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▼ ASSOCIATED INSTITUTIONS:	Medical Research Station, Kumba, Cameroon.
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## Adult *Simulium damnosum s.l.*: dispersal, migration, host-searching behaviour and vectorial capacity of flies in Cameroon.

In collaboration with the Medical Research Station in Kumba, Cameroon, the biology, ecology and vectorial capacity of *Simulium damnosum s.l.* populations were to be studied in various bioclimatic zones of the country, with particular regard to the different epidemiology of onchocerciasis in rain-forest and savanna, and with the aim of developing new or alternative strategies of onchocerciasis control.

- An automatic trap ("umbrella-fan-trap", Fig. 1) has been developed for blood-searching *S. damnosum s.l.* flies, which could be very helpful in monitoring the fly-populations during a control campaign. Using visual, chemical and thermic stimuli for attraction, the number of flies caught by this trap were between 60 and 100% of the corresponding catch on a fly-collector in the rain-forest (*S. squamosum*, *S. yahense* and *S. mengense* mainly), but were even higher in the savanna (*S. damnosum s.s.* and *S. sirbanum* mainly). A total of 4,591 flies was caught during 17 experiments

(60 hrs of running the trap). Only very few other insects were attracted.

- The behaviour of the human population was studied with regard to the risk and prevention of onchocerciasis transmission. A reduction of about 90% of the risk of receiving infective fly-bites could be achieved by appropriate clothing of the legs which prevented the flies from taking a bloodmeal (Fig. 2). Alternatively, the topical application of 1 cc of DEET-Insect repellent on each leg reduced the number of fly-attacks by more than 90% over a period of about 3 hours.

- An experimental treatment of the river Vina du Nord near Touboro (see Fig. 4 for location) showed the high efficacy of *Bacillus thuringiensis* H 14 against *Simulium* larvae. At least during the dry season, when the man-fly contact is highest but the water discharge of the rivers is low, the intensity of disease transmission could be much reduced by the simple and cheap application of this larvicide

from the ground. A similar experiment in the forest at the river Meme and its tributaries gave less convincing results.

- During the rainy season, however, the long-distance immigration of vector flies from perennial breeding sites in the southern Adamaoua mountains might jeopardize the beneficial effects of such a localized control programme in the savanna along the rivers Mayo Rey, Benoue and Vina du Nord. This phenomenon was studied with regard to the species of vectors involved (mainly *S. damnosum s.s.* and *S. sirbanum*, few *S. squamosum*) and to the risk of transmission introduced by these invading flies.

- The dispersal of fly-populations up and downstream and inland away from the breeding rivers was studied in the rain-forest and savanna in order to determine areas of high risk of transmission which human settlements should avoid. Species and season-specific dispersal behaviour was seen in *S. damnosum s.s.*, *S. squamo-*

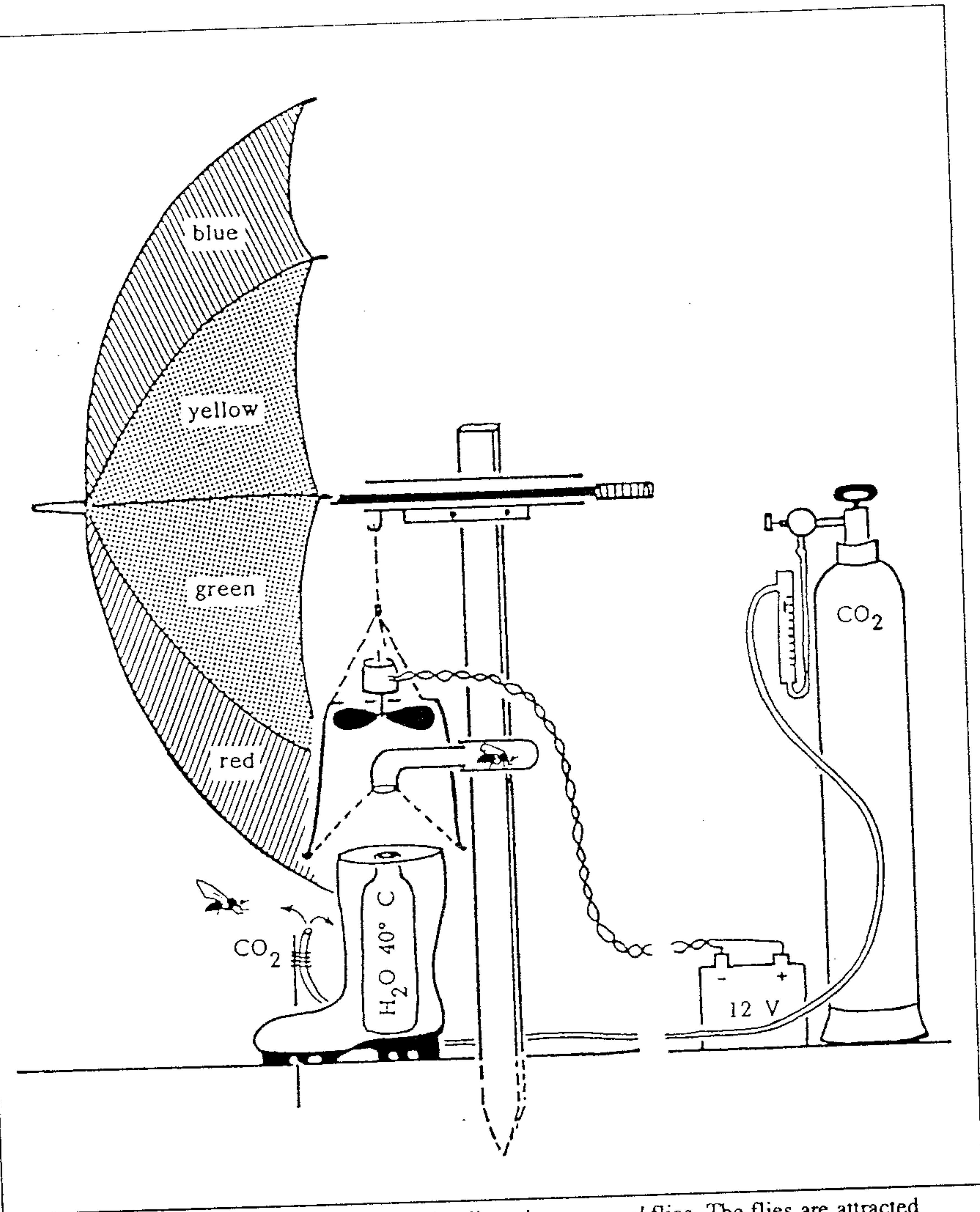


Fig. 1: Automatic trap for catching *Simulium damnosum s.l.* flies. The flies are attracted by the colourful umbrella, by CO<sub>2</sub> from a tank (100 ltr/hr) and by the warmth of hot water in the rubber boots. They are sucked into the net above the boots by a fan and are crawling in the glass tube outside the trap where they can be easily collected.

sum-*S. yahense*, *S. mengense* in the rain forest and in *S. damnosum s.s./S. sirbanum* in the savanna. Four mark-recapture experiments in the savanna (18,570 flies marked with UV-fluorescent dye-powder, 124 recaptured) showed the high motility of the fly-populations and the preferential direction of dispersal flights upstream from the release point.

- A formula for the vectorial capacity of *Simulium* populations is given, the species-specific parameters of which have been estimated from dissections of wild-caught flies in the rain-forest and savanna and from experimental transmission. Using this formula, the effects of different control strategies on the intensity of onchocerciasis transmission were compared.

- *Simulium damnosum s.l.* Annual Biting Rates and *Onchocerca volvulus* Transmission Potentials have been assessed at 5 fly-catching sites

near three villages in North-Cameroon (see Fig. 3), completing the results of a former study in the same area (RENZ 1987). These data provide useful base-line information for the community-based ivermectin trials, which have now been started, in collaboration with the Centre Pasteur, OCEAC and IMPM, in this region. Today, the intensity of disease transmission seems to be even higher than 10 years ago, presumably due to the much higher density of the human population along the worst affected rivers.

- The cytotaxonomy of the *S. damnosum s.l.* complex was studied with regard to the geographic and seasonal variations in the occurrence of the prevailing species in Cameroon, namely *S. damnosum s.s.*, *S. squamosum*, *S. yahense*, *S. mengense* and *S. sirbanum*. With the exception of *S. sirbanum* all other species occurred in the rain-forest as well as in the savan-

na. A Cameroonian trainee has been trained in cytotaxonomy at the Medical Research Station in Kumba.

- Morphological and morphometrical criteria have been developed for separating the adult and larval stages of the prevailing vectors in Cameroon, in conjunction with studies on the behaviour and vectorial capacity of these different vector-populations in the rain-forest and savanna.

- *S. bovis* is a man-biting species in North-Cameroon. Annual Biting Rates of 2,000 to 3,000 flies/ man/ year were recorded and filarial infections were common. Besides of infective larvae of animal origin ("Type D", DUKE 1967, RENS & FRANZ 1979), which are also found in *S. damnosum s.l.* from the same area, other infective larvae morphologically indistinguishable form *O. volvulus* were also observed. Microfilariae of *O. volvulus* were ingested and developed up to the preinfective stage, but no infective stage larvae were yet obtained from experimentally fed *S. bovis*.

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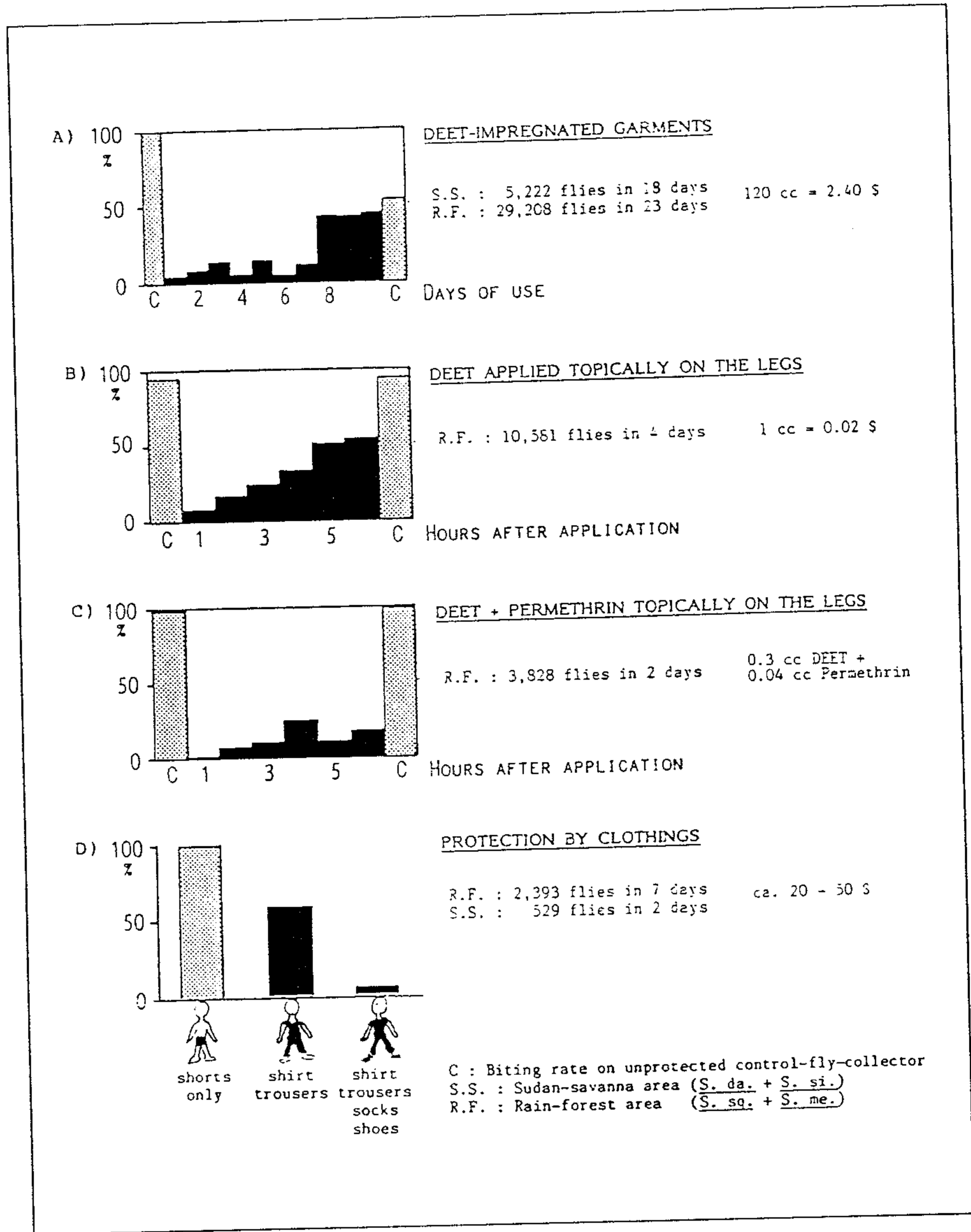


Fig. 2:  
 Reduction of *S. damnosum sl* biting rates on man by the use of repellent and appropriate clothing of the body.

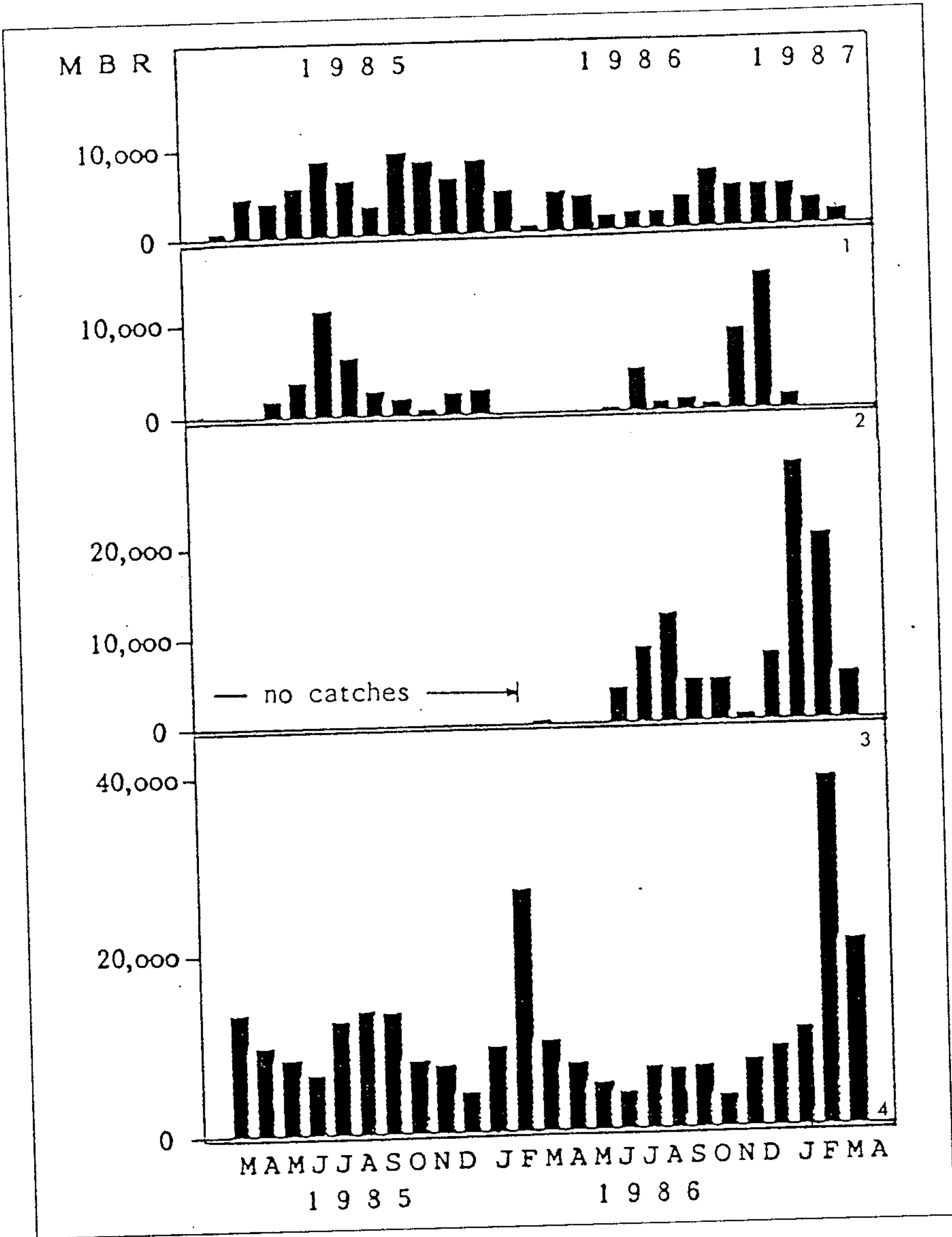


Fig. 3: *S. damnosum s.l.* Monthly Biting Rates on man (MBR at four sites in the Cameroon savanna (1985-1987).

1. Vina du Nord, Touboro
2. Mayo Rey, Tchollire
3. Mayo Oldiri, Taboun
4. Vina du Sud, Wakwa

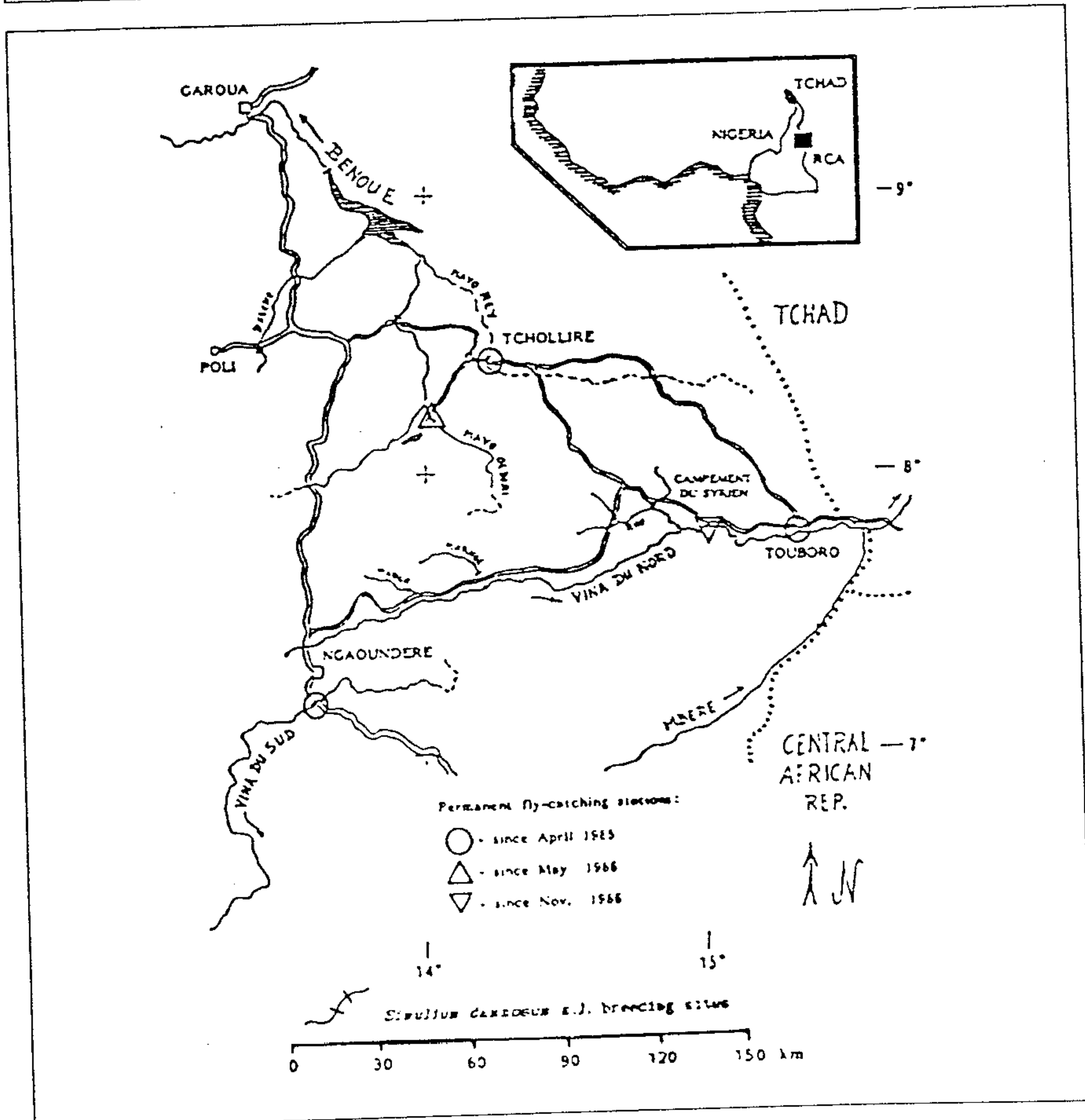


Fig. 4: The study area in North-Cameroon.