

MARQUESAN SIMULIIDAE *

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INTRODUCTION

The following notes are based mainly upon the study of collections made during 1928 and 1929 by the Pacific Entomological Survey under the direction of E. P. Mumford, to whom I am indebted for the privilege of examining the material collected by Mr. Mumford and A. M. Adamson and their field assistants.

Three species of *Simulium* have so far been found in Polynesia: *S. buissoni* Roubaud in the Marquesas, and *S. tahitiense* Edwards and *S. cheesmanae* Edwards in Society Islands. *S. buissoni* has also been recorded from Society Islands, but wrongly, as now appears. In addition to these strictly Polynesian species, one (*S. jolyi* Roubaud) is found in Fiji and in New Hebrides, but the family is apparently absent from the Hawaiian, Samoan, and Tongan islands. A synonym of *S. jolyi* is *S. laciniatum* Edwards. When describing *S. laciniatum* I had overlooked Roubaud's description of the species, which is well characterized by the structure of the hind tarsi. L. E. Cheesman has found *S. jolyi* to be widely distributed in New Hebrides.

Simuliidae are a scourge in the Marquesas. Miss Cheesman, who visited this part of the Pacific on the St. George Expedition in 1925, wrote: "*S. buissoni*, the 'no-no' of the Marquesans, occurs in incredible numbers in the Taipi Valley, Nukuhiva. In the month of January it was biting most viciously, and would cover all exposed flesh in black masses, setting up unbearable irritation and producing much swelling of the parts attacked . . . It haunted the shores at the mouth of the valley, and even came out to sea, attacking the passengers of incoming ships." A. M. Adamson wrote on December 12, 1930: "They are a serious pest on Nukuhiva and Eiao—and are said to have been, up till about forty years ago, on Uapou as well. Their 'disappearance'—or at least their ceasing to attack human beings—is said to have been quite sudden. The whole question seems to be of great interest in both the Marquesas and Society Islands."

As *Simulium* was found to be much more troublesome on some islands of the Marquesas than on others—on some islands they were not found biting man at all—it was naturally suspected that more than one species might be present. At first sight the material submitted by Mumford and Adamson

* Pacific Entomological Survey Publication I, article 9.

appeared to belong to a single species, but a more careful study led to the conclusion that one form was represented among the specimens from Nukuhiva and Eiao, but that this form was replaced by a closely allied but distinct race on most of the other islands, including Uapou and Hivaoa. Moreover, on Hivaoa two other distinct species were found to be represented, and all three species were found together. The Nukuhivan species (*S. buissoni*) has a slightly but appreciably longer proboscis than the others, and this probably accounts for the marked difference in biting habits; the mouthparts of the variety of *S. buissoni* on Hivaoa are perhaps too short to pierce the human skin, although sufficiently long to pierce the skin of birds.

In describing the Simuliidae collected in the south Pacific by the St. George Expedition,²⁵ I noted that a small species found by Cheesman in Tahiti appeared indistinguishable from *S. buissoni*. Further material of this same species was subsequently obtained by A. L. Tonnoir and submitted to me in 1930, but again I did not detect any distinction between it and *S. buissoni*. The present collections, however, make it clear that the Tahitian species is certainly distinct from any of those now shown to exist in the Marquesas; not only are the larvae and pupae markedly different, but the female is readily distinguishable from *S. buissoni*, at least, in the much larger abdominal tergites. Reduction of the abdominal tergites is a character found in several of the most bloodthirsty species of the genus, and would probably be a useful adaptation to such species, allowing of greater distension of the abdomen.

Genus SIMULIUM

Subgenus EUSIMULIUM

All three recorded Polynesian species, as well as the two new ones described below, and one new species from Tahiti,²⁶ belong to the subgenus *Eusimulium*, the adult females having the following characters:

Frons only moderately wide, dull. Antennae 11-segmented. Thorax dark, without special ornamentation. Front tarsi only very indistinctly flattened. Hind tarsi with well-developed projection (calcipala) at tip of first segment on inner side, and with distinct excision (pedisulcus) dorsally near base of second segment. Claws with strong basal tooth. Wings without basal cell; radius hairy throughout; sector simple, lying close to R_1 ; costa with minute spinules in addition to fine hairs; Cu_2 with strong double bend.

²⁵ Edwards, F. W., Diptera Nematocera from the South Pacific collected by the 'St. George' Expedition, 1925: Ann. Mag. Nat. Hist., (9), 20, pp. 241-243, 1927.

²⁶ Edwards, F. W., *Simulium oviceps*, new species, manuscript, Bernice P. Bishop Museum.

They are all, however, different from the typical species of the subgenus, such as *S. aureum* Fries and *S. latipes* Meigen, in the complete absence of hairs on the upper surface of the radial sector, and also (in three species at least) in the greater number of filaments in the pupal respiratory organs, which are typically only four. In these respects they resemble Enderlein's group *Gomphostilbia*.

Regarding the possible origin of *S. buissoni* and other Polynesian Simuliidae, little can be said. There are no obvious allies among the described South American species; on the other hand, some Oriental species such as *S. atratum* de Meijere seem somewhat allied. Closer allies may be found in New Guinea when that fauna is better known. On the whole, evidence does not conflict with that afforded by other groups of animals in suggesting that the whole Polynesian fauna has been derived from the west.

Simulium buissoni Roubaud (figs. 30, 31, 32).

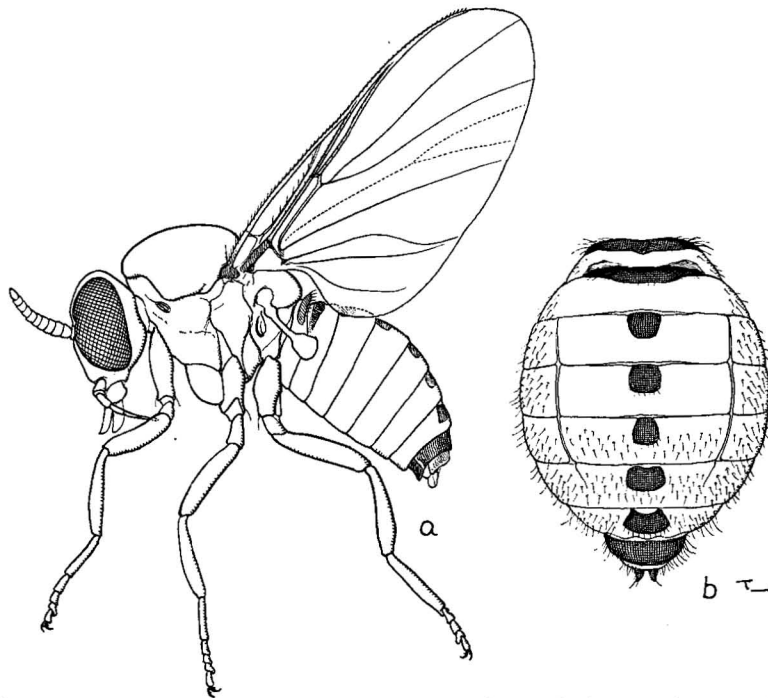


FIGURE 30. *Simulium buissoni* Roubaud: *a*, adult female in side view; *b*, abdomen of female in dorsal view (distended with blood) showing small tergal plates.

Female

Black, averaging about 1.7 mm. in length of body. Frons rather narrow above antennae, but considerably widened upwardly; face large and broad; in perfect specimens both the frons and the face bear coarse yellowish pubescence, but this is not very

dense. Antennae black, the two basal segments sometimes indistinctly paler. Labrum (as seen from in front) fully three-fifths as long as antennae. Last palpal segment distinctly longer than the others combined. Thorax dull, without trace of stripes, clothed above with coarse golden-yellowish pubescence, rather dense in perfect specimens. Pleural membrane and mesosternum bare. Abdomen with scanty yellowish pubescence which is evenly distributed; basal fringe yellowish. Tergites 3 to 6 all small, somewhat narrower or at least scarcely broader than long, tergite 7 also smaller than in many species, usually less than twice as broad as long, but rather variable in size; tergites 3 to 6 dull, 7 to 9 slightly shining. No sternite to segment 6. Legs mainly dark brownish, but tibiae more or less pale at extreme base and sometimes indistinctly paler in middle; first hind tarsal segment mainly pale, only about the apical fourth or fifth darkened; pubescence of tibiae coarse and yellowish throughout, or at least on the basal three-fourths. First hind tarsal segment almost as long as the tibia, deepest in middle, rather less deep on apical third; its apical projection (calcipala) occupying about two-thirds of the depth at tip, long, reaching beyond the middle of the short second segment; third segment not or scarcely longer than broad. Basal tooth not quite reaching middle of claws. Hair at base of wing dark. Radial sector entirely bare above, with one row of hairs beneath. Halteres dark brownish, knob sometimes indistinctly paler at tip.

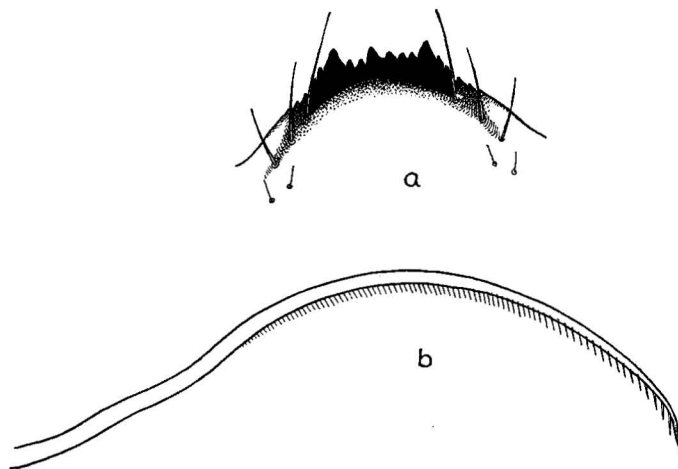


FIGURE 31. Mouth parts of larva of *Simulium buissoni* Roubaud: a, mentum; b, single fan-ray.

Larva

Head largely pale above, but with very characteristic fronto-clypeal markings in the form of a figure 8, conspicuous in dark specimens, somewhat faint in pale specimens; sides of head largely dark, but with the usual clear area over the eyes and another clear area behind them. Labral fans normal, large, with about 30 rays; pectinations moderately close. Antennae 4-segmented, the two basal segments thin-walled as usual, second longer than first; third segment as usual more slender and strongly chitinized, about half as long as first two together; fourth minute. Mandibles of the usual form. Mentum with the median and lateral teeth strongly projecting, separated by three small teeth. A pair of small ventral tubercles present on last segment. Terminal circlet of hooks of about 60 rows, with about 12 hooks in the row. Chitinous anal armature normal, not passing more than half way around the body. Anal gills simple.

Pupa

Respiratory organ almost as long as the pupa itself, formed of six branches; the main stem forks close to the base into a dorsal and ventral branch, the ventral branch forks again at a considerable distance from the first branch, the dorsal branch gives one long branch externally near its base, and two more branches further out internally, the distance between the bases of these three branches being subject to some individual variation. Tergites 3 and 4 (but not 2) each with an apical row of eight (4 + 4) recurved hooks; tergites 6 to 8 each with a basal row of about eight small backwardly directed spines; tergite 9 with a pair of very small sharp tubercles. Sternites 4 to 7 each with four (2 + 2) apical reflexed hooks. Cocoon rather closely woven, not quite covering thorax of pupa, without anterior projection above, without floor beneath thorax, and without connecting band in front.

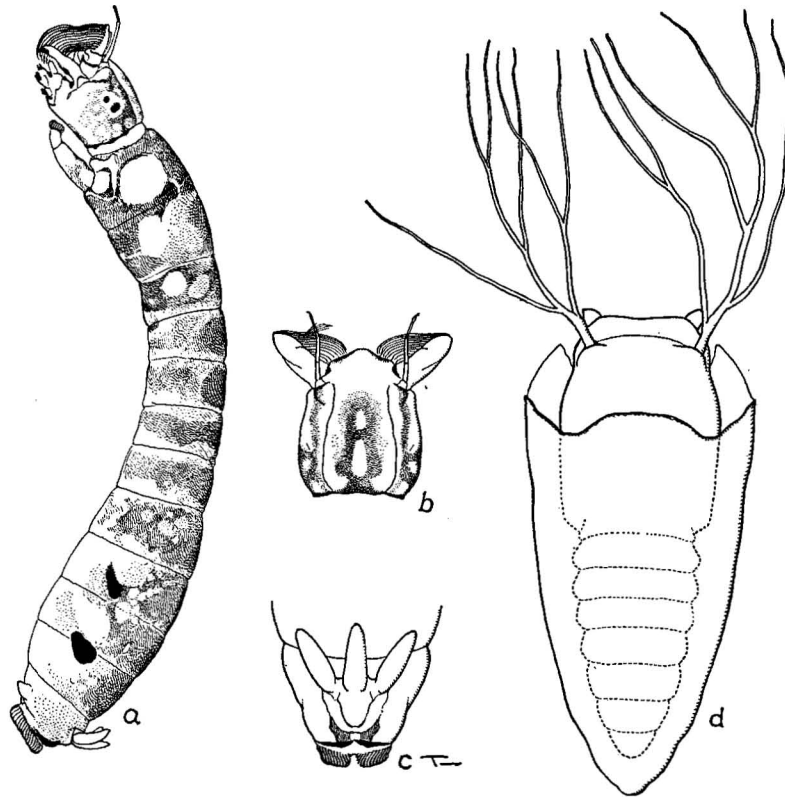


FIGURE 32. *Simulium buissoni* Roubaud, larva and pupa: *a*, larva in side view; *b*, head of larva in dorsal view; *c*, tip of abdomen of larva in dorsal view; *d*, pupa in cocoon.

Nukuhiva: Vaioa, Hakau Valley, near sea level, November 16, 1929; Teuanui, Toovii, elevation 2,000 feet, October 25, 1929; Tapuaooa, elevation 3,100 feet, November 14, 1929; Taiohae, elevation 100 feet; Taiohae,

near shore, January 24, 1929; Tauamaka, elevation 2,900 feet, November 10, 1929; Ooumu, elevation 4,050 feet, November 12, 1929, Mumford and Adamson.

Eiao: Vaituha, near sea level, October 1-2, 1929; near center of island, elevation 1,665 feet, September 28, 1929, Adamson.

Uahuka: Putatauuu, Vaipae Valley, elevation 880 feet, September 20, 1929, Adamson.

In addition to this material I have examined a number of specimens in the British Museum (Natural History) determined by Roubaud, probably from Nukuhiva, and also those collected by Cheesman on the same island. I am unable to distinguish between the specimens from Nukuhiva and those from Eiao, but those from Uahuka perhaps have the proboscis slightly shorter.

Larvae and pupae, presumably of *S. buissoni*, were collected by the Pacific Entomological Survey on Nukuhiva, Eiao, Uapou, and Hivaoa. These are all alike, including those from Hivaoa.

***Simulium buissoni gallinum*, new variety.**

Average size perhaps slightly smaller (1.4 mm.) than typical *S. buissoni*. Mouth parts distinctly shorter; labrum less than half as long as antenna. Basal antennal segments distinctly yellowish. Tibiae (especially the hind pair) with the narrow yellowish area at the base more clearly defined, contrasting with the dark tibia; pubescence of hind tibia mainly dark brown, and apparently somewhat finer than in *S. buissoni*, the coarse yellowish pubescence being usually confined to the base. Halteres paler, yellowish brown.

Hivaoa: Atuona Valley, elevation 300-350 feet, March and July, 1929, 8 females (including type); Mataovau, elevation 390 feet, June 6, 1929, 13 females; Hanaheka [Tanaeka] Valley, elevation 1,100 feet, June 4, 1929, 16 females; Tahauku, seashore, July 10, 1929; Mumford and Adamson. Tahauku, numerous females taken on domestic fowl, August 22, 1929, LeBronnec.

Tahuata: Tehue Valley, elevation 800 feet, 1 female, LeBronnec and H. Tauraa.

Fatuhiva: Hanavave Valley, elevation 50 feet, 1 female, LeBronnec.

Uapou: Hakahetau Valley, elevation 100-3,000 feet, December, 1929, and January, 1930, numerous females, Adamson and Whitten.

It is possible that the specimens collected on Uapou may represent a distinct race intermediate between typical *S. buissoni* and variety *gallinum*; they agree with the above definition except that in most insects the hind tibiae have a band of yellowish pubescence in the middle as well as at the base, and the halteres are darker.

Simulium mumfordi, new species.

Mouth parts rather shorter than in *S. buissoni*, labrum barely half as long as antennae. Front rather narrower, less widened above; face also narrower. Front and face (even in perfect specimens) greyish, with black suberect hair only, no yellowish pubescence. Thoracic pubescence entirely dark brown and rather more close-lying. Abdominal pubescence still scantier and dark; basal fringe dark. Tergite 6 less reduced, nearly twice as broad as long; tergites 6 to 9 more distinctly shining. Bases of tibiae more distinctly (but narrowly) pale; tibial pubescence all dark and rather finer.

Hivaoa: Atuona Village, September 5, 1929, on window, 2 females (including type); Atuona Valley, elevation 100-325 feet, 5 females; Tahauku, July 10, 1929, 2 females; Mumford and Adamson.

Simulium adamsoni, new species.

Size larger (length of body, fully 2 mm.; wing, 2.5 mm.) than *S. buissoni*. Mouth parts shorter, labrum barely half as long as antennae. Yellowish pubescence on frons and face perhaps somewhat denser, that on frons directed outward from the middle line instead of downward as in *S. buissoni* (this may not be a constant feature, but the three specimens examined are alike). Yellowish coarse pubescence on sides of abdomen and on first tergite rather denser, but pubescence on tergites 6 to 9 dark brownish and finer. Tergites 5 to 7 much better developed, tergite 6 more than twice as broad as long. Legs with the femora and tibiae extensively pale brown; front and middle pairs almost entirely so, hind pairs somewhat darker, the tibia with an ill-defined dark ring near base. Tibial pubescence yellowish.

Hivaoa: Atuona Valley, elevation 330 feet, March 28, 1929, type female, and elevation 300 feet, July 6, 1929, 1 female, Mumford and Adamson.

Fatuhiva: Punahitahi, Omoa [Oomoa] Valley, altitude 650 feet, August 18, 1930, one female, LeBronnec.