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## Chapter 8

# Aquatic Biodiversity of Madagascar: *Simulium* (Diptera: Simuliidae) from the Réserve Naturelle Intégrale d'Andohahela and Surrounding Areas

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### Abstract

The distribution of species of the genus *Simulium* (Diptera: Simuliidae) in rivers situated inside and outside the Réserve Naturelle Intégrale d'Andohahela is reviewed. No new species were discovered during the inventory of the reserve.

### Résumé

Les auteurs étudient la distribution du genre *Simulium* (Diptera: Simuliidae) dans les rivières situées à l'intérieure et à l'extérieure de la Réserve Naturelle Intégrale d'Andohahela. Aucune espèce nouvelle n'a été découverte à l'intérieure de la réserve.

### Introduction

The hydrographic network of southeastern Madagascar, including many rivers that have their origins in the hills making up the Réserve Naturelle Intégrale (RNI) d'Andohahela, comprises five main drainage systems: the Mandrare, the Efaho, the Tarantsy, the Ebakika, and the Manampanihy basins. The eastern portion of this region has, on the higher slopes, relatively intact primary forest typical of the humid zone, whereas much of the lower slopes has been cleared and contains open grassland or secondary forest. The vegetation to the west of the Anosyenne Mountains is distinctly drier and contains a variety of natural habitats, from spiny bush to gallery forest and human-degraded habitats (see Chapters 1 and 2). Generally the slopes along the eastern versant are steeper than those on the western ver-

sant. These different ecological factors have given rise to various types of colonization and life history strategies by different *Simulium* species.

The collections reported on here were carried out within the framework of the project "Biologie et biodiversité des eaux continentales malgaches." Given the number of sites visited and the breadth of the collections, it is now possible to estimate the distribution and species richness of several groups of aquatic insects. Here we focus on the inventory and geographic distribution of *Simulium* spp. existing in southeastern Madagascar. All preimaginal forms of *Simulium* are aquatic and restricted to running water. There is considerable variation in this genus in certain life history parameters (e.g., rate of oxygen flow, pH, turbidity, temperature, habitat), and several species are rather strict in their ecological requirements. Furthermore, female *Simulium* are hematophagous and in some cases may be rather dependent on a specific source for blood.

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## List of *Simulium* Known from Basins in Southeastern Madagascar

Current information on the species diversity of the Malagasy *Simulium* fauna indicates that it is relatively poor in comparison to that of Africa. Thirty-eight species are known from Madagascar, 32 of which have been named, with six currently being described. By comparison, 90 species are known from the African continent. The watersheds of southeastern Madagascar contain 20 species of *Simulium*; this number is exceptionally high in comparison with other areas of the island. Thus, slightly over 50% of the known Malagasy species of this genus occur in the southeast. These species are:

- S. adersi* Pomeroy, 1921;
- S. ambositrae* Grenier and Grjébine, 1958;
- S. brunhesi* Elouard and Ranaivoharindriaka, 1996;
- S. gyas* de Meillon, 1951;
- S. imerinae* Roubaud, 1951;
- S. impukane* de Meillon, 1936;
- S. iphias* de Meillon, 1951;
- S. iphias* (10 filaments), undescribed;
- S. iphias* (15 filaments), undescribed;
- S. iphias* (17 filaments), undescribed;
- S. iphias* (18 filaments), undescribed;
- S. iphias* (19 filaments), undescribed;
- S. metecontae* Elouard and Pilaka, 1996;
- S. neireti* Roubaud, 1905;
- S. philipponi* Elouard and Pilaka, 1997;
- S. ruficorne* Macquart, 1838;
- S. starmuhlneri* Grenier and Grjébine, 1963;
- S. tolongoinae* Grenier, 1972;
- S. unicornutum* Pomeroy, 1920; and
- Simulium* new species, undescribed.

## Discussion

On the basis of an analysis of the distribution of *Simulium* species known from the basins of southeastern Madagascar, it is possible to distinguish two species groups that correspond to each of the botanical ecosystems.

### Group 1

In this group are savannicolous and grassland species that live in tepid, medium- or slow-mov-

ing waters with sandy bottoms. Larvae most often hang or cling to the floating substrates. Species in this group include *Simulium adersi*, *S. ruficorne*, *S. iphias* 15 filaments, *S. iphias* 17 filaments, *S. iphias* 18 filaments, *S. iphias* 19 filaments, *S. imerinae*, *S. philipponi*, *S. impukane*, *Simulium* new species, and *unicornutum* (Fig. 8-1, maps II-V).

### Group 2

In this group are forest species that live in fresh waters with relatively rapid currents and occasional waterfalls, and often in rivers that circulate under forest galleries that cover all or nearly all of the river's width. This group includes *Simulium neireti*, *S. ambositrae*, *S. starmuhlneri*, *S. tolongoinae*, *S. iphias* 10 filaments, and *S. gyas* (Fig. 8-1, maps V and VI).

The hydrographic system of the RNI d'Andohahela includes four main basins: the Mandrare (western part), the Tarantsy and the Efaho (southern part), and the Manampanihy (eastern part). Inside the reserve, *Simulium* captured in the upper streams of the Mandrare are different from those recorded in watercourses of the upper part of the Manampanihy. Thus, *S. adersi* and *S. unicornutum* are characteristic of the upper part of the Mandrare Basin, whereas species such as *S. gyas*, *S. starmuhlneri*, *S. tolongoinae*, *S. neireti*, and *S. ambositrae* occur in the upper streams of the Manampanihy Basin.

*Simulium starmuhlneri* is a strictly forest-dwelling species that has only been found in small tributaries under a continuous covering of forest. Others, such as *S. gyas*, *S. ambositrae*, *S. iphias* 10 filaments, and *S. tolongoinae*, are found in waters that course through a discontinuous forest cover.

Few species occur in microsympatry, and generally one to four species are collected at each site. There is more similarity among the faunas of *Simulium* spp. found in open savannah or grassland habitats than among those from forest habitats. This may be explained by the fact that savannah rivers or those passing through open country are often larger and contain a greater variety of microhabitats within the same system, whereas mountain streams are often smaller and more homogeneous.

*Simulium starmuhlneri*, *S. tolongoinae*, and *S. neireti* were collected in the forest of the RNI d'Andohahela. None of these *Simulium* are endemic to the reserve, and they are known to occur at other forested sites of eastern Madagascar. This



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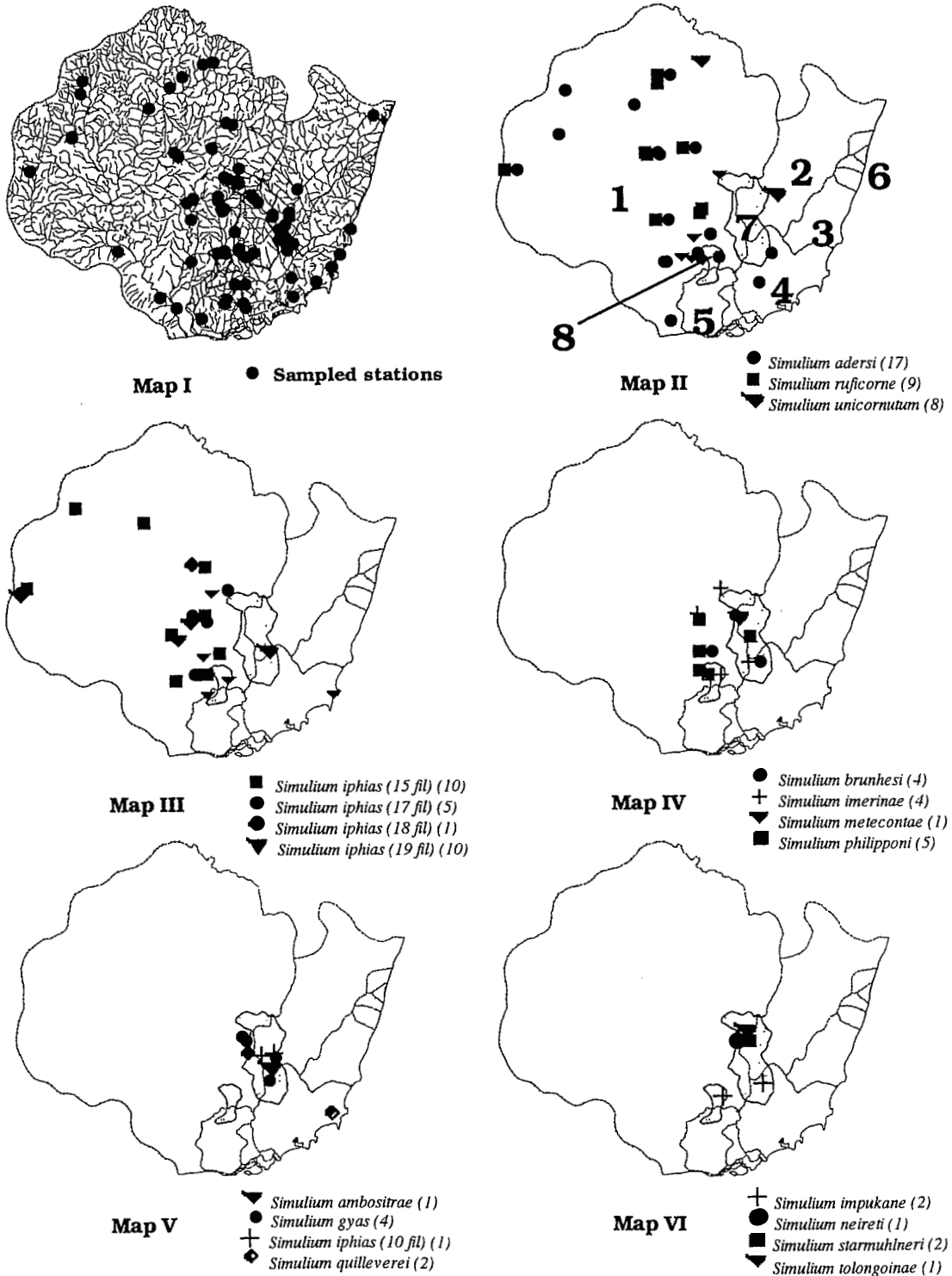


FIG. 8-1. Maps of the spatial distribution of *Simulium* spp. occurring in southeastern Madagascar. Areas in gray are the parcels of the RNI d'Andohahela. **Map I**, hydrographic network of southeastern Madagascar; **Maps II to VI**, distribution of *Simulium* spp. Key to localities figured on Map II: 1, Mandrare Basin; 2, Manampanihy Basin; 3, Ebakika Basin; 4, Efaho Basin; 5, Tarantsy Basin; 6, small coastal basins; 7 and 8, RNI d'Andohahela.

is in contrast to the tributaries of the Mandrare and the Manampanihy basins, which flow through open zones and from which several new species have been discovered (*S. philipponi*, *Simulium* new species, and *S. brunhesi*).

### Acknowledgments

This study represents contribution 13 of the project "Biotypologie et biodiversité des eaux continentales malgaches," run jointly by CNRE and ORSTOM. The program is financed through the French Fonds d'Aide et de Coopération (FAC). We thank our colleagues at Laboratoire de Recherche sur les Systèmes Aquatiques et leur Environnement (LRSAE) for their help and assistance. We are deeply indebted to the Ministère de la Recherche Appliquée au Développement (MRAD) for the facilities made available for our research program. Maps were drawn with the CartoNOE software, written by O. Hertu. S. M. Goodman and two reviewers provided useful comments on an earlier versions of this chapter.

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June 30, 1999  
Publication 1503

**PUBLISHED BY FIELD MUSEUM OF NATURAL HISTORY**