

**Bionomics of black flies (Diptera: Simuliidae)
in Costa Rica. VII. Genus *Simulium*
subgenus *Hearlea*¹**

by

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(Received for publication February 24, 1977)

Abstract: Black fly populations were studied in 100 streams in Costa Rica for a period of two years. Among the specimens collected in the field were larvae and pupae of the subgenus *Hearlea*. A comparison of available material from Canada, Mexico, Guatemala and Panama allowed us to identify the species of *Hearlea* as *Simulium (Hearlea) chiriquiense* Field, 1967. This is the first report of this subgenus and species for this country; distribution and other ecological data are presented.

As part of a two-year study, 1968-1970, black fly populations were observed in 100 streams in Costa Rica (Vargas & Travis, 1973). During the first year of the project, monthly observations were made on 53 stream sites in the Valle Central and during the second year, 28 of these 53 streams plus 47 new ones outside the Valle Central were visited bimonthly.

At each stream site larvae, pupae and adults were collected. Larvae and some pupae were preserved in alcohol and other mature pupae were isolated for rearing.

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This investigation was supported in part by the United States Army Medical Research and Development Command, Contract DADA-17-68-c-8023. The findings in this report are not to be construed as an official Department of the Army position unless so designated by official documents. The investigation was also financed by the Universidad de Costa Rica, Vicerrectoría de Investigación.
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Among the specimens collected some larvae and pupae of the subgenus *Hearlea* were found. This is the first report of the presence of this subgenus in Costa Rica.

A review of the literature indicated that there are 19 recorded species of *Hearlea*. Only one, *Simulium (H.) canadense*, is found in both the nearctic region and the neotropics, the rest are neotropical in distribution (Dalmat, 1955; Díaz Nájera & Vulcano, 1962; Field, 1967).

COMPARISON OF SPECIES

There were available for comparison larvae of *S. (H.) canadense* from Canada, specimens of adults, pupae and larvae of *S. (H.) ethelae* from México and Guatemala and *S. (H.) chiriquiense* from Panama. Comparisons with other species were made from illustrations and descriptions in the literature (Vargas & Díaz Nájera, 1957; Dalmat, 1950).

Adults: The following structures in the adults of *S. (H.) ethelae* from Mexico and Guatemala were compared and considered identical: buccopharynx, Y-piece, cerci, anal lobe, adminiculum, arms of adminiculum, clasper and basistyle. Minor morphological differences were noted between *S. (H.) chiriquiense* and *S. (H.) ethelae*.

Pupae: Pupal branchiae of the *Hearlea* from Costa Rica were similar to those of the specimens of *S. (H.) ethelae* and *S. (H.) chiriquiense*. The short lobe present at the junction of the branchial arms of *S. (H.) capricornis*, *S. (H.) dalmati* and *S. (H.) estevezi* is not present in either *S. (H.) ethelae* or *S. (H.) chiriquiense*, nor in the specimens from Costa Rica. However, the Costa Rican pupae are distinctive in that the tips of the branchial arms are broadly rounded rather than pointed as in the species mentioned above.

Differences between our material, as compared with the illustrated species, were as follows:

- 1) Absence of antler-like branches at the base of each branchia, seen in *S. (H.) carolinae*, *S. (H.) gorirossiae*, *S. (H.) johnsoni*, *S. (H.) menchacai*, *S. (H.) larvispinosum*, and *S. (H.) temascalense*;
- 2) Equally inflated arms of the branchiae as compared with the dissimilar arms, one longer and much inflated characteristic of *S. (H.) juarezi*, *S. (H.) burchi*, *S. (H.) deleoni*, *S. (H.) delatorrei*, *S. (H.) canadense* and *S. (H.) nigricornis*;
- 3) No resemblance to the distinctive and markedly inflated and corrugated branchiae of *S. (H.) contrerense*.

Larvae: Only the larvae of *S. (H.) ethelae* and *S. (H.) chiriquiense* need be compared with the Costa Rican specimens as characters of adults and pupae exclude the other *Hearlea* species. The larvae of *S. (H.) ethelae*, both Mexican and Guatemalan specimens, had 35-36 rays in the mouth brushes, while the Costa Rican larvae had from 45 to 49 rays. This was the only apparent difference that we found. Larvae of *S. (H.) chiriquiense* that we recently collected from the type locality, Boquete, Chiriquí, Panamá, showed 36-38 rays and thus, based on the number of rays, appear to be more closely related to *S. (H.) ethelae* than to the Costa Rican specimens.

In order to have a statistically valid taxonomical identification of this Costa Rican member of the subgenus *Hearlea* more specimens should be examined and the significance of the variations in different characters of the three life stages evaluated. Until this is done we consider our material as *Simulium (H.) chiriquiense*.

DISTRIBUTION OF *SIMULIUM (HEARLEA) CHIRIQUIENSE* IN COSTA RICA

The description and location of the streams on which these studies are based have been previously reported in detail (Vargas & Travis, 1973).

Hearlea immature stages were present in 20 of the 100 streams, and all but one of these collection sites were within the Valle Central. Distribution by stream numbers of these locations is plotted in Figure 1.

Data from monthly observations in 1968-69 and the bimonthly visits in 1969-70 are presented in Figure 2. Streams 16, 17, 26, 27, 31, 32, 32a, 34, 40, 42, 73, were observed in both 1968-69 and 1969-70. In three streams (26, 27 and 42), specimens were found at almost every collection during the two years; in the other streams occurrence was spotty. The single record for stream 73 is probably due to frequent disturbance of the stream bed by workers gathering rocks and gravel.

ECOLOGICAL NOTES

Observations on the 100 stream sites studied may be summarized as follows:

Altitude: *Hearlea* larvae and pupae were present in streams from 500 m to 2790 m above sea level but were not found in streams below 500 m. A higher percentage occurred at higher elevations.

Temperature: Generally, the streams with *Hearlea* had minimum temperatures of 11-16 C and a range of 4 to 6 degrees. None were collected from streams in which the minimum temperature was over 20 C or varied more than 10 degrees.

Water velocity and turbulence: *Hearlea* were found more often in streams where the water ran fast and was turbulent. None were found in slowly trickling streams.

Pollution: There were fewer specimens in heavily polluted streams.

Shade: The amount of shade at the collection sites seemed to have little relation to the presence or absence of immature specimens of *Hearlea*.

ACKNOWLEDGMENTS:

We wish to express our thanks to field technicians Roberto Echeverri and Guillermo Zúñiga R.; to Dr. Patricia Barrantes for her laboratory assistance; and to Dr. C. W. Sabrosky, Systematic Entomology Laboratory, USDA, for the loan of *S. (H.) ethelae* specimens from the U. S. National Museum.

RESUMEN

Se estudió las poblaciones de simúlidos en 100 corrientes de Costa Rica por un periodo de dos años. En los ejemplares colectados en el campo se encontró larvas y pupas del subgénero *Hearlea*. La comparación de material disponible de *Hearlea* de Canadá, México, Guatemala y Panamá con el de Costa Rica permitió clasificar el costarricense como *Simulium* (*H.*) *chiriquiense* Field, 1967.

Este constituye el primer informe de la presencia, ecología y distribución de este subgénero y especie en Costa Rica.

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Fig. 1. Geographical distribution of *Simulium* (*H.*) *chiriquiense* in Costa Rica, Central America.

Code: #3 (Qda. Agua), #11 (R. Itiquís), #16 (R. Tibás), #17 (R. Turú), #25 (R. Durazno), #26 (R. Virilla), #27 (Qda. Las Nubes), #28 (R. Desbarrumbo), #29 (R. Cascajal), #31 (R. Itiquís), #32 (R. Tambor), #32a (R. Tambor), #34 (R. Poasito), #40 (Qda. la Cañada), #41 (R. Yerbabuena), #42 (R. Quemados), #45 (Qda. Palmital), #46 (Quebrada), #66 (R. Angel), #73 (R. Reventado).

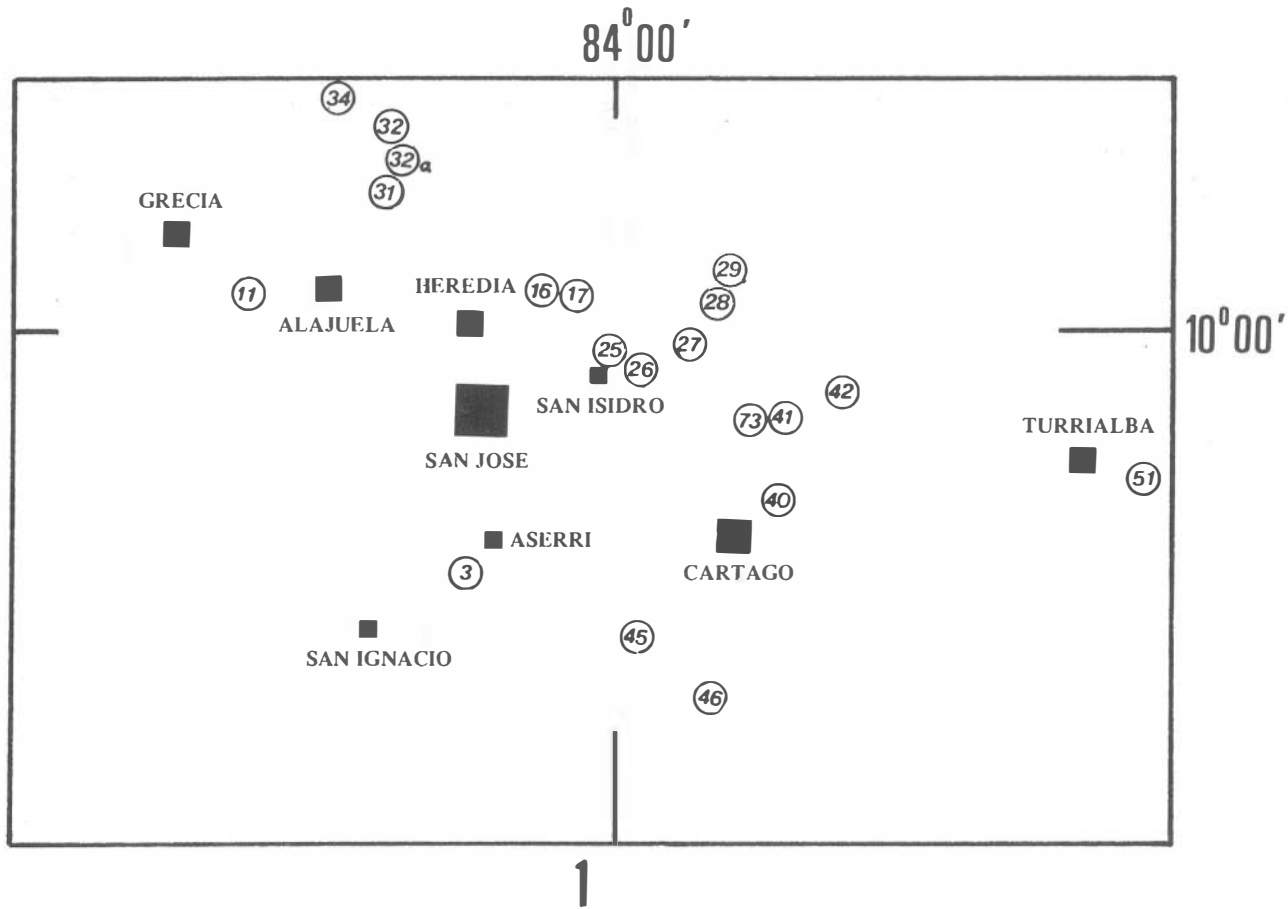
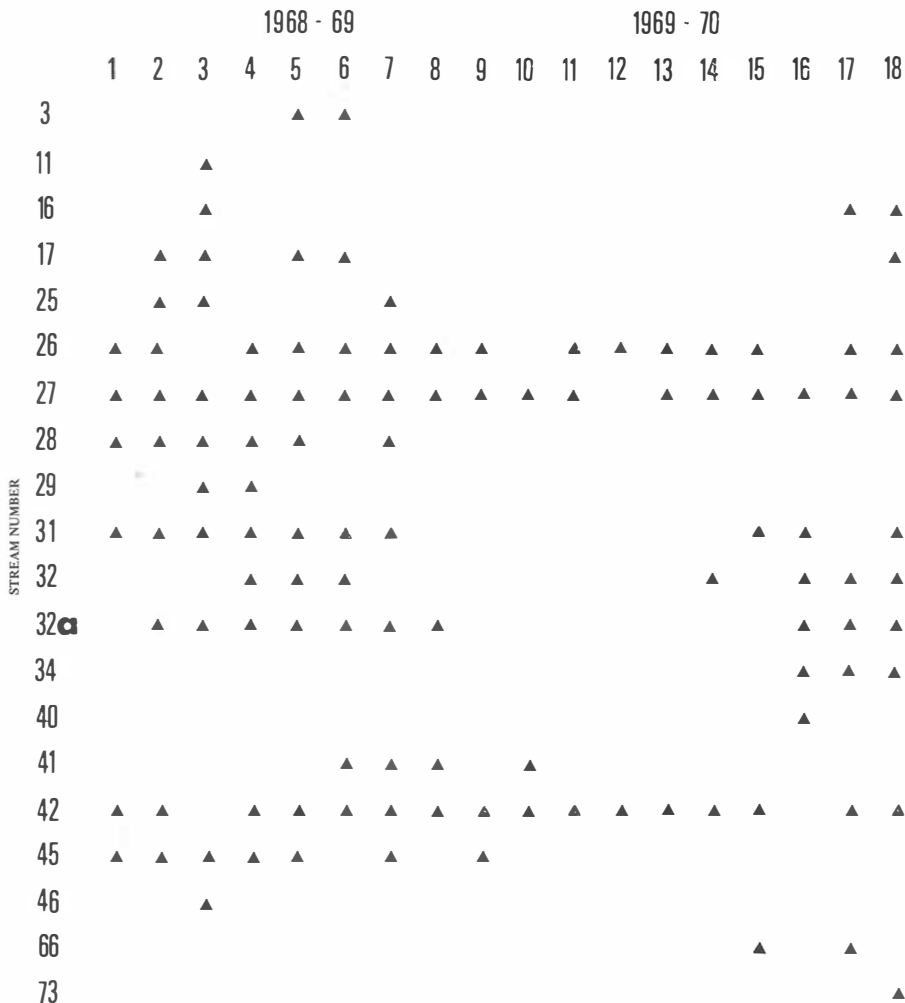
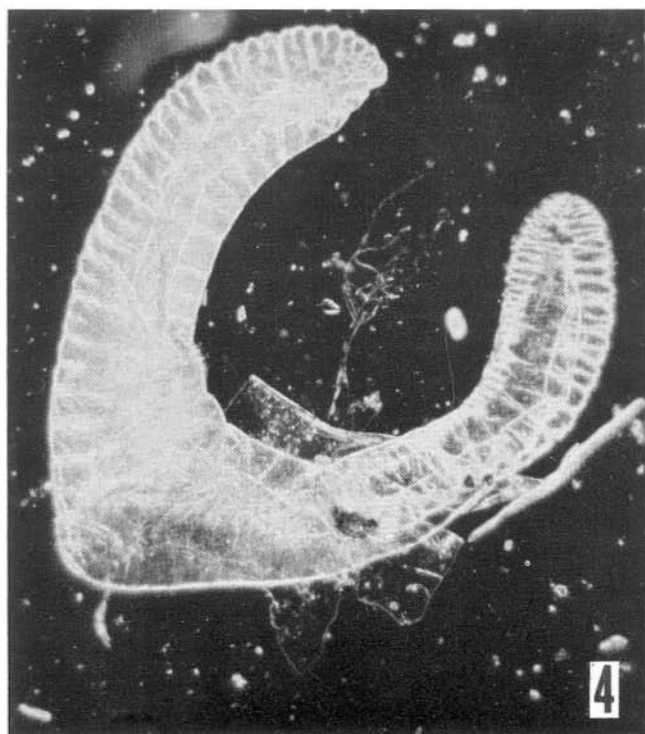
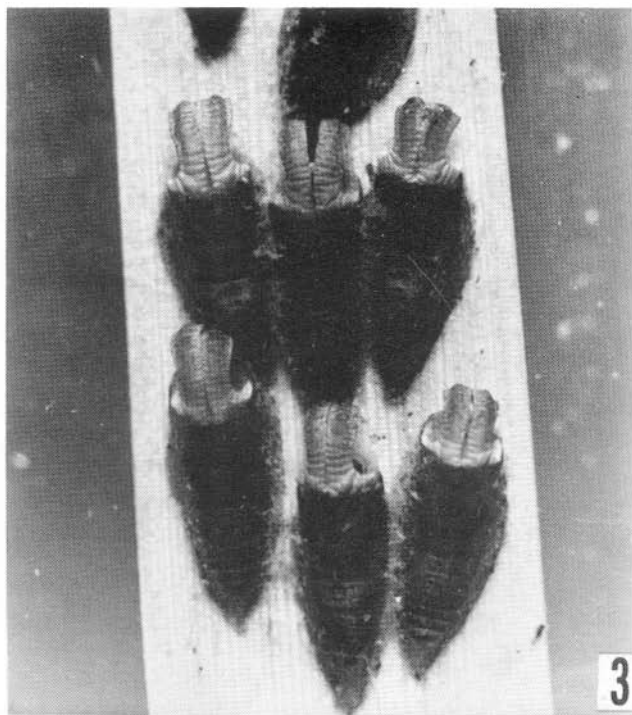


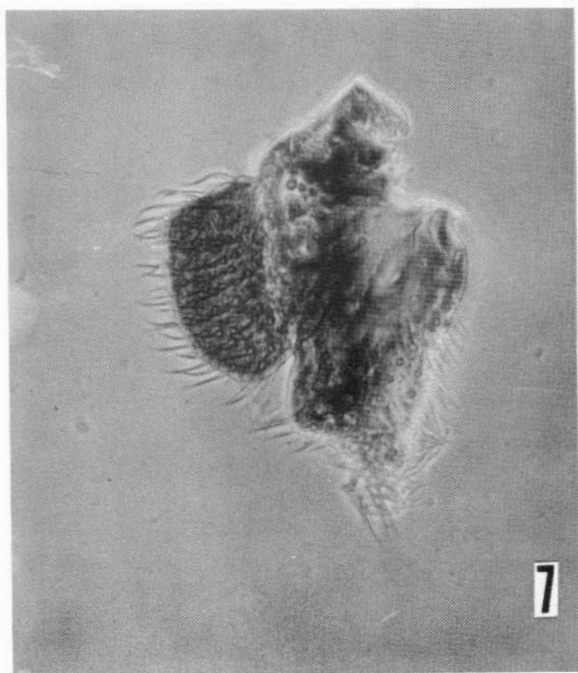
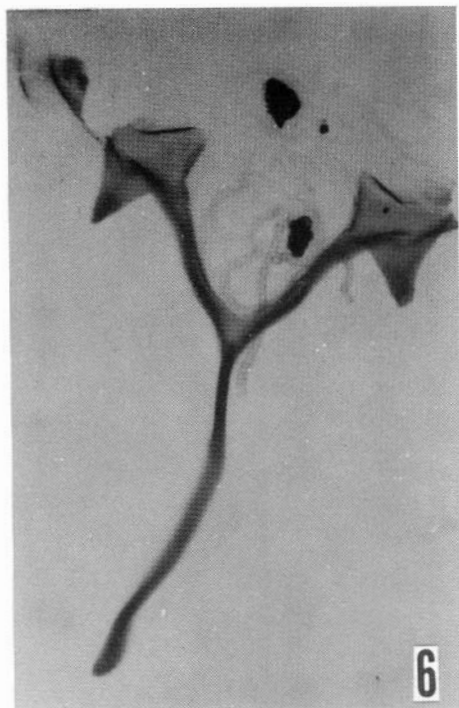
Fig. 2. *Simulium (H.) chiriquiense* present in stream sites at indicated observation numbers and dates (1968-69 observed monthly, 1969-1970 observed bimonthly). Code in Fig. 1.



Figs. 3-4. *Simulim (H.) chiriquiense* Pupa (Costa Rican specimen):3, General aspect of pupae attached to leaf blade. 4, Detail of branchial arms.



Figs. 5-7. *Simulium (H.) chiriquiense* Female (Costa Rican specimen): 5, Buccopharynx.
6, Y-piece. 7, Cercus and anal lobe.



Figs. 8-10. *Simulium (H.) chiriquiense* Male (Costa Rican specimen): 8, Clasper and basistyle.
9, Adminiculum. 10, Arms of adminiculum.

