

Courtship Behavior of *Samoaia attenuata* and *S. leonensis*¹

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The drosophiloid genus *Samoaia* Malloch, comprised of seven species, is restricted to the Samoa Islands. Wheeler and Kambysellis (1966) observe that "a considerable amount of local evolution has taken place" on the Samoa Islands since 30 of the 48 drosophiloid species found on the islands appear to be endemic. Excluding the seven *Samoaia* species, the remaining 23 endemics all belong to various genera that have representatives in other parts of the world. It thus appears that the ancestral *Samoaia* population arose on the Samoa Islands and that its descendants have undergone at least seven speciation events but none has been able to migrate to other areas.

The *Samoaia* species are difficult to maintain in the laboratory, but by using special culture media (Wheeler and Clayton, 1965) two of the species, *S. attenuata* and *S. leonensis*, were maintained for a period of time at the University of Texas. The courtship behaviors of these species were studied and are as follow:

COURTSHIPS

Samoaia attenuata Wheeler and Kambysellis

The male orients upon a nearby female and moves to her rear, positioning himself closely behind the tip of her abdomen. He then lifts and extends his forelegs over the female's abdomen. The extended legs each form an arc resulting in the tips of the tarsi being directed inward. The wing vanes of both sexes of the *Samoaia* flies when in repose are not held horizontal, as occurs in other *Drosophila*, but rather are "roof shaped" with the costal margins strikingly depressed. Further, the wing-tips are depressed and thus the flies appear humpbacked. Having extended and arced his forelegs, the male then begins to vibrate the distal segments of his fore tarsi rapidly up and down in small amplitude movements, and at the same time thrusts the tips of the tarsi under the sides of the female's abdomen. This movement is possible because of the laterally downward slanting position of the female's wing vanes. The male, after successfully thrusting his foreleg tarsi under the female's abdomen appears to be gently "hugging" the female's abdomen and wings. Simultaneously as he vibrates his tarsi under and against the venter of the female's abdomen, he very slowly curls the tip of his abdomen down and forwards and under his thorax, resulting in the abdominal tip being directed forward. A receptive female then extends the tip of her abdomen rearward and thrusts it against the male's genitalia, thus enabling intromission to occur. At the start of copulation, the male retains his "hugging" grasp of the female and the venter of his thorax rests on the dorsal surface of her wing vanes. Almost invariably the copulating male quickly enters a cataleptic trance and often falls off the female, especially if she makes any movement. The genitalic union, however, is maintained and the female may rarely drag the inert male behind her. At the termination of copulation, the genitalia are quickly disengaged and the male immediately recovers from his trance and jumps to his feet.

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A non-receptive female kicks with her hind feet, decamps, or flies away when a male attempts to embrace her with his forelegs.

Eight copulations were observed. The minimum copulatory time was 4'25", the maximum 9'28" and the mean duration 6'37".

Samoaia leonensis Wheeler and Kambysellis

The male orients and positions himself behind the female in the same manner as does the *attenuata* male. He then raises, straightens, and extends both of his forelegs over the female's abdomen and repeatedly strikes sharply downward against the dorsal surfaces of the female's wing vanes, resulting in his tarsi and the distal portion of the tibia sliding outward across the sloping female wing vanes. After repeatedly striking the female, he curls the tip of his abdomen under and forward, and attempts to achieve intromission. If the female refuses to extend her abdominal tip rearward and allow intromission, but does not decamp or fly away, then the male will relax his abdomen to the normal position and engages in a bout of body trembling. He rapidly moves his body, especially the wings and abdomen, up and down so that the abdominal tip and wing tips appear to be vibrating. At the same time he repeatedly opens and closes the genitalic claspers. After a bout of body trembling, he returns to foreleg striking and attempts intromission. The receptive female thrusts the tip of her abdomen rearward against the male's genitalia and allows intromission.

Mounted on top of the female's wings, the copulating male does not enter a catalytic trance, and usually will periodically claw the female's wing surfaces with his fore tarsi. At the end of copulation he turns and quickly dismounts.

Non-receptive females may kick, decamp, or fly away—but usually they engage in wing scissoring by repeatedly extending both wings sharply out and back about 10°-15° from the resting position. This action is effective in causing the courting male to desist courtship and turn away from the female.

Four copulations were observed and two were timed. The duration of these two was 38 and 49 seconds, respectively.

DISCUSSION

The founders of the *leonensis* stock were collected in a tiny remnant of disturbed lowland forest near Leone, Tutuila Island. The *attenuata* stock was acquired from a dense jungle type forest on Upolu Island at an elevation of about 650 m (2,000 ft.). Wheeler (personal communication) notes that the adult flies are extremely difficult to locate in the field, that they prefer shaded localities with low light intensities and high moisture levels. The flies sit on the damp soil or vegetable litter. When disturbed, they move by a quick hopping flight, remaining close to the substrate. They therefore are difficult to collect by netting. Wheeler collected some individuals by sweeping over mushrooms, but the larval substrates are unknown.

Wheeler and Kambysellis (1966), on the basis of the external genitalia, divided the seven *Samoaia* species into two groups, i.e. (1) *attenuata*, *comma*, and *hirta*, and (2) *leonensis*, *nuda*, and *ocellaria*, with the seventh species *mallochi* as a divergent member of the *attenuata* group. Thus the two species *attenuata* and *leonensis* belong to different groups. The overall pattern of courtship of *attenuata* and *leonensis* is similar but they do show interesting dissimilarities, i.e. *leonensis* has an extremely short copulatory period, one of the shortest known, and the male

uses its extended forelegs merely to strike against the wings. In comparison, *attenuata* wraps its forelegs around the female's abdomen and wings, a movement unknown for any other drosophiloid, but has a copulatory period that is moderate in duration when compared to other species.

The unique configuration of the wings of *Samoaia* species results in the wing vanes forming a type of pseudocarapace which completely covers the abdomen. When the individual is sitting or walking, the anterior margins and the tips of the wing vanes are in close proximity to the substrate—so close that often the courting male experiences difficulty in thrusting the tip of his abdomen under the wings of the female. The typical behavior exhibited by other drosophiloids is that the receptive female allows the mounting male either (1) to push her wings upward and apart with his head and/or forelegs, or (2) she herself spreads her wing vanes outward and upward (Spieth, 1952, 1966). The result is that the copulating male's body rests upon the dorsum of the female's abdomen. Neither female of the *Samoaia* species studied spreads or allows her wings to be spread, and the copulating male rests upon the dorsal surface of the female's wing vanes. The *Samoaia* flies tend to be immobile during copulation and the male of the *attenuata* also enters a cataleptic trance. The flies are predominantly dark brown to brownish black in overall coloration, and have patterned wings. This assemblage of characteristics, i. e., structural, pigmentary and behavioral that the *Samoaia* flies possess, appear to be adaptations for dwelling on or close to a tropical forest floor and also probably serve as cryptic adaptations that protect against the inevitable predators that are found in such an area. Finally, it appears that development of the unique conformation of the wings has served as the selective force that molded the courtship behavior of the males.

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