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BRIEF COMMUNICATION

MORPHOMETRIC CHANGES OF *Triatoma flavida* NEIVA, 1911 (HEMIPTERA:TRIATOMINAE) IN THE TRANSITION FROM SYLVATIC TO LABORATORY CONDITIONS

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SUMMARY

The one-generational metric changes occurring in *Triatoma flavida* (Hemiptera: Triatominae) when carried from its wild habitat (caves) to laboratory, were examined using traditional morphometric techniques. As for other species of *Triatoma*, *Rhodnius* or *Panstrongylus* studied in similar conditions, a significant reduction of head, thorax and wing size was observed. Sexual dimorphism of the wings, while present in the wild sample, was not detected anymore in the laboratory individuals. Biological significance and epidemiological importance are discussed.

KEYWORDS: Morphometric changes; Sylvatic-laboratory; *Triatoma flavida.*

In various species of Triatominae, morphological and genetic changes have been observed associated with their adaptation from sylvatic to domestic or laboratory populations. These changes generally involved genetic drift effects[3] together with a reduction in average size and modification of sexual size dimorphism[4,6,7]. Although these observations are found in various genera (*Rhodnius*, *Triatoma* and *Panstrongylus*), more species have to be analyzed before accepting them as generalities for Triatominae. The idea that such differences observed in laboratory might parallel those between sylvatic and synanthropic populations is another hypothesis[6] which can be studied only in species that have natural domestic colonies, like the main vectors of Chagas disease. In the present work, we wished to determine if morphometric changes could be detected in the exclusively sylvatic, Cuban species *T. flavida,* when adapted to laboratory conditions. This species is endemic in Cuba, it is also the most abundant representative of Triatominae on the island. *T. flavida,* is a sylvatic species but is reportedly attracted to houses by lights[8]. In recent years, there have been increasing reports of little-known species of Triatominae establishing domestic colonies, previously considered to be exclusively sylvatic in habitats[11]. In this regard, our study contributes to the entomological surveillance of a potential vector of Chagas disease.

In 2000, a total of 87 sylvatic specimens of *T. flavida* (33 fourth instar nymphs, 50 fifth instar nymphs, four adults) were collected in caves of Peninsula de Guanahacabibes, Pinar del Rio (Cuba). These insects were maintained in laboratory conditions at 26 ± 2 °C and 76 ± 2% of relative humidity. Blood meals were offered at intervals of 7-15 days. The original parents (44 females and 37 males) were used for morphometric analysis, together with 21 males and 21 females taken randomly from the F1 generation.

We used a stereoscopic microscope and an ocular micrometer. The measurement of wing and thorax were made with an objective 10X and eyepiece 20X, the head measurements were performed with objective 16 and the same eyepiece, except the PO measurement where we used an objective 25.

Out of 22 characters initially measured according to standard procedures[2,4], we retained 15 ones for best accuracy and precision: OE, outer eyes; IE, inner eyes; EO, external ocelli; AO, ante-ocular region; AT, anteclypeus; DE, diameter of eye; PO, post-ocular region; R1 and R2, first and second rostrum segments, respectively; I, width between humerus; J, length of the thorax; H, width at the intersection of the fore and median lobes[2] and C, D, E three measurements of the wing[4].

Means and standard deviation for each character were reported by sex and biotope (Table 1 for head, Table 2 for thorax and Table 3 for wings), and compared between sexes (Table 4, left part) or ecotopes (Table 4, right part) using HSD of Tukey test[13] . Each comparison was tested for final significance using the sequential Bonferroni test as described by SOKAL & ROHLF (1995)[12].

In only one generation, size systematically decreased from wild to laboratory specimens for almost all characters (Tables 1, 2, 3), and this reduction was apparently more pronounced in the males (Table 4, right part).

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Table 1
Head metric properties of *Triatoma flavida*

	Females				Males			
	Field (44)		Laboratory (21)		Field (37)		Laboratory (21)	
Var	Mean (μ)	SD	Mean (μ)	SD	Mean (μ)	SD	Media (μ)	SD
OE	235.91	11.30	215.34	7.48	227.31	8.17	207.80	10.14
IE	127.22	8.23	111.58	5.41	116.87	6.28	102.41	5.63
EO	148.06	7.61	133.41	5.24	142.41	6.60	128.02	7.04
AO	322.49	15.17	284.88	13.43	310.99	16.81	272.75	14.38
AT	131.72	6.02	119.12	6.06	126.66	6.71	112.66	7.78
DE	146.13	8.02	134.22	5.41	142.11	6.77	131.52	10.57
R1	120.01	8.85	109.69	12.07	117.33	9.86	110.23	7.29
PO	84.39	4.58	78.10	4.49	81.07	4.46	75.05	4.52
R2	407.39	17.49	373.82	13.80	398.49	17.0	359.27	14.93

Mean and standard deviation (SD) for nine head measurements for field and laboratory samples of females and male *T. flavida.*
OE: Outer distance between eyes; IE: Inner distance between eyes; EO: Outer distance between ocelli; AO: Anteocular distance; AT: antenniferous tubercle; DE: Diameter of the eye; R1 and R2: Lengths of first and second rostral segments; PO: Postocular distance (excluding neck).

Table 2
Thorax metric properties of *Triatoma flavida*

	Females				Males			
	Field (26)		Laboratory (27)		Field (25)		Laboratory (21)	
Var	Mean (μ)	SD	Mean (μ)	SD	Mean (μ)	SD	Mean (μ)	SD
I	589.84	27.08	539.33	29.42	557.64	25.78	517.28	26.33
J	431.65	21.06	391.33	22.09	421.92	20.17	387.24	19.40
H	363.11	13.21	334.66	18.00	339.84	14.53	316.71	13.83

Mean and standard deviation (SD) for three thorax measurements for field and laboratory samples of females and male *T. flavida.*
I: Width between humerus; J: Length of the thorax; H: Width at the intersection of the fore and median lobes.

Table 3
Wing metric properties of *Triatoma flavida*

	Females				Males			
	Field (40)		Laboratory (10)		Field (34)		Laboratory (14)	
Var	Mean (μ)	SD	Mean (μ)	SD	Mean (μ)	SD	Mean (μ)	SD
C	706.05	43.28	645.30	45.10	682.94	39.74	615.21	45.29
D	809.10	47.78	747.90	49.37	773.47	41.50	711.64	47.42
E	318.60	37.45	286.20	31.97	293.29	23.35	283.50	24.13

Mean and standard deviation (SD) for three wing measurements for field and laboratory samples of females and male *T. flavida.*
C: Between 2 and 4; D: between 3 and 5; E: between 1 and 2.

The well known sexual dimorphism of Triatominae (females on average larger than males[9]) was confirmed for 8 characters in wild specimens while for 3 ones only in laboratory samples (IE, EO, HO). Sexual dimorphism was not present at all for laboratory wings (Table 4, left part).

Biological significance: Head size decreasing in the transition from sylvatic to domestic or laboratory conditions has been demonstrated in other Triatominae species such as *Triatoma dimidiata, T. brasiliensis, T. infestans, Rhodnius domesticus, Panstrongylus rufotuberculatus* and *P. geniculatus*[1,4,5,6,7,14]. It was thus also verified here for *T. flavida* with a significant decrease in almost all the characters measured in head, thorax and wings.

Various explanations have been suggested to understand this change. For instance, natural selection may favor larger phenotypes in less favorable (more unstable or "sylvatic") habitats, possibly due to a greater capacity to resist temporary food shortages, whereas smaller individuals apparently survive better under laboratory or domestic

Table 4
Univariate analysis of *Triatoma flavida*

	Between males and females				Between field and laboratory			
	Field		Laboratory		Females		Males	
Var.	p	Bonf	p	Bonf	p	Bonf	p	Bonf
OE	0.001989	S	0.119947	NS	0.000020	S	0.000020	S
IE	0.000020	S	0.000073	S	0.000020	S	0.000020	S
EO	0.002958	S	0.000020	S	0.000020	S	0.000020	S
AO	0.007053	S	0.065264	NS	0.000020	S	0.000020	S
AT	0.011641	NS	0.017532	NS	0.000020	S	0.000020	S
DE	0.190123	NS	0.852732	NS	0.000023	S	0.000084	S
R1	0.805702	NS	0.999965	NS	0.003554	S	0.121028	NS
R2	0.129470	NS	0.027026	NS	0.000020	S	0.000020	S
PO	0.030574	NS	0.293539	NS	0.000248	S	0.000540	S
I	0.001088	S	0.129558	NS	0.000020	S	0.000098	S
J	0.580556	NS	0.991189	NS	0.000020	S	0.000022	S
H	0.000022	S	0.002748	S	0.000020	S	0.000043	S
C	0.219757	NS	0.603306	NS	0.020368	NS	0.000735	S
D	0.019833	S	0.480972	NS	0.037300	NS	0.006383	S
E	0.011133	S	0.999962	NS	0.174039	NS	0.957333	NS

Parametric comparisons (HSD of Tukey test) at 15 head, thorax and wing measurements of *T. flavida*, exploring sexual dimorphism in the laboratory and in the field collected samples, and biotope differences for each sex. p, level of significance; Bonf, sequential Bonferroni test.

conditions where food availability is less restricted[4,11]. DUJARDIN *et al.* (1999)[6] also suggested that the size reduction could reveal the effect of population density on bug size: in laboratory colonies each individual would get less blood because of competition, smaller individuals would survive and the average size decrease. However, other mechanisms, such as inbreeding, different host-feeding patterns and/or developmental times, may also explain these size differences[10].

Sexual dimorphism modification appears as a secondary effect of size reduction, as long as this latter occurs at different rates according to sex. When the rate is similar in each sex, no sexual dimorphism modification is expected. For instance no such evidence could be established after five laboratory generations of *P. geniculatus*[7] , although these authors could observe a significant decreasing in head or wing size.

Epidemiological significance: In conclusion, our observations confirmed the previous ones about metric changes in Triatominae in the transition from natural habitat to laboratory conditions of life: size is reduced, sexual dimorphism is affected. As long as these changes could reflect the modifications from sylvatic to domestic conditions of life of any Triatominae, our observations have epidemiological importance. They could provide indeed objective criteria for evaluating the level of adaptation of an insect to domestic structures. In case of complete isolation from sylvatic foci, a well adapted domestic population of Triatominae should have shorter size and modified sexual dimorphism relative to its sylvatic counterpart. No such differences would be detected in case of frequent exchanges with sylvatic foci.

RESUMEN

Cambios morfométricos de *Triatoma flavida* Neiva, 1911 (Hemiptera:Triatominae) que ocurrieron cuando fueron llevados desde su hábitat selvático al laboratorio

Fueron examinados los cambios morfométricos que ocurrieron en la primera generación de *Triatoma flavida* cuando fueron llevados desde su hábitat selvático (cuevas) al laboratorio, mediante el uso de técnicas morfométricas tradicionales. Se observó una reducción significativa del tamaño de la cabeza, tórax y alas, como ocurre en otras especies de *Triatoma, Rhodnius* o *Panstrongylus* estudiados en condiciones similares. El dimorfismo sexual de tamaño en las alas, aunque presente en los individuos selváticos, no se detectó en los de laboratorio. La significación biológica y la importancia epidemiológica son discutidas.

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