Crozetia Davies (Diptera: Simuliidae): redescription of Cr. crozetensis, Cr. seguyi, number of larval instars, phylogenetic relationships and historical biogeography

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Abstract

The taxonomy of the genus Crozetia Davies (Diptera: Simuliidae) is reviewed. Apart from the eggs, all stages of Crozetia crozetensis (Womersley) and Cr. seguyi Beaucournu-Saguez and Vernon, are fully redescribed with only claws and genitalia detailed for the female of Cr. crozetensis. A phylogenetic analysis of the Simuliidae indicates that Crozetia is the sister group of all other members of the extant Simuliini, in agreement with current molecular evidence. Palaeogeological evidence on
the age of the Crozet Islands is equivocal, but a very late Cretaceous to early Eocene age (79-54 Mya) is most likely, hence the presence of simuliiids on this archipelago is not the result of vicari-
ance from Gondwanaland. Method of dispersal to the Crozet Archipelago may have been via wind or possibly vectored by birds from Africa, as suggested by presence of a basal tooth on the adult female claw. Morphometric analysis of larvae of *Cr. seguyi* indicates seven instars which is typical for the Simuliidae.

**Key words:** Simuliidae, *Crozetia*, taxonomy, larval instars, phylogenetic relationships, biogeography

**Introduction**

The Simuliidae are found on many isolated volcanic islands that possess suitable running water habitats, attesting to great dispersal ability of the adults. Most such islands possess only a few species each, but in French Polynesia, there have been major species radiations on some islands (Craig et al. 2001). In the Pacific, south of New Zealand, the southernmost islands there that possess simuliiids (*Austrosimulium*) are Campbell Island (52.55°S 169.18° W) and Auckland Islands (50.68°S 166.15°E). Both sets of islands each possess a single endemic species. Navarino Island (Chile), at 55.10°S 67.65°W, is ostensibly the most southern island in the world to possess simuliiids (*Pauraustrosimulium*), but is not far distant from the South American continent.

Southeast of South Africa (Fig. 1), in the southern Indian Ocean, the Crozet Islands (46.40°S 51.78° E) possess two species in the endemic genus *Crozetia*. These islands (Fig. 2) are the most isolated from any other land mass that possesses Simuliidae. The Kerguelen Islands ~1,500 km further to the east, although with suitable habitats, lack simuliiids. Both archipelagoes have a severe climate, befitting their latitude, and now lack trees, although each is well covered with tussock grasses (Fig. 3).

*Crozetia* has been of interest to students of black flies because the larvae are highly aberrant (Dumbleton 1962, Davies 1965, 1974, Currie and Craig 1987). In particular the labral fan rays are markedly modified and apparently do not serve in filter feeding. Rather, these rake-like fans are used to browse the substrate. The pupae and adults also exhibit peculiarities.

The first simuliid material from the Crozet Islands was collected by T. H. Johnston and J. W. Marr (Johnston 1937) during a British, Australian and New Zealand Antarctic Research Expedition (BANZARE) in 1929. Womersley (1937) described the material (two males and some dozen larvae) as *Simulium (Cnephia) crozetense*. He illustrated the wing, leg, antenna and genitalia of the male, and hypostoma, antenna, palpus and mandible of the larva. As Dumbleton (1962) noted, Womersley misidentified certain larval structures. A further eight adults (male and female) were collected by R. Jeannel during an expedition in 1939 to the French Austral Islands (Prince Edward, Crozet and Kerguelen Islands). These were described by Séguy (1940) and assigned to the genus *Cnephia* Enderlein.