cdot trime C31 + x,x,x, - trime C31$ 3180 traces $0,0$ $0,2$ $0,2$ 27 $x,x,x, - trime C31 + monome C32$ 3237 $8,9$ $1,4$ $7,8$ $0,5$ 29unknown 3250 traces $0,0$ $0,1$ $0,1$ $0,1$ 30 $n \cdot C33$ 3300 $7,5$ $1,3$ $3,8$ $0,1$ 31internally branched monome C33 3329 traces $0,0$ $0,2$ $0,2$ 33 $4 \cdot me C34$ 3458 traces $0,0$ $0,1$ $0,1$ 33 $4 \cdot me C34$ 3458 traces $0,0$ $0,2$ $0,2$ 35internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 $5 \cdot me C35$ 3553 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 $x,x - dime C36 + x,x,x - trime C35$ 3580 traces $0,0$ $0,2$ $0,2$ 39 $x - me C36$ 3645 $0,2$ $0,0$ traces $0,0$ 41 $x,x,x - trime C36$ 3660 $0,1$ $0,1$ $0,6$ $0,3$ 44 $5 - me C37$ 3753 $0,3$ $0,1$ $0,4$ $0,2$ 45 $x,x - dime C37$ 3777 $1,8$ $0,4$ $5,0$ <td>22</td> <td>unknown</td> <td>3085</td> <td>traces</td> <td>0.0</td> <td>0.2</td> <td>0.2</td>	22	unknown	3085	traces	0.0	0.2	0.2		
245-me C313150traces0,00,10,125x,x-dime C313170traces0,00,20,226x,x-dime C31 + x,x,x-trime C313180traces0,00,20,227x,x,x-trime C3131900,70,10,50,0283,x,x-trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,130n- C3333007,51,33,80,131internally branched monome C333329traces0,00,20,1323,x,x-trime C3334474,20,74,30,3334-me C343458traces0,00,10,134n- C3535000,10,1traces0,035internally branched monome C353530traces0,00,20,2365-me C353580traces0,00,20,20,237x,x-dime C35 + x,x,x- trime C353580traces0,00,20,238internally branched monome C363628traces0,00,10,140x-me C36 (?)3651traces0,00,10,041x,x,x- trime C3636800,10,10,60,342unknown37130,10,1traces0,043internally branched monome C373733	23	<i>n</i> -C31	3100	31.7	2.7	20.8	1.4		
25x,x-dime C313170traces0,00,20,226x,x-dime C31 + x,x,x- trime C313180traces0,00,20,227x,x,x,- trime C3131900,70,10,50,0283,x,x- trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,130 n - C3333007,51,33,80,131internally branched monome C333329traces0,00,20,1323,x,x- trime C343458traces0,00,10,1334-me C343458traces0,00,20,235internally branched monome C353530traces0,00,20,235internally branched monome C353530traces0,00,20,2365-me C353530traces0,00,20,20,237x,x- dime C35 + x,x,x- trime C353580traces0,00,20,238internally branched monome C363628traces0,00,10,040x-me C36 (?)3651traces0,00,10,041x,x,x- trime C3636800,10,10,60,3445-me C3737530,30,10,40,245x,x- dime C3737530,30,22,80,4463 x, dime C37	24	5-me C31	3150	traces	0.0	0.1	0.1		
26x,x- dime C31 + x,x,x,- trime C313180traces0,00,20,227x,x,x,- trime C3131900,70,10,50,0283,x,x- trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,130 n -C3333007,51,33,80,131internally branched monome C333329traces0,00,20,131a,x,x- trime C3434474,20,74,30,3334- me C343458traces0,00,10,134 n -C3535000,10,1traces0,035internally branched monome C353530traces0,00,20,2365- me C353553traces0,00,20,20,237x,x- dime C35 + x,x,x- trime C353580traces0,00,20,20,239x- me C3636450,20,0traces0,00,10,041x,x,x- trime C3636800,10,10,60,342unknown37130,10,10,40,2445- me C3737530,30,22,80,4455,00,5463	25	x.x- dime C31	3170	traces	0.0	0.2	0.2		
27 $x_x x_x$ - trime C3131900,70,10,50,028 $3,x,x$ - trime C31 + monome C32 3237 $8,9$ $1,4$ $7,8$ $0,5$ 29unknown 3250 traces $0,0$ $0,1$ $0,1$ $0,1$ 30 n -C33 3300 $7,5$ $1,3$ $3,8$ $0,1$ 31internally branched monome C33 3329 traces $0,0$ $0,2$ $0,1$ 32 $3,x,x$ - trime C33 3447 $4,2$ $0,7$ $4,3$ $0,3$ 334- me C34 3458 traces $0,0$ $0,1$ $0,1$ 34 n -C35 3500 $0,1$ $0,1$ traces $0,0$ 35internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 365- me C35 3500 $0,1$ $0,1$ traces $0,0$ $0,2$ $0,2$ 365- me C35 3530 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3580 traces $0,0$ $0,2$ $0,2$ 38internally branched monome C36 3628 traces $0,0$ $0,2$ $0,2$ 39 x - me C36 3645 $0,2$ $0,0$ traces $0,0$ 41 x,x,x - trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42unknown 3713 $0,1$ $0,1$ $0,4$ $0,2$ 43internally branched monome C37 3728 $0,3$ $0,1$	26	x.x- dime C31 + $x.x.x$ - trime C31	3180	traces	0.0	0.2	0.2		
283,x,x- trime C31 + monome C3232378,91,47,80,529unknown3250traces0,00,10,130 n - C3333007,51,33,80,131internally branched monome C333329traces0,00,20,1323,x,x- trime C3334474,20,74,30,3334- me C343458traces0,00,10,134 n - C3535000,10,1traces0,035internally branched monome C353530traces0,00,20,2365- me C353553traces0,00,20,20,2365- me C35 + x,x,x- trime C353580traces0,00,90,738internally branched monome C363628traces0,00,20,239x- me C3636450,20,0traces0,040x- me C36 (?)3651traces0,00,10,041x,x,x- trime C3636800,10,10,60,342unknown37130,10,10,40,2445- me C3737530,30,22,80,445x,x- dime C3737771,80,45,00,5	27	x.x.x trime C31	3190	0.7	0.1	0.5	0.0		
29unknown3250traces0,00,10,130 n -C3333007,51,33,80,131internally branched monome C333329traces0,00,20,132 $3,x,x$ - trime C3334474,20,74,30,3334- me C343458traces0,00,10,134 n -C3535000,10,1traces0,035internally branched monome C353530traces0,00,20,2365- me C353553traces0,00,20,20,237 x,x - dime C35 + x,x,x - trime C353580traces0,00,20,20,238internally branched monome C363628traces0,00,10,10,039 x - me C3636450,20,0traces0,00,10,041 x,x,x - trime C3636800,10,10,60,342unknown37130,10,1traces0,043internally branched monome C3737280,30,10,40,2445- me C3737530,30,22,80,445 x,x - dime C3737771,80,45,00,5	28	3.x.x- trime C31 + monome C32	3237	8.9	1.4	7.8	0.5		
30 $n - C33$ 3300 $7,5$ $1,3$ $3,8$ $0,1$ 31internally branched monome C33 3329 traces $0,0$ $0,2$ $0,1$ 32 $3,x,x$ - trime C33 3447 $4,2$ $0,7$ $4,3$ $0,3$ 33 4 - me C34 3458 traces $0,0$ $0,1$ $0,1$ 34 $n - C35$ 3500 $0,1$ $0,1$ traces $0,0$ 35 internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 5 - me C35 3553 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3580 traces $0,0$ $0,2$ $0,2$ 38 internally branched monome C36 3628 traces $0,0$ $0,2$ $0,2$ 39 x - me C36 3645 $0,2$ $0,0$ traces $0,0$ 40 x - me C36 (?) 3651 traces $0,0$ $0,1$ $0,0$ 41 x,x,x - trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ $0,4$ $0,2$ 44 5 - me C37 3753 $0,3$ $0,1$ $0,4$ $0,2$ 44 5 - me C37 3777 $1,8$ $0,4$ $5,0$ $0,5$	29	unknown	3250	traces	0.0	0.1	0.1		
31internally branched monome C333329traces0,00,20,132 $3,x,x-$ trime C33 3447 $4,2$ $0,7$ $4,3$ $0,3$ 33 $4-$ me C34 3458 traces $0,0$ $0,1$ $0,1$ 34 $n-$ C35 3500 $0,1$ $0,1$ traces $0,0$ 35 internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 $5-$ me C35 3553 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 $x,x-$ dime C35 + $x,x,x-$ trime C35 3580 traces $0,0$ $0,2$ $0,2$ 38 internally branched monome C36 3628 traces $0,0$ $0,2$ $0,2$ 39 $x-$ me C36 3645 $0,2$ $0,0$ traces $0,0$ 41 $x,x,x-$ trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ $0,6$ $0,3$ 44 $5-$ me C37 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45 $x,x-$ dime C37 3707 $1,8$ $0,4$ $5,0$ $0,5$	30	n- C33	3300	7.5	1.3	3.8	0.1		
32 $3,x,x$ - trime C33 3447 $4,2$ $0,7$ $4,3$ $0,3$ 33 $4 - \text{me C34}$ 3458 traces $0,0$ $0,1$ $0,1$ 34 $n - \text{C35}$ 3500 $0,1$ $0,1$ traces $0,0$ 35 internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 $5 - \text{me C35}$ 3553 traces $0,0$ $0,2$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3580 traces $0,0$ $0,9$ $0,7$ 38 internally branched monome C36 3628 traces $0,0$ $0,2$ $0,2$ 39 $x - \text{me C36}$ 3645 $0,2$ $0,0$ traces $0,0$ 41 x,x,x - trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ $0,6$ $0,3$ 44 $5 - \text{me C37}$ 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45 x,x -dime C37 37077 $1,8$ $0,4$ $5,0$ $0,5$	31	internally branched monome C33	3329	traces	0.0	0.2	0.1		
33 $4 - me C34$ 3458 $traces$ $0,0$ $0,1$ $0,1$ 34 $n - C35$ 3500 $0,1$ $0,1$ $traces$ $0,0$ $0,2$ $0,2$ 35 internally branched monome C35 3530 $traces$ $0,0$ $0,2$ $0,2$ $0,2$ 36 $5 - me C35$ 3553 $traces$ $0,0$ $0,2$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3580 $traces$ $0,0$ $0,9$ $0,7$ 38 internally branched monome C36 3628 $traces$ $0,0$ $0,2$ $0,2$ 39 $x - me C36$ 3645 $0,2$ $0,0$ $traces$ $0,0$ 40 $x - me C36$ (?) 3651 $traces$ $0,0$ $0,1$ $0,0$ 41 x,x,x -trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ $0,6$ $0,3$ 44 $5 - me C37$ 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45 x,x -dime C37 37077 $1,8$ $0,4$ $5,0$ $0,5$	32	3.x.x- trime C33	3447	4.2	0.7	4.3	0.3		
34 $n - C35$ 3500 $0,1$ $traces$ $0,0$ 35 internally branched monome C35 3530 traces $0,0$ $0,2$ $0,2$ 36 $5 - me C35$ 3553 traces $0,0$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3580 traces $0,0$ $0,9$ $0,7$ 38 internally branched monome C36 3628 traces $0,0$ $0,2$ $0,2$ 39 $x - me C36$ 3645 $0,2$ $0,0$ traces $0,0$ 40 $x - me C36$ (?) 3651 traces $0,0$ $0,1$ $0,0$ 41 x,x,x - trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ traces $0,0$ 43 internally branched monome C37 3728 $0,3$ $0,1$ $0,4$ $0,2$ 44 $5 - me C37$ 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45 x,x -dime C37 3800 $0,2$ $0,1$ $0,6$ $0,1$	33	4- me C34	3458	traces	0.0	0.1	0.1		
35internally branched monome C353530traces0,00,20,236 $5 - \text{me C35}$ 3553 traces0,00,20,237 $x,x- \dime C35 + x,x,x- trime C35$ 3580 traces0,00,90,738internally branched monome C36 3628 traces0,00,20,239 $x - \text{me C36}$ 3645 0,20,0traces0,040 $x - \text{me C36}$ 3651 traces0,00,10,041 $x,x,x- \text{trime C36}$ 3680 0,10,10,60,342unknown 3713 0,10,1traces0,043internally branched monome C37 3728 0,30,10,40,244 $5 - \text{me C37}$ 3753 0,30,22,80,445 $x,x- \dime C37$ 3777 1,80,45,00,546 $3x - \dime C37$ 3800 0,20,10,60,1	34	n- C35	3500	0.1	0.1	traces	0.0		
36 $5 - me C35$ 3553 $traces$ $0,0$ $0,2$ $0,2$ 37 x,x - dime C35 + x,x,x - trime C35 3553 $traces$ $0,0$ $0,9$ $0,7$ 38 internally branched monome C36 3628 $traces$ $0,0$ $0,2$ $0,2$ 39 x - me C36 3645 $0,2$ $0,0$ $traces$ $0,0$ 40 x - me C36 (?) 3651 $traces$ $0,0$ $0,1$ $0,0$ 41 x,x,x - trime C36 3680 $0,1$ $0,1$ $0,6$ $0,3$ 42 unknown 3713 $0,1$ $0,1$ $traces$ $0,0$ 43 internally branched monome C37 3728 $0,3$ $0,1$ $0,4$ $0,2$ 44 5 - me C37 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45 x,x - dime C37 3777 $1,8$ $0,4$ $5,0$ $0,5$ 46 $3x$ - dime C37 3800 $0,2$ $0,1$ $0,6$ $0,1$	35	internally branched monome C35	3530	traces	0.0	0.2	0.2		
37 $x,x-dime C35 + x,x,x-trime C353580traces0,00,20,238internally branched monome C363628traces0,00,20,239x-me C3636450,20,0traces0,040x-me C36 (?)3651traces0,00,10,041x,x,x- trime C3636800,10,10,60,342unknown37130,10,1traces0,043internally branched monome C3737280,30,10,40,2445-me C3737530,30,22,80,445x,x- dime C3737771,80,45,00,5463x- dime C3738000,20,10,60,1$	36	5- me C35	3553	traces	0.0	0.2	0.2		
38 internally branched monome C36 3628 traces 0,0 0,2 0,2 39 x- me C36 3645 0,2 0,0 traces 0,0 40 x- me C36 (?) 3651 traces 0,0 0,1 0,0 41 x,x,x- trime C36 3680 0,1 0,1 0,6 0,3 42 unknown 3713 0,1 0,1 traces 0,0 43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0.2 0.1 0.6 0.1	37	x_x -dime C35 + x_x x-trime C35	3580	traces	0.0	0.9	0.7		
39 x- me C36 3645 0,2 0,0 traces 0,0 40 x- me C36 (?) 3651 traces 0,0 0,1 0,0 41 x,x,x- trime C36 3680 0,1 0,1 0,6 0,3 42 unknown 3713 0,1 0,1 0,6 0,3 43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0,2 0,1 0,6 0,1	38	internally branched monome C36	3628	traces	0,0	0,2	0.2		
40 x - me C36 (?) 3651 traces 0,0 0,1 0,0 41 x,x,x- trime C36 3680 0,1 0,1 0,6 0,3 42 unknown 3713 0,1 0,1 0,6 0,3 43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0.2 0.1 0.6 0.1	39	x-me C36	3645	0.2	0,0	traces	0,0		
41 x,x,x- trime C36 3680 0,1 0,1 0,6 0,3 42 unknown 3713 0,1 0,1 traces 0,0 43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0,2 0,1 0,6 0,1	40	x - me C36(?)	3651	traces	0,0	0.1	0,0		
42 unknown 3713 0,1 0,1 traces 0,0 43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0,2 0,1 0,6 0,1	41	x x x-trime C36	3680	0.1	0.1	0.6	03		
43 internally branched monome C37 3728 0,3 0,1 0,4 0,2 44 5- me C37 3753 0,3 0,2 2,8 0,4 45 x,x- dime C37 3777 1,8 0,4 5,0 0,5 46 3 x- dime C37 3800 0.2 0.1 0.6 0.1	42	unknown	3713	0.1	0.1	traces	0,0		
445- me C37 3753 $0,3$ $0,2$ $2,8$ $0,4$ 45x,x- dime C37 3777 $1,8$ $0,4$ $5,0$ $0,5$ 46 $3x$ - dime C37 3800 02 01 06 01	43	internally branched monome C37	3728	0.3	0.1	0.4	0,0		
45 x,x -dime C37 3777 $1,8$ $0,4$ $5,0$ $0,5$ 46 $3x$ -dime C37 3800 0.2 0.1 0.6 0.1	44	5- me C37	3753	0,3	0.2	2.8	0,2 04		
$46 3 \text{ x-dime} C37 \qquad \qquad 3800 \qquad 0.2 \qquad 0.1 \qquad \qquad 0.6 \qquad 0.1$	45	x x - dime C37	3777	1.8	0.4	5.0	0,5		
	46	3 x- dime C37	3800	0.2	0.1	0.6	0,5		

TABLE II Percent hydrocarbons from selected components of *Triatoma dimidiata*

a: hydrocarbon and peak numbers are the same as reported in Fig. 1; *b*: means were compared by the unpaired t test, differences between males and females were extremely significant for peaks 2815 and 3777 (P < 0.0001), very significant for 3100 and 3852 KI (P < 0.005), and significant for peaks 3300, 3851 and 3952 KI (P < 0.03) n = 4 for females, n = 9 for males. n = 4 for females, n = 9 for males

0,4

1,4

0,4

0,6

0,1

0,5

0,4

1,1

traces

traces

0,6

0,1

0,2

0,1

0,2

0,1

0,2

0,2

0,2

0,0

0,0

0,6

2,2

0,1

traces

traces

0,5

1,9

1,3

0,2

0,3

1,0

0,2

0,2

0,0

0,0

0,0

0,2

0,9

0,5

0,1

0,3

3825

3852

3874

3900

3915

3930

3952

3976

4000

4053

47

48

49

50

51

52

53

54

55

56

internally branched monome C38

internally branched monome C39

x,x- dime C39 + x,x,x- trime C39

x,x-dime C38

x,x-dime C38

unknown

5- me C39

unknown

unknown

branched/normal

x,x,x- trime C38

Among the methyl-branched alkanes, the major components consisted of a mixture of different isomers of terminally branched trimethyl odd chains together with internally branched monomethyl of even numbered chain, eluting at 3034 KI (3,x,x- trimethylC29 plus x- methyl C30) and 3237 KI (3,x,x- trimethyl C31 plus x- methyl C32), followed by 3,x,x- trimethyl C33 (3447 KI), 3,x- dimethyl C27 (2815 KI), and internally branched x,x- dimethyl C37 (3777 KI), x,x- dimethyl C38 (3852 KI) and at 3976 KI eluted a mixture of x,x- dimethyl and x,x,x- trimethyl C39. Sexual differences evaluated by the unpaired t test were very significant for the peak eluting at 3100 KI, the major hydrocarbon component *n*-C31, extremely significant (P <0.005) for peaks of 3777 and 2815 KI (P < 0.0001) corresponding to x,x- dimethyl C37 and 3,x- dimethyl C27, respectively. Significant differences were found for peaks eluting at 3300, 3852 and 3952 KI (P = 0.02) (Table II). Four peaks were selected for peak ratios (R values) to evaluate sex-dependant, quantitative differences in hydrocarbon components, and the comparison of three R values separated T. dimidiata males and females at the 95% level of confidence (Table III). In addition, females had higher amounts of methyl-branched components than males with a branched to normal ratio of 0.98 for females and 0.56 for males. Peaks at 3150, 3170, and 3180 KI corresponding to mono-, di- and trimethyl C31 as well as mono-, di-, and trimethyl C35 eluting at 3530, 3553 and 3580 KI, and monomethyl C36 (3628 KI) were detectable in females, but less apparent in males.

T. barberi - Fig. 2A, B shows the gas chromatographic traces for adult males and females of T. barberi. The major n-alkanes are n-C29, n-C31, together with n-C33 and n-C27, plus minor amounts of straight chains from 22 to 37 carbons representing 57.9-52.5% respectively of the total hydrocarbons. Major methyl-branched components corresponded to mono-, di- and trimethyl derivatives of C33, C35 and C37 chains, with a branched to normal ratio of 0.90 for males and 0.73 for females. The KI values agreed well with one methyl group internally and subterminally located, dimethyl isomers with at least one methyl inserted internally, subterminal or terminally, and when three methyl groups were present, they were located at internal positions. Minor amounts of mono-, di- and trimethyl derivatives of C32, C34, C36 were observed as well as monoand dimethyl-C25, C27, C29 and C31 chains (Table IV); differences between males and females were not significant.

D. maxima - *D. maxima* hydrocarbon profiles showed a predominance of normal chains with a branched to normal ratio of 0.67 for males and 0.50 for females (Table V, Fig. 3), and no sexual dimorphism was evident. The major alkane was *n*-C31, followed by *n*-C29 and *n*-C33 which together accounted for 52.8% of total hydrocarbon for males and 61.1% for females. In the methylbranched fraction, three isomer series of 35, 37 and 39 atoms in the carbon backbone together with minor amounts of 4-me C34 and two series of 36 and 38 carbons were the prevailing branched structures.

DISCUSSION

Analysis of insect cuticular hydrocarbons was shown to be useful for discriminating members of a number of insect complexes, among them the *Anopheles gambiae* complex (Carlson & Service 1979, Milligan et al. 1986), *A. maculipennis* complex (Phillips et al. 1988), and Glossina species (Carlson et al. 1993). Within the Triatominae, cuticular hydrocarbon analysis can help in differenciating species of the *infestans* complex (Juárez & Brenner 1985), and also provides phylogenetic markers for comparing the main genera, *Triatoma, Rhodnius* and *Panstrongylus* (Juárez et al. 2000). The hydrocarbon structures of the Mexican species *T. pallidipennis* and *T. mazzotti*, both included in the *phyllosoma* complex, were previously determined by CGC coupled to mass spectrometry (MS) (Juárez & Brenner 1987, Juárez & Blomquist 1993).

Gas chromatographic analysis of adults of T. dimidiata, T. barberi and D. maxima showed characteristic hydrocarbon profiles, with carbon number ranging from 22 to more than 40, with a mixture of saturated straight and methyl-branched chains, with one, two, and three methyl groups, external and internally located. Methylbranched chains exhibited methyl-branching patterns consistent with previous data from other Triatominae (Juárez & Blomquist 1993, Juárez et al. 2000, 2001). However, when T. dimidiata was compared to closely related species T. pallidipennis and T. mazzotti (phyllosoma complex), differences were evident. T. dimidiata showed larger amounts of branched chains, with terminally mono, diand trimethyl derivatives of C29, C31 and C33 accounting for 26% of the total hydrocarbon content, whereas these components were present in minor amounts in the other species (Juárez & Blomquist 1993). The major components for both species eluted quite closely at 37.9 ECL (corresponding to 3790 KI), the mass spectral identification showed large amounts of a mixture of x,x-dimethyl C37 together with x-me C38 for T. pallidipennis (Juárez & Brenner 1987) and at 37.7 ECL (ca. 3770 KI) for T. mazzotti (Juárez & Blomquist 1993); T. dimidiata showed a peak eluting at 3770 KI (x,x- dimethyl C37), although quantitatively less relevant. Sex-dependant, quantitative differences in certain hydrocarbons were found in T. dimidiata. The comparison of three selected peak ratios (R values)

TABLE III

R values	for selected	peaks in Triate	oma dimidiata	adult insects
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T. dimidiata	3034/3100 ± SE ^a	$3300/3777\pm SE$	$3777/3100\pm SE$
Males Females	$\begin{array}{c} 0.36^b \pm 0.11 \\ 0.67 \ \pm \ 0.12 \end{array}$	$\begin{array}{c} 4.14 \pm 0.14 \\ 0.78 \pm 0.12 \end{array}$	$\begin{array}{c} 0.06 \pm 0.04 \\ 0.24 \pm 0.08 \end{array}$

a: peak ratios calculated from data shown in Table II; *b*: means differed significantly at the 95% level of confidence; n = 4 for females, n = 9 for males



Fig. 2: capillary gas chromatography profiles of the cuticular hydrocarbons of *Triatoma barberi*. A: corresponds to adult females; B: adult males. Numbers indicating each hydrocarbon peak are indicated in A, and correspond to peak numbers from Table IV.

separated *T. dimidiata* males and females at the 95% level of confidence (Table III) however, both sexes were not distinguishable for *T. barberi* and *D. maxima*.

Analysis at genus level based on the complete 18S rRNA gene showed the impossibility of distinguishing the genera Dipetalogaster, Panstrongylus and Triatoma (Bargues et al. 2000), however the rather simple hydrocarbon pattern of *Dipetalogaster* is easily differentiated from both Triatominii (Juárez et al. 2000). The analysis of triatomine wings by CGC is reliable and thus enables comparison of these data to those obtained by other techniques for specimen identification on the same insect, and collaborative work is presently addressing this subject. Among more than 130 species reported for Triatominae, the cuticular hydrocarbon structure and CGC profiles for species with major epidemiological significance, T. infestans, T. brasiliensis, Rhodnius prolixus and a number of related species, were previously reported (Juárez & Blomquist 1993, Juárez et al. 2000, 2001). A pattern of primarily quantitative rather than qualitative differences reinforces the idea that epicuticular hydrocarbons represent relatively primitive characters for these insects. T. dimidiata showed a simpler hydrocarbon fingerprint and is easily separated from species of the phyllosoma complex (Juárez & Brenner 1986, Juárez & Blomquist 1993). Within each genera examined there was an indication that species from drier regions present more complex cuticular hydrocarbon profiles than their congenerics from wetter regions. Although interspecific variations might be more relevant, the complexity of the hydrocarbon pattern of T. *dimidiata* was intermediate between those reported for T. tibiamaculata and T. vitticeps from high relative humidity (RH) coastal regions, and that for T. infestans from varying RH areas (Juárez et al. 2000). T. barberi of drier regions, showed a more complex pattern. D. maxima surface hydrocarbon mixture showed the largest amounts of straight chains from 60% to 67.8% of the total hydrocarbon mixture, for males and females respectively; the relative abundance of *n*-alkanes might be related to exposure to warm conditions.

			Male		Female	Female	
Peak	Hydrocarbon ^a	Kovats Indices	% b	S.E.	%	S.E.	
1	<i>n</i> - C22	2200	0,3	0,1	0,3	0,0	
2	<i>n</i> - C23	2300	0,5	0,1	0,3	0,0	
3	<i>n</i> - C24	2400	1,1	0,1	1,1	0,2	
4	<i>n</i> - C25	2500	1,1	0,1	1,1	0,2	
5	x- me + x,x- dime C25	2540	0,3	0,1	0,3	0,0	
6	<i>n</i> - C26	2600	0,4	0,0	0,5	0,1	
7	<i>n</i> - C27	2700	3,7	1,0	5,5	0,5	
8	5- me C27	2750	0.3	0,1	0,4	0,1	
9	x,x- dime C27	2773	0,2	0,1	0,4	0,1	
10	n- C28	2800	0.8	0.1	1.0	0.1	
11	unknown	2809	traces	0.0	0.5	0.1	
12	unknown	2820	0.3	0.2	1.2	0.3	
13	internally branched monome C28	2831	0.2	0.1	0.7	0.1	
14	n- C29	2900	17.0	1.3	19.6	2.6	
15	$x - me + x x - dime C^{29}$	2941	traces	0.0	0.3	0,0	
16	x = dime(29)	2972	0.1	0,0	0,3	0,0	
17	n - C30	3000	0,1	0.1	1.0	0,0	
18	internally branched monome C30	3033	1.6	0,1	1,0	0,1	
10	A_{-} me $\pm x x_{-}$ dime C30	3058	1,0	0,0	traces	0,4	
20	+ mc $+$ x,x ² unite C50	3100	1,1	0,6	15.0	0,0	
20	<i>n</i> -C31	2140	10,5	0,0	15,0	0,4	
21	J- IIIe CS1	2171	0,4	0,1	0,5	0,0	
22	x, x- diffe C51	2200	1,0	0,5	1,1	0,5	
23	<i>n</i> -C32	3200	0,5	0,1	0,7	0,2	
24	x- me C32	3238	1,2	0,5	1,1	0,3	
25	x,x- dime C32	3262	traces	0,0	0,4	0,0	
26	3 - me + x, x - dime C 32	3275	0,2	0,1	0,4	0,0	
27	n- C33	3300	8,7	0,5	7,2	1,3	
28	x- me C33	3333	0,2	0,1	1,1	0,2	
29	x - me + x, x - dime C33	3339	traces	0,0	0,4	0,0	
30	5 - me + x, x - dime C33	3357	1,6	0,2	1,2	0,4	
31	x,x- dime C33	3369	traces	0,0	0,4	0,0	
32	5,x- dime + x,x,x - trime C33	3381	6,3	1,0	2,4	1,1	
33	3,x- dime C33	3412	3,3	0,8	2,5	0,4	
34	x- me C34	3432	0,1	0,0	0,3	0,0	
35	x- me C34	3446	1,0	0,3	1,5	0,5	
36	4- me + x,x- dime C34	3461	1,5	0,4	1,4	0,2	
37	x,x- dime C34	3473	traces	0,0	0,3	0,0	
38	4,x- dime + x,x,x - trime C34	3489	0,3	0,2	0,5	0,2	
39	<i>n</i> - C35	3500	1,2	0,4	1,1	0,2	
40	4,x,x- trime C34	3519	1,0	0,3	0,7	0,0	
41	internally br- monome C35	3527	1,3	0,2	1,7	0,6	
42	5- me C35	3550	3,0	0,8	1,8	0,4	
43	3- me + x,x- dime C35	3572	2,5	0,4	1,6	0,6	
44	3,x- dime C35	3600	5,8	0,5	5,2	0,6	
45	unknown	3623	0,3	0,1	0,4	0,0	
46	6- me C36	3646	0,6	0,2	0,7	0,2	
47	4- me + x,x- dime C36	3656	0,9	0,3	0,9	0,1	
48	x,x,x- trime C36	3687	0,5	0,2	1,4	0,3	
49	<i>n</i> -C37	3700	0,6	0,4	1,8	0,7	
50	4,x,x- trime C37	3716	4,3	0,9	2,5	0,2	
51	x- me C37	3726	0,6	0,1	0,8	0,1	
52	5- me C37	3747	1,3	0,1	0.8	0.2	
53	3- me + x,x- dime C37	3774	1,1	0,4	1,4	0,2	
54	3.x- dime C37	3800	1.9	0,6	2.7	0.2	
55	x.x.x- trime C38	3887	traces	0.0	0.3	0.1	
56	3.x- dime C39	4004	traces	0.0	0.3	0.0	
	branched/normal		0,9	*	0,7	.,*	

TABLE IV Percent hydrocarbons from selected components of *Triatoma barberi*

a: hydrocarbon and peak numbers are the same as reported in Fig. 2; *b*: differences between means were not significant; n = 4 for females, n = 5 for males

Peak Hydrocarbon a Indices ψ^b S.E. ψ^b S.E. 1 n -C22 2200 0,1 0,1 traces 0,0 3 internally branched monome C23 2338 0,1 0,1 0,1 0,0 4 n -C24 2400 0,2 0,1 0,1 0,0 5 n -C25 2500 0,3 0,1 0,3 0,0 7 n -C26 2600 0,3 0,1 0,3 0,0 9 n -C27 2700 2,1 0,1 3,7 0,9 10 internally branched monome C27 2730 1,4 0,8 0,3 0,1 13 n -C28 2800 0,4 0,1 0,5 0,1 14 unknown 2820 0,2 0,2 traces 0,0 15 internally branched monome C28 2830 0,1 0,0 0,2 0,1 16 n -C30 3000			Kovats	Male		Female	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Peak	Hydrocarbon ^{<i>a</i>}	Indices	% b	S.E.	%	S.E.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1	<i>n</i> - C22	2200	0,1	0,1	traces	0,0
3 internally branched monome C23 2338 0,1 0,1 traces 0,0 4 n-C24 2400 0,2 0,1 0,1 0,0 7 n-C25 2500 0,6 0,1 0,3 0,0 7 n-C27 2700 2,1 0,1 3,7 0,9 10 internally branched monome C27 2730 1,4 0,8 0,3 0,1 11 5-me C27 2749 0,1 0,1 traces 0,0 13 n-C28 2800 0,4 0,1 0,5 0,1 14 unknown 2820 0,2 0,2 traces 0,0 15 internally branched monome C28 2830 0,1 0,0 traces 0,0 15 internally branched monome C30 3034 0,5 0,4 0,3 traces 0,0 16 n-C29 2955 0,4 0,3 0,1 0,1 1,4 3,4 0,2	2	<i>n</i> - C23	2300	0,2	0,1	0,1	0,0
4 $n - C24$ 2400 0.2 0,1 0,1 0,0 5 $n - C25$ 2500 0,6 0,1 0,3 0,1 8 internally branched monome C26 2635 0,3 0,2 traces 0,0 9 $n - C27$ 2700 2,1 0,1 0,3 0,0 10 internally branched monome C27 2730 1,4 0,8 0,3 0,1 11 $5 - me C27$ 2749 0,1 0,1 traces 0,0 13 $n -C28$ 2800 0,4 0,1 0,5 0,1 14 unknown 2820 0,2 0,2 traces 0,0 16 $n -C29$ 2926 0,1 0,0 traces 0,0 18 $5 -me C3$ 3000 1,3 0,1 1,8 0,1 0,1 10 internally branched monome C30 3034 0,5 0,4 0,3 traces 0,0 21 $n-C31$ 3100 25.6 2,8 28.3 2,0 1,0 1,0 <td>3</td> <td>internally branched monome C23</td> <td>2338</td> <td>0,1</td> <td>0,1</td> <td>traces</td> <td>0,0</td>	3	internally branched monome C23	2338	0,1	0,1	traces	0,0
5 $n \cdot C25$ 2500 0.6 0.1 0.5 0.1 7 $n \cdot C26$ 2600 0.3 0.1 0.3 0.0 9 $n \cdot C27$ 2700 2.1 0.1 3.7 0.9 10 internally branched monome C27 2730 1.4 0.8 0.3 0.1 11 5 - me C27 2749 0.1 0.1 traces 0.0 13 $n \cdot C28$ 2800 0.4 0.1 0.5 0.1 14 unknown 2820 0.2 0.2 traces 0.0 15 internally branched monome C28 2830 0.1 0.0 traces 0.0 16 $n \cdot C29$ 2905 0.4 0.3 traces 0.0 18 5-me C29 2905 0.4 0.3 traces 0.0 19 $n \cdot C30$ 3000 1.3 0.1 1.8 0.1 20 internally branched monome C30 3034 0.5 0.5 0.1 0.1 21 $n \cdot C31$ 31	4	n -C24	2400	0,2	0,1	0,1	0,0
7 $n - C25$ 2600 0.3 0.1 0.3 0.0 8 internally branched monome C26 2635 0.3 0.2 traces 0.0 9 $n - C27$ 2700 2.1 0.1 0.1 3.7 0.9 10 internally branched monome C27 2730 1.4 0.8 0.3 0.1 13 $n - C28$ 2800 0.4 0.1 0.5 0.1 14 unknown 2820 0.2 0.2 traces 0.0 16 $n - C29$ 2900 11.7 1.0 15.3 0.5 15 internally branched monome C29 2926 0.1 0.0 traces 0.0 16 $n - C30$ 3000 1.3 0.1 1.8 0.1 10 internally branched monome C30 3034 0.5 0.4 0.9 0.2 2 unknown 3145 0.5 0.5 0.1 0.1 23 $s.x-crime C31$ 3186 1.3	5	n -C25	2500	0,6	0,1	0,5	0,1
8 internally branched monome C26 2635 0.3 0.2 traces 0.0 9 n -C27 2700 2,1 0,1 3,7 0,9 10 internally branched monome C27 2730 1,4 0,8 0,3 0,1 11 5-me C27 2749 0,1 0,1 traces 0,0 13 n -C28 2800 0,4 0,1 0,5 0,1 14 unknown 2820 0,2 0,2 traces 0,0 15 internally branched monome C28 2830 0,1 0,0 traces 0,0 16 n -C29 2900 1,7 1,0 15,3 0,5 17 internally branched monome C30 3034 0,5 0,4 0,9 0,2 19 n -C31 3110 0,5 0,4 0,9 0,2 0,1 1 n -C31 3145 0,5 0,5 0,1 0,1 1 n -C33 </td <td>7</td> <td><i>n</i> -C26</td> <td>2600</td> <td>0,3</td> <td>0,1</td> <td>0,3</td> <td>0,0</td>	7	<i>n</i> -C26	2600	0,3	0,1	0,3	0,0
9 $n \cdot c27$ 2700 2.1 0.1 3.7 0.9 10 internally branched monome C27 2730 1.4 0.8 0.3 0.1 13 $n \cdot c28$ 2800 0.4 0.1 traces 0.0 13 $n \cdot c29$ 2900 0.1 0.1 0.5 0.1 14 unknown 2820 0.2 0.2 traces 0.0 15 internally branched monome C29 2926 0.1 0.0 traces 0.0 16 $n \cdot C29$ 2900 1.1.7 1.0 15.3 0.5 17 internally branched monome C30 3034 0.5 0.4 0.9 0.2 20 internally branched monome C30 3034 0.5 0.4 0.9 0.2 21 $n \cdot C31$ 3145 0.5 0.5 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.1 0.3 0.3 1.3 0.3 1.3 0.3 1.5 1.3 0.1 0.1 <td< td=""><td>8</td><td>internally branched monome C26</td><td>2635</td><td>0,3</td><td>0,2</td><td>traces</td><td>0,0</td></td<>	8	internally branched monome C26	2635	0,3	0,2	traces	0,0
10 internally branched monome C27 2730 1,4 0,8 0,3 0,1 11 5 -me C27 2749 0,1 0,1 traces 0,0 13 n -C28 2800 0,4 0,1 0,5 0,1 14 unknown 2820 0,2 0,2 traces 0,0 15 internally branched monomeC28 2900 11,7 1,0 15,3 0,5 17 internally branched monome C29 2925 0,4 0,3 traces 0,0 18 5-me C29 2955 0,4 0,3 traces 0,0 0,2 0,1 10 internally branched monome C30 3034 0,5 0,4 0,9 0,2 0,1 21 n -C31 3100 25,6 2,8 28,3 2,0 22 unknown 3119 0,1 0,0 0,2 0,1 23 5-me C31 1445 0,5 0,5 0,1 0,0 24 $x,x.x.trime C31 + internally branched 3230 1,8 1,2 $	9	n -C27	2700	2,1	0,1	3,7	0,9
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	10	internally branched monome C27	2730	1,4	0,8	0,3	0,1
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	11	5- me C27	2749	0,1	0,1	traces	0,0
14 unknown 2820 0,2 0,2 traces 0,0 15 internally branched monomeC28 2830 0,1 0,0 0,2 0,0 16 n -C29 2900 11,7 1,0 15,3 0,5 17 internally branched monome C29 2925 0,4 0,3 traces 0,0 18 5 -me C29 2955 0,4 0,3 traces 0,0 20 internally branched monome C30 3034 0,5 0,4 0,9 0,2 0,1 21 n -C31 3100 25,6 2,8 28,3 2,0 0,2 0,1 1,1 23 sx.x-trime C31 3186 1,3 0,2 0,1 1,1 24 x.x.x-trime C31 + internally branched 3230 1,8 1,2 2,5 1,0 75 mcC33 3300 15,4 3,3 1,7,5 1,0 27 5-meC33 3300 15,4 3,3 1,3 0,3 1,3 0,3 20 unknown 3421	13	<i>n</i> -C28	2800	0,4	0,1	0,5	0,1
15 internally branched monomeC28 2830 0,1 0,0 0,2 0,0 16 n -C29 2900 11,7 1,0 15,3 0,5 17 internally branched monome C29 2925 0,4 0,3 traces 0,0 18 5-me C29 2955 0,4 0,3 traces 0,0 19 n -C30 3000 1,3 0,1 1,8 0,1 0 internally branched monome C30 3034 0,5 0,4 0,9 0,2 21 n -C31 3100 25,6 2,8 28,3 2,0 22 unknown 3119 0,1 0,0 0,2 0,1 24 x,x.r. trime C31 3186 1,3 0,2 1,9 0,1 25 x,x trime C31 3185 traces 0,0 0,1 0,0 26 n -C33 3300 15,4 3,3 1,7.5 1,0 26 n -C34 3461 traces 0,0 0,1 0,0 27 5 -meC35	14	unknown	2820	0,2	0,2	traces	0,0
16 $n - C29$ 2900 11,7 1,0 15,3 0,5 17 internally branched monome C29 2925 0,1 0,0 traces 0,0 18 5-me C29 2955 0,4 0,3 traces 0,0 19 n -C30 3000 1,3 0,1 1,8 0,1 20 internally branched monome C30 3034 0,5 0,4 0,9 0,2 21 n -C31 3100 25,6 2,8 28,3 2,0 22 unknown 3119 0,1 0,0 0,2 0,1 23 5-me C31 3186 1,3 0,2 1,9 0,1 24 x,x,x-trime C31 + internally branched 3230 1,8 1,2 2,5 1,0 me C32	15	internally branched monomeC28	2830	0,1	0.0	0,2	0,0
17 internally branched monome C29 2926 0.1 0.0 traces 0.0 18 5-me C29 2955 0.4 0.3 traces 0.0 18 5-me C29 2955 0.4 0.3 traces 0.0 20 internally branched monome C30 3034 0.5 0.4 0.9 0.2 21 n-C31 3100 25.6 2.8 28.3 2.0 2 unknown 3119 0.1 0.0 0.2 0.1 23 5-me C31 3186 1.3 0.2 1.9 0.1 25 3.x.x-trime C31 + internally branched 3230 1.8 1.2 2.5 1.0 26 n -C33 3306 15.4 3.3 1.7.5 1.0 27 5-meC33 3356 traces 0.0 0.1 0.0 28 3.x-dimeC33 3406 1.8 0.3 1.3 0.3 29 unknown 3421 0.0 0.0 0.2 0.1 3.x-dimeC34 3450 <td< td=""><td>16</td><td>n -C29</td><td>2900</td><td>11,7</td><td>1.0</td><td>15.3</td><td>0,5</td></td<>	16	n -C29	2900	11,7	1.0	15.3	0,5
18 5-me $C29$ 2955 0.4 0.3 traces 0.0 19 $n-C30$ 3000 1.3 0.1 1.8 0.1 20 internally branched monome C30 3034 0.5 0.4 0.9 0.2 21 $n-C31$ 3100 25,6 2.8 28,3 2.0 22 unknown 3119 0.1 0.0 0.2 0.1 23 5-me C31 3186 1.3 0.2 1.9 0.1 24 x.x.x-trime C31 + internally branched 3230 1.8 1.2 2.5 1.0 me C32	17	internally branched monome C29	2926	0,1	0.0	traces	0,0
19 $n-C30$ 3000 1,3 0,1 1,8 0,1 20 internally branched monome C30 3034 0,5 0,4 0,9 0,2 21 $n-C31$ 3100 25,6 2,8 28,3 2,0 21 $n-C31$ 3145 0,5 0,5 0,1 0,1 23 $5-me C31$ 3145 0,5 0,5 0,1 0,1 23 $5-me C31$ 3186 1,3 0,2 1,9 0,1 24 $x,x,x-trime C31 + internally branched 3230 1,8 1,2 2,5 1,0 me C32 $	18	5-me C29	2955	0.4	0.3	traces	0.0
20 internally branched monome C30 3034 0,5 0,4 0,9 0,2 21 n -C31 3100 25,6 2,8 28,3 2,0 22 unknown 3119 0,1 0,0 0,2 0,1 23 5-me C31 3145 0,5 0,5 0,1 0,1 24 x,x,x -trime C31 3186 1,3 0,2 1,9 0,1 25 $3,x,x$ -trime C31 3186 1,3 0,2 1,9 0,1 26 n -C33 3300 15,4 3,3 17,5 1,0 27 5 - meC33 3300 15,4 3,3 1,3 0,3 28 $3,x$ - dimeC33 3406 1,8 0,3 1,3 0,3 29 unknown 3421 0,0 0,0 0,2 0,1 31 x,x - dime C34 3450 2,5 0,9 3,1 1,0 31 internally branched monome C35 3531 4,2 1,8 1,6 0,2 34 x - dime C35 3540<	19	<i>n</i> -C30	3000	1.3	0.1	1.8	0.1
21 $n-C31$ 3100 $25,6$ $2,8$ $28,3$ $2,0$ 22 unknown 3119 $0,1$ $0,0$ $0,2$ $0,1$ 23 5-me C31 3145 $0,5$ $0,5$ $0,1$ $0,1$ 23 5-me C31 3186 $1,3$ $0,2$ $1,9$ $0,1$ 24 x,x-trime C31 + internally branched 3230 $1,8$ $1,2$ $2,5$ $1,0$ me C32 - - - $ -$ <t< td=""><td>20</td><td>internally branched monome C30</td><td>3034</td><td>0.5</td><td>0.4</td><td>0.9</td><td>0.2</td></t<>	20	internally branched monome C30	3034	0.5	0.4	0.9	0.2
22 unknown 3119 0,1 0,0 0,2 0,1 23 5-me C31 3145 0,5 0,5 0,1 0,1 24 x,x,x-trime C31 3186 1,3 0,2 1,9 0,1 24 x,x,x-trime C31 3186 1,3 0,2 1,9 0,1 25 3,x,x-trime C31 + internally branched 3230 1,8 1,2 2,5 1,0 26 n -C33 3300 15,4 3,3 1,7,5 1,0 27 5-meC33 3406 1,8 0,3 1,3 0,3 29 unknown 3421 0,0 0,0 0,2 0,1 31 x,x-dime C34 3461 traces 0,0 0,1 0,0 31 x,x-dime C34 3461 traces 0,0 0,1 0,0 31 x,x-dime C35 3500 1,7 0,3 1,4 0,4 35	21	n-C31	3100	25.6	2.8	28.3	2.0
235-me C3131450,50,50,10,124 x,x,x -trime C3131861,30,21,90,125 $3,x,x$ -trime C31 + internally branched32301,81,22,51,0me C3226 n -C33330015,43,317,51,0275-meC333356traces0,00,10,028 $3,x$ -dimeC3334061,80,31,30,329unknown34210,00,00,20,1304-me C3434502,50,93,11,031 x,x -dime C343461traces0,00,10,031internally branched monome C3535314,21,81,60,234 x -mono + x,x -dime C3535401,40,41,00,4355-me C3535501,00,30,80,136 $x,x,-$ dime C3535720,20,10,20,138internally branched monome C3636270,20,10,30,139internally branched monome C3636441,00,20,70,20,240 x -me C3737315,30,93,80,9445-me C3737493,51,83,00,80,147internally branched monome C3838261,80,60,5 <t< td=""><td>22</td><td>unknown</td><td>3119</td><td>0.1</td><td>0.0</td><td>0.2</td><td>0.1</td></t<>	22	unknown	3119	0.1	0.0	0.2	0.1
24x.x.x.rtime C3131861.30.21.90.125 $3,x.x-trime C31 + internally branched32301,81.22,51,0me C32$	23	5-me C31	3145	0.5	0.5	0.1	0.1
253, x,x - trime C31 + internally branched32301,81,22,51,0me C32 $n - C33$ 30015,43,317,51,026 $n - C33$ 330615,43,317,51,0275 - meC333356traces0,00,10,0283,x - dimeC3334061,80,31,30,329unknown34210,00,00,20,1304 - me C343461traces0,00,10,031x,x - dime C343461traces0,00,10,031internally branched monome C3535314,21,81,60,234x - mono + x,x - dime C3535401,40,41,00,4355 - me C3535501,00,30,80,136x,x,- dime C3535720,20,10,20,1373,x - di + x,x,x- trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,139internally branched monome C3636240,60,50,40,140x - me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445 - me C3737493,51,83,00,8453,x - dime C3438000,40,3 <td>24</td> <td>$x_x x_y$ trime C31</td> <td>3186</td> <td>1.3</td> <td>0.2</td> <td>1.9</td> <td>0.1</td>	24	$x_x x_y$ trime C31	3186	1.3	0.2	1.9	0.1
111 <th< td=""><td>25</td><td>$3_{x,x}$ trime C31 + internally branched</td><td>3230</td><td>1,8</td><td>1.2</td><td>2.5</td><td>1.0</td></th<>	25	$3_{x,x}$ trime C31 + internally branched	3230	1,8	1.2	2.5	1.0
26 $n - C33$ 3300 $15,4$ $3,3$ $17,5$ $1,0$ 27 $5 - meC33$ 3356 traces $0,0$ $0,1$ $0,0$ 28 $3,x - dimeC33$ 3406 $1,8$ $0,3$ $1,3$ $0,3$ 29unknown 3421 $0,0$ $0,0$ $0,2$ $0,1$ 30 $4 - meC34$ 3450 $2,5$ $0,9$ $3,1$ $1,0$ 31 $x,x - dimeC34$ 3461 traces $0,0$ $0,1$ $0,0$ 32 $n -C35$ 3500 $1,7$ $0,3$ $1,4$ $0,1$ 33internally branched monome C35 3531 $4,2$ $1,8$ $1,6$ $0,2$ 34 $x - mon + x,x - dimeC35$ 3540 $1,4$ $0,4$ $1,0$ $0,4$ 35 $5 - meC35$ 3550 $1,0$ $0,3$ $0,8$ $0,1$ 36 $x,x,- dimeC35$ 3572 $0,2$ $0,1$ $0,2$ $0,1$ 37 $3,x - di + x,x,x - trimeC37$ 3600 $0,7$ $0,2$ $0,2$ $0,0$ 38 internally branched monomeC36 3627 $0,2$ $0,1$ $0,3$ $0,1$ 40 $x - meC36$ 3644 $1,0$ $0,2$ $0,7$ $0,2$ $0,7$ $0,2$ 45 $3,x - dimeC37$ 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x - dimeC38$ 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47 internally branched monomeC38 3826 $1,8$ $0,6$ $0,5$ $0,2$	20	me C32	3230	1,0	1,2	2,3	1,0
275- meC333356traces0,00,10,028 $3,x$ -dimeC333406 $1,8$ $0,3$ $1,3$ $0,3$ 29unknown3421 $0,0$ $0,0$ $0,2$ $0,1$ 304- me C343450 $2,5$ $0,9$ $3,1$ $1,0$ 31 x,x -dimeC343461traces $0,0$ $0,1$ $0,0$ 32 n -C353500 $1,7$ $0,3$ $1,4$ $0,1$ 33internally branched monome C353531 $4,2$ $1,8$ $1,6$ $0,2$ 34 x - mono + x,x - dime C353540 $1,4$ $0,4$ $1,0$ $0,4$ 355- me C353572 $0,2$ $0,1$ $0,2$ $0,1$ 36 $x,x,-$ dime C353572 $0,2$ $0,1$ $0,2$ $0,1$ 37 $3,x$ - di + x,x,x - trime C373600 $0,7$ $0,2$ $0,2$ $0,01$ 38internally branched monome C363627 $0,2$ $0,1$ $0,3$ $0,1$ 39internally branched monome C363644 $1,0$ $0,2$ $0,7$ $0,2$ 43internally branched monome C373731 $5,3$ $0,9$ $3,8$ $0,9$ 44 5 -me C373749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x$ - dime C373749 $3,5$ $1,8$ $0,6$ $0,5$ $0,2$ 46 n -C383870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C393930 <td>26</td> <td><i>n</i> -C33</td> <td>3300</td> <td>15,4</td> <td>3,3</td> <td>17,5</td> <td>1,0</td>	26	<i>n</i> -C33	3300	15,4	3,3	17,5	1,0
28 $3,x - dimeC33$ 3406 $1,8$ $0,3$ $1,3$ $0,3$ 29unknown 3421 $0,0$ $0,0$ $0,2$ $0,1$ 30 $4 - meC34$ 3450 $2,5$ $0,9$ $3,1$ $1,0$ 31 $x,x - dimeC34$ 3461 traces $0,0$ $0,1$ $0,0$ 32 $n - C35$ 3500 $1,7$ $0,3$ $1,4$ $0,1$ 31internally branched monome C35 3531 $4,2$ $1,8$ $1,6$ $0,2$ 34 $x - mon + x, x - dimeC35$ 3540 $1,4$ $0,4$ $1,0$ $0,4$ 35 $5 - meC35$ 3550 $1,0$ $0,3$ $0,8$ $0,1$ 36 $x,x, - dimeC35$ 3572 $0,2$ $0,1$ $0,2$ $0,1$ 37 $3,x - dimeC37$ 3600 $0,7$ $0,2$ $0,2$ $0,0$ 38 internally branched monome C36 3627 $0,2$ $0,1$ $0,3$ $0,1$ 39 internally branched monome C36 3634 $0,6$ $0,5$ $0,4$ $0,1$ 45 $meC37$ 3731 $5,3$ $0,9$ $3,8$ $0,9$ 44 $5 - meC37$ 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x - dimeC37$ 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47 internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 46 $n -C38$ 3870 $0,2$ $0,2$ $0,3$ $0,0$ 47 interna	27	5-meC33	3356	traces	0,0	0,1	0,0
29unknown 3421 0,00,00,20,1304- me C34 3450 2,50,9 $3,1$ 1,031x,x-dime C34 3461 traces0,00,10,032 n -C35 3500 1,70,31,40,133internally branched monome C35 3531 4,21,81,60,234x-mono + x,x-dime C35 3550 1,00,30,80,1355- me C35 3550 1,00,30,80,136x,x,-dime C35 3572 0,20,10,20,137 $3,x$ - di + x,x,x- trime C37 3600 0,70,20,20,038internally branched monome C36 3627 0,20,10,30,140x- me C36 3644 1,00,20,70,243internally branched monome C37 3731 $5,3$ 0,9 $3,8$ 0,9445- me C37 3749 $3,5$ $1,8$ $3,0$ 0,845 $3,x$ - dime C37 + unknown 3771 $1,8$ 0,60,50,246 n -C38 3800 0,40,30,10,147internally branched monome C38 3826 $1,8$ 0,60,50,2485- me C38 3877 0,50,40,60,249 3 - me + x,x - dime C38 3877 0,50,40,60,249 3 - me + x,x - dime C38 <td>28</td> <td>3,x- dimeC33</td> <td>3406</td> <td>1,8</td> <td>0,3</td> <td>1,3</td> <td>0,3</td>	28	3,x- dimeC33	3406	1,8	0,3	1,3	0,3
304-me C3434502,50,93,11,031x,x-dime C343461traces0,00,10,032 n -C3535001,70,31,40,131internally branched monome C3535314,21,81,60,234x-mono + x,x-dime C3535401,40,41,00,4355-me C3535501,00,30,80,136x,x,-dime C3535720,20,10,20,1373,x-di + x,x,x-trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,139internally branched monome C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445-me C3737493,51,83,00,8453,x-dime C37 + unknown37711,80,80,70,246 n -C3838000,40,30,10,147internally branched monome C3838261,80,60,50,2485-me C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2485-me C3939492,11,22,70,452x,x-dime C3939691,80,91,3 <td< td=""><td>29</td><td>unknown</td><td>3421</td><td>0,0</td><td>0,0</td><td>0,2</td><td>0,1</td></td<>	29	unknown	3421	0,0	0,0	0,2	0,1
31x,x-dime C343461traces0,00,10,032 n -C3535001,70,31,40,133internally branched monome C3535314,21,81,60,234x-mon + x,x-dime C3535401,40,41,00,4355-me C3535501,00,30,80,136x,x,- dime C3535720,20,10,20,1373,x- di + x,x,x- trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,140x-me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445-me C3737493,51,83,00,8453,x- dime C37 + unknown37711,80,80,70,246 n -C3838470,50,40,60,247internally branched monome C3838261,80,60,50,2485-me C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2485-me C3939492,11,22,70,452x,x- dime C3939691,80,91,30,350internally branched monome C3939492,11,22,7 <td>30</td> <td>4- me C34</td> <td>3450</td> <td>2,5</td> <td>0,9</td> <td>3,1</td> <td>1,0</td>	30	4- me C34	3450	2,5	0,9	3,1	1,0
32 $n - C35$ 35001,70,31,40,133internally branched monome C3535314,21,81,60,234x - mon + x,x - dime C3535401,40,41,00,4355 - me C3535501,00,30,80,136x,x,- dime C3535720,20,10,20,1373,x - di + x,x,x - trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,140x - me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445 - me C3737493,51,83,00,8453,x - dime C37 + unknown37711,80,80,70,246 $n - C38$ 38000,40,30,10,147internally branched monome C3838261,80,60,50,2485 - me C3838700,20,20,30,0493 - me + x,x - dime C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2515 - me C3939492,11,22,70,452x,x - dime C3939691,80,91,30,3545 - me C3939691,80,9<	31	x,x- dime C34	3461	traces	0,0	0,1	0,0
33internally branched monome C3535314.21.81.60.234x-mono + x,x- dime C3535401,40,41,00,4355-me C3535501,00,30,80,136x,x,- dime C3535720,20,10,20,1373,x- di + x,x,x- trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,139internally branched monome C3636340,60,50,40,140x- me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445- me C3737493,51,83,00,8453,x- dime C37 + unknown37711,80,80,70,246 n -C3838000,40,30,10,147internally branched monome C3939302,10,20,30,050internally branched monome C3939492,11,22,70,4515- me C3939691,80,91,30,3	32	n -C35	3500	1,7	0,3	1,4	0,1
34x-mon + x,x- dime C3535401,40,41,00,4355-me C3535501,00,30,80,136x,x,- dime C3535720,20,10,20,1373,x- di + x,x,x- trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,139internally branched monome C3636441,00,20,70,240x- me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445- me C3737493,51,83,00,8453,x- dime C37 + unknown37711,80,80,70,246n -C3838000,40,30,10,147internally branched monome C3838261,80,60,50,2485- me C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2515- me C3939492,11,22,70,452x,x- dime C3939691,80,91,30,3	33	internally branched monome C35	3531	4,2	1,8	1,6	0,2
355- me C3535501,00,30,80,136 $x,x,-$ dime C3535720,20,10,20,137 $3,x-$ di + $x,x,x-$ trime C3736000,70,20,20,038internally branched monome C3636270,20,10,30,139internally branched monome C3636340,60,50,40,140 $x-$ me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445- me C3737493,51,83,00,845 $3,x-$ dime C37 + unknown37711,80,80,70,246 n -C3838000,40,30,10,147internally branched monome C3838261,80,60,50,2485- me C3838470,50,40,60,2493- me + $x,x-$ dime C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2515- me C3939492,11,22,70,452 $x,x-$ dime C3939691,80,91,30,3	34	x- mono + x,x - dime C35	3540	1,4	0,4	1,0	0,4
36x,x,- dime C35 3572 $0,2$ $0,1$ $0,2$ $0,1$ 37 $3,x$ - di + x,x,x- trime C37 3600 $0,7$ $0,2$ $0,2$ $0,0$ 38 internally branched monome C36 3627 $0,2$ $0,1$ $0,3$ $0,1$ 39 internally branched monome C36 3634 $0,6$ $0,5$ $0,4$ $0,1$ 40 x- me C36 3644 $1,0$ $0,2$ $0,7$ $0,2$ 43 internally branched monome C37 3731 $5,3$ $0,9$ $3,8$ $0,9$ 44 5- me C37 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x$ - dime C37 + unknown 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 n -C38 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47 internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 48 5 - me C38 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50 internally branched monome C39 3930 $2,1$ $0,2$ $1,7$ $0,2$ 51 5 - me C39 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 x,x - dime C39 3969 $1,8$ $0,9$ $1,3$ $0,3$	35	5- me C35	3550	1,0	0,3	0,8	0,1
37 $3,x- di + x,x,x- trime C37$ 3600 $0,7$ $0,2$ $0,2$ $0,0$ 38internally branched monome C36 3627 $0,2$ $0,1$ $0,3$ $0,1$ 39internally branched monome C36 3634 $0,6$ $0,5$ $0,4$ $0,1$ 40 $x-me C36$ 3644 $1,0$ $0,2$ $0,7$ $0,2$ 43internally branched monome C37 3731 $5,3$ $0,9$ $3,8$ $0,9$ 44 $5-me C37$ 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x-$ dime C37 + unknown 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 n -C38 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 48 $5-me C38$ 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C39 3930 $2,1$ $0,2$ $0,3$ $0,0$ 51 $5-me C39$ 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 $x,x-$ dime C39 3969 $1,8$ $0,9$ $1,3$ $0,3$	36	x,x,- dime C35	3572	0,2	0,1	0,2	0,1
38internally branched monome C36 3627 $0,2$ $0,1$ $0,3$ $0,1$ 39internally branched monome C36 3634 $0,6$ $0,5$ $0,4$ $0,1$ 40x- me C36 3644 $1,0$ $0,2$ $0,7$ $0,2$ 43internally branched monome C37 3731 $5,3$ $0,9$ $3,8$ $0,9$ 445- me C37 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x$ - dime C37 + unknown 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 n -C38 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 485- me C38 3847 $0,5$ $0,4$ $0,6$ $0,2$ 493- me + x,x- dime C38 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C39 3930 $2,1$ $0,2$ $1,7$ $0,2$ 515- me C39 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 x,x - dime C39 3969 $1,8$ $0,9$ $1,3$ $0,3$	37	3,x- di + x,x,x- trime C37	3600	0,7	0,2	0,2	0,0
39internally branched monome C36 3634 $0,6$ $0,5$ $0,4$ $0,1$ 40x- me C36 3644 $1,0$ $0,2$ $0,7$ $0,2$ 43internally branched monome C37 3731 $5,3$ $0,9$ $3,8$ $0,9$ 445- me C37 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x$ - dime C37 + unknown 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 n -C38 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 485- me C38 3847 $0,5$ $0,4$ $0,6$ $0,2$ 493- me + x,x- dime C38 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C39 3930 $2,1$ $0,2$ $1,7$ $0,2$ 515- me C39 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 x,x - dime C39 3969 $1,8$ $0,9$ $1,3$ $0,3$	38	internally branched monome C36	3627	0,2	0,1	0.3	0,1
40x- me C3636441,00,20,70,243internally branched monome C3737315,30,93,80,9445- me C3737493,51,83,00,8453,x- dime C37 + unknown37711,80,80,70,246 n -C3838000,40,30,10,147internally branched monome C3838261,80,60,50,2485- me C3838470,50,40,60,2493- me + x,x- dime C3838700,20,20,30,050internally branched monome C3939302,10,21,70,2515- me C3939492,11,22,70,452x,x- dime C3939691,80,91,30,3	39	internally branched monome C36	3634	0,6	0,5	0,4	0,1
43internally branched monome C37 3731 $5,3$ $0,9$ $3,8$ $0,9$ 445- me C37 3749 $3,5$ $1,8$ $3,0$ $0,8$ 45 $3,x$ - dime C37 + unknown 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 n -C38 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 485- me C38 3847 $0,5$ $0,4$ $0,6$ $0,2$ 493- me + x,x- dime C38 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C39 3930 $2,1$ $0,2$ $1,7$ $0,2$ 515- me C39 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 x,x - dime C39 3969 $1,8$ $0,9$ $1,3$ $0,3$	40	x- me C36	3644	1.0	0,2	0.7	0,2
445- me C3737493,51,83,00,845 $3,x$ - dime C37 + unknown 3771 1,80,80,70,246 n -C38 3800 0,40,30,10,147internally branched monome C38 3826 1,80,60,50,2485- me C38 3847 0,50,40,60,2493- me + x,x- dime C38 3870 0,20,20,30,050internally branched monome C39 3930 2,10,21,70,2515- me C39 3949 2,11,22,70,452 x,x - dime C39 3969 1,80,91,30,3branched/normal $0,7$ $0,7$ $0,7$ $0,7$	43	internally branched monome C37	3731	5,3	0,9	3.8	0,9
45 $3,x- \dim e C37 + \ln known$ 3771 $1,8$ $0,8$ $0,7$ $0,2$ 46 $n - C38$ 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C38 3826 $1,8$ $0,6$ $0,5$ $0,2$ 48 $5 - me C38$ 3847 $0,5$ $0,4$ $0,6$ $0,2$ 49 $3 - me + x, x - \dim e C38$ 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C39 3930 $2,1$ $0,2$ $1,7$ $0,2$ 51 $5 - me C39$ 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 $x, x - \dim e C39$ 3969 $1,8$ $0,9$ $1,3$ $0,3$	44	5- me C37	3749	3,5	1.8	3.0	0,8
46 $n - C38$ 3800 $0,4$ $0,3$ $0,1$ $0,1$ 47internally branched monome C383826 $1,8$ $0,6$ $0,5$ $0,2$ 48 $5 - me C38$ 3847 $0,5$ $0,4$ $0,6$ $0,2$ 49 $3 - me + x, x - dime C38$ 3870 $0,2$ $0,2$ $0,3$ $0,0$ 50internally branched monome C393930 $2,1$ $0,2$ $1,7$ $0,2$ 51 $5 - me C39$ 3949 $2,1$ $1,2$ $2,7$ $0,4$ 52 $x, x - dime C39$ 3969 $1,8$ $0,9$ $1,3$ $0,3$	45	3.x- dime C37 + unknown	3771	1.8	0.8	0.7	0.2
47 internally branched monome C38 3826 1,8 0,6 0,5 0,2 48 5- me C38 3847 0,5 0,4 0,6 0,2 49 3- me + x,x- dime C38 3870 0,2 0,2 0,3 0,0 50 internally branched monome C39 3930 2,1 0,2 1,7 0,2 51 5- me C39 3949 2,1 1,2 2,7 0,4 52 x,x- dime C39 3969 1,8 0,9 1,3 0,3 branched/normal 0,7 0,5 0,7 0,5 0,5 0,5	46	<i>n</i> -C38	3800	0.4	0.3	0.1	0.1
48 5- me C38 3847 0,5 0,4 0,6 0,2 49 3- me + x,x- dime C38 3870 0,2 0,2 0,3 0,0 50 internally branched monome C39 3930 2,1 0,2 1,7 0,2 51 5- me C39 3949 2,1 1,2 2,7 0,4 52 x,x- dime C39 3969 1,8 0,9 1,3 0,3 branched/normal 0,7 0,5 0,4 0,6 0,2	47	internally branched monome C38	3826	1.8	0.6	0.5	0.2
49 3- me + x,x- dime C38 3870 0,2 0,2 0,3 0,0 50 internally branched monome C39 3930 2,1 0,2 1,7 0,2 51 5- me C39 3949 2,1 1,2 2,7 0,4 52 x,x- dime C39 3969 1,8 0,9 1,3 0,3	48	5- me C38	3847	0.5	0.4	0.6	0.2
50 internally branched monome C39 3930 2,1 0,2 1,7 0,2 51 5- me C39 3949 2,1 1,2 2,7 0,4 52 x,x- dime C39 3969 1,8 0,9 1,3 0,3 branched/normal 0.7 0.5 0.5 0.5	49	3 - me + x.x - dime C38	3870	0.2	0.2	0.3	0.0
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	50	internally branched monome C39	3930	2.1	0.2	1.7	0.2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	51	5- me C39	3949	2.1	1.2	2.7	04
branched/ormal 0.7 0.5	52	x.x- dime C39	3969	1.8	0.9	13	03
		branched/normal	2,0,	0.7	3,2	0.5	0,0

TABLE V	
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Percent hydrocarbons of selected components of Dipetalogaster maxima

a: hydrocarbons and peak number are the same as in Fig. 3, minor component peaks 6, 12, 41, 42 and 53 corresponding to 2530 KI (internally br monome- C25), 2730 KI (x,x- dime C27), 3670 KI (x,x- dime C36), 3700 KI (n- C37), and 4050 KI (3,x- di plus 5,x,x- trime C39) are not included; *b*: n = 4 for males, n = 5 for females



Fig. 3: capillary gas chromatography profiles of the cuticular hydrocarbons of *Dipetalogaster maxima*. A: corresponds to adult females; B: adult males. Numbers indicating each hydrocarbon peak are indicated in A, and correspond to peak numbers from Table V.

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