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Vectorial capacity of Simulium damnosum s.l. populations in Cameroon

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The transmission of *Onchocerca volvulus* by different vectors of the *Simulium damnosum* s.l. complex was studied in the Cameroon rain forest around Kumba (4°39′/9°26′) and in the savanna near Ngaoundere (7°12′/13°34′). Variations in the infection rates by *O. volvulus* infective stage larvae (L_3) became apparent after morphological classification of the flies. *S. squamosum* and *S. yahense* were not distinguished in the rain forest and they are considered to form one interbreeding population in the savanna (see Table 1, next page).

These differences in the vectorial efficiency of the various *Simulium* populations are explained by variations in the parameters defining: the vector density relative to man (m), its daily feeding rate (a), the proportion of bloodmeals on the human host (h), the daily survival rate (p) and the period necessary for the maturation of the infective larvae (n = 7 days), the susceptibility of the vector as defined by the number of infective larvae deriving from one bloodmeal on an (moderately) infected person (1), and the probability for one infective larva to leave the host during the bloodmeal of the vector (g = 0.7). The vectorial capacity (*sensu* Garrett-Jones 1964) gives the number of new infections (worm-couples) potentially distributed every day by a given vector population after feeding on an infected person (DBR: Daily Biting Rate on man = m a h):

$$\text{Vectorial capacity} = \text{DBR } h\ p^n\ 1\ g\ /\ [2(1-\langle 1-g\rangle p^3)]$$

Near *Simulium* breeding sites, it could be as high (on a monthly average) as 100 worm-couples per man per day in *S. squamosum-S. yahense* (river Moungo) and 10 for *S. mengense* (r. Meme) in the rain forest, 40 for *S. squamosum/yahense* in the Guinea savanna (r. Vina du Sud) and 20 for *S. damnosum* s. str. in the Sudan savanna (r. Vina d. Nord). Though S. damnosum s.str. was frequent in the rain forest, only very few infective stage larvae were observed in these flies and it is probably of no importance as a vector of onchocerciasis in this area.

Variations in the vectorial capacity were mainly due to the availabilitiy of suitable breeding sites. The probability of survival, as expressed by the parous rate of the total man-biting fly-population, was lowest for *S. mengense* and *S. squamosum-S. yahense* in the forest (25 and 35 % parous). It was highest for *S. damnosum s. str.* and *S. squamosum/yahense* in the savanna during the rainy season (50 %). The zoophily of the fly-populations was generally speaking high in the savanna, probably the majority of all bloodmeals being taken on animals there, but was much lower in the forest. *S. mengense* was less anthropophilic than *S. squamosum* or *S. yahense* at sites where they occurred sympatrically in the forest. Highest mean numbers of infective larvae *O. volvulus* were observed in *S. mengense* in the forest (5.5 per infective fly), followed by forest *S. squamosum-S. yahense* (4.4), Guinea savanna *S. squamosum/yahense* (3.3) and Sudan savanna *S. damnosum s. str.* (3.0) and *S. sirbanum* (1.9).

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Reference

Garrett-Jones, C.: Bull. WHO 30 (1964) 241–261

Table 1 Number of L3 *O. volvulus* per fly dissected

Species	Rainforest	Guinea Sav.	Sudan Sav.
S. mengense	0.065		
S. squamosum/yahense	0.167	0.050	
S. damnosum s.str.	0.014		0.140 rs
S. sirbanum			0.022 ds

rs = rainy season, ds = dry season