

Preliminary evidence of association between species of mosquitoes in Atlantic forest of Santa Catarina State, (Diptera: Culicidae)

Evidências preliminares de associação entre espécies de mosquitos em Mata Atlântica no Estado de Santa Catarina, (Diptera: Culicidae)

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ABSTRACT

A positive coefficient of association (affinity) between *Runchomyia reversa* and *Anopheles cruzii* and high (0.38) index were observed, probably due to the similar breeding places (bromeliads) and to landing habits. Furthermore, a high (0.92) index of association between *Oc. scapularis* and *Wyeomyia incaudata*, with low coefficient of association was observed.

Key-words: Culicidae. Interspecific association. *Runchomyia reversa*. *Anopheles cruzii*. Bromeliad.

RESUMO

Foi observado coeficiente de associação positivo (afinidade) entre *Runchomyia reversa* and *Anopheles cruzii* e alto (0,38) índice de associação, provavelmente devido a similaridade entre os criadouros (bromélias) e aos hábitos de pouso, e alto (0,92) índice de associação entre *Oc. scapularis* e *Wyeomyia incaudata*, com baixo coeficiente de associação.

Palavras-chaves: Culicidae. Associação interespecífica. *Runchomyia reversa*. *Anopheles cruzii*. Bromélia.

The study of association between species of mosquitoes can provide clues to an understanding of their biology and role in the transmission of pathogens. Associations can be due to the sharing of the same breeding places or to the flying and feeding behaviour of adults. For example, the coefficients and indices of association between *Culex pipiens* and *Culex torrentium* in containers and in ground pools were studied, with somewhat different values for each habitat⁵. Methods for the study of association were revised⁶, citing several studies on mosquitoes, though none done in South America.

Mosquitoes were collected weekly from September to December 2001 in a trail at a secondary forest at Unidade de Conservação Ambiental Desterro (27°31'51" S 48°30'44" W, 50-150m a.s.l., Florianópolis, Santa Catarina, southern Brazil). Mosquitoes landing on two collectors in the morning, in ten points in the trail, were collected.

Three hundred fifty eight mosquitoes, belonging to 22 species, 14 of them new for the fauna of the state, were obtained⁴. *Runchomyia reversa* Lane & Cerqueira,

Ochlerotatus scapularis Rondani, *Wyeomyia incaudata* (Root) and *Anopheles cruzii* Dyar & Knab were the predominant species, constituting 62.9% of the total. Samples from below and from above the waist were separated, and 136 samples were analyzed.

Coefficients of interspecific association¹ and indices of association^{7,8} were calculated to clarify the relationship between pairs of the four species above. The coefficient (C_{AB}) considers only the numbers of occurrences in which both species are together or separated, while the index of association (I) considers also the numbers of mosquitoes in the collections in which they occur together. The values of the coefficients of association and of the indices of association can vary from +1 (complete association) to -1 (complete dissociation).

The coefficients of association, shown in the Table 1, between the species indicate at a first glance some association between *Runchomyia reversa* and *Wyeomyia incaudata* (0.22 ± 0.12) and between that species and *Anopheles cruzii* (0.83 ± 0.04). However, except for the high value of X^2 (15.02) for the coefficient

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Table 1 - Coefficients of association (C_{AB}) and indices of association (I) between species of mosquitoes collected in the morning in a trail at UCAD, Florianópolis, State of Santa Catarina, Brazil.

Species	<i>Runchomyia reversa</i>		<i>Ochlerotatus scapularis</i>		<i>Wyeomyia incaudata</i>		<i>Anopheles cruzii</i>	
	C_{AB}	I	C_{AB}	I	C_{AB}	I	C_{AB}	I
<i>Ru. reversa</i>	-	-	0.017±0.07	-0.51	0.22±0.12	-0.23	0.83±0.04*	0.38
<i>Oc. scapularis</i>	0.017±0.07	-0.51	-	-	0.054±0.25	0.92	0.055±0.24-0.69	-
<i>Wy. incaudata</i>	0.22±0.12	-0.23	-0.054±0.25	0.92	-	-	0.19±0.19	-0.59
<i>An. cruzii</i>	0.83±0.04*	0.38	0.055±0.24	-0.69	0.19±0.19	-0.59	-	-

* $X^2 \gg X^2_{tab 1\%}$; to other C_{AB} : $X^2 < X^2_{tab 5\%}$

of association^{1 6 7} between *R. reversa* and *A. cruzii*, all the others were lower than the X^2 for the 2 x 2 analysis (3.84). Therefore, most coefficients of association were not significant. In the association between *R. reversa* and *A. cruzii*, the product of the number of samples in which both species are absent and that in which both are present is greater than the product of the numbers of samples in which one of them is absent; therefore, this association is positive (affinity)⁷.

The indices of association for two pairs (*O. scapularis* vs *W. incaudata* and *R. reversa* vs *A. cruzii*) were respectively 0.92 and 0.38. This result should be added to the high coefficient of association for *R. reversa* vs *An. cruzii*. The habitats of immature insects of the first pair are quite different. Immature forms of *O. scapularis* live in temporary pools in the ground, and sometimes in artificial containers, while those of *Wyeomyia (Phoniomyia)* spp and *R. reversa*² are in bromeliads. So, any association is probably related to the flying and landing habits of the species, or possibly in the shelters. *A. cruzii* has its immature forms in bromeliads², like *R. reversa*, and this association can have had some influence on the above results.

Only I, and not C_{AB} , was high for the pair *O. scapularis*/*W. incaudata*. This could indicate that they are not frequently associated, but that there are specific conditions, such as temperature, humidity, luminosity, pressure, hour, which stimulate several mosquitoes of both species to bite. The landing habits of the mosquitoes were studied (CB Marcondes, U Paterno: dados não publicados) and it is probable that these habits of the species constituting the pairs are much more important than the habitats of the immature forms.

Since samples from below and from above the waist were separated, this association could be related to a similar distribution of landing on the body. In fact, all *W. incaudata* were collected below the waist, a significantly greater quantity of *R. reversa* was collected below, and there is a non-significant indication of preference of *O. scapularis* to land on this part of the body (CB Marcondes, U Paterno: dados não publicados), which should be further investigated. This is additional evidence for the influence of biting habits on the results.

This preliminary evidence of association between mosquito species in the Atlantic forest should be further studied, if possible associated to careful observation of meteorological conditions in the sites of breeding and collection of the insects.

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