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Effects of urbanization on transmission of human African trypanosomiasis in a suburban relict forest area of Daloa, Côte d'Ivoire

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Abstract

The epidemiological risk of human African trypanosomiasis transmission was evaluated from entomological parameters (apparent trap density, female teneral rates, daily survival rates, proportion of human feeds) of tsetse (*Glossina palpalis palpalis*) populations in the town of Daloa, Côte d'Ivoire. High tsetse densities were found in the town outskirts, where the calculated risk of transmission was greatest. Environmental changes brought about by urbanization did not result in the disappearance of tsetse, or the interruption of sleeping sickness transmission. The few cases of sleeping sickness detected (32) in the years 1990–95 indicated that transmission was unrelated to tsetse density.

Keywords: human African trypanosomiasis, *Glossina palpalis palpalis*, urban area, epidemiology, risk factors, Côte d'Ivoire

Introduction

Human African trypanosomiasis (HAT), sleeping sickness, was already recorded from the western forest area of Côte d'Ivoire in the early years of the twentieth century. Since 1975 most cases have been detected in the central western region, of which Daloa (6° 53′ N, 6° 27′ W: population 160 000) is the economic capital and from which cases were reported from 1930 onward, including a 1968–69 urban/suburban epidemic probably induced by agricultural development of the inland valley areas (BRENGUES *et al.*, 1969). Since 1990, 32 cases have been detected in Daloa: 27 from urban areas and 5 from peripheral villages.

Daloa was created in 1908 and its size has doubled between 1970 and 1990, reaching 20 km^2. Since 1960, the ombrophilic forest has been progressively replaced by coffee and cocoa plantations, though irrigated rice fields have been developing in inland valleys (Fig. 1). Corn, cassava and yam are the major other crops. The main agricultural activities occur between April and June for the latter cultivations and between October and January for coffee and cocoa.

Entomological investigations were made for 1 year (1997–98) to study the effects of present land use on sleeping sickness transmission; results were analysed in relation to ecological zone: urban, transitional and suburban outskirts.

Materials and Methods

Vavoua traps (LAVEISSIÈRE & GRÉBAUT, 1990) were used for bimonthly catches of tsetse, each operated for 4 days at a time and emptied daily between 14:00 and 18:00. Traps were sited: (a) in the town proper (33 traps), (b) in the 9 peripheral villages within a 10-km radius of the town centre (26 traps) and (c) in the transition zones crossed daily by urban residents *en route* to cultivate their fields in the rural areas outside the town (76 traps). Traps were placed in sites where man–fly contact may be favoured: along the tracks, near the water-supply points, in the coffee and cocoa plantations, along the rice fields.

Because it is the main forest-zone vector of sleeping sickness, only the riverine *palpalis*-group species *Glossina (Nemorhina) palpalis palpalis* (which made up 97·8% of the 33 722 tsetse caught in the traps) was used for the calculation of the risk parameters (apparent trap density per day [ADT], physiological age [teneral females rate] and proportion of human feeds [identified by the method of DIALLO *et al.*, 1997]). Daily survival rates of *G. p. palpalis* were calculated by the method of CHALLIER & TURNER (1985). The epidemiological risk index, based on these parameters, was calculated following LAVEISSIÈRE *et al.* (1994).

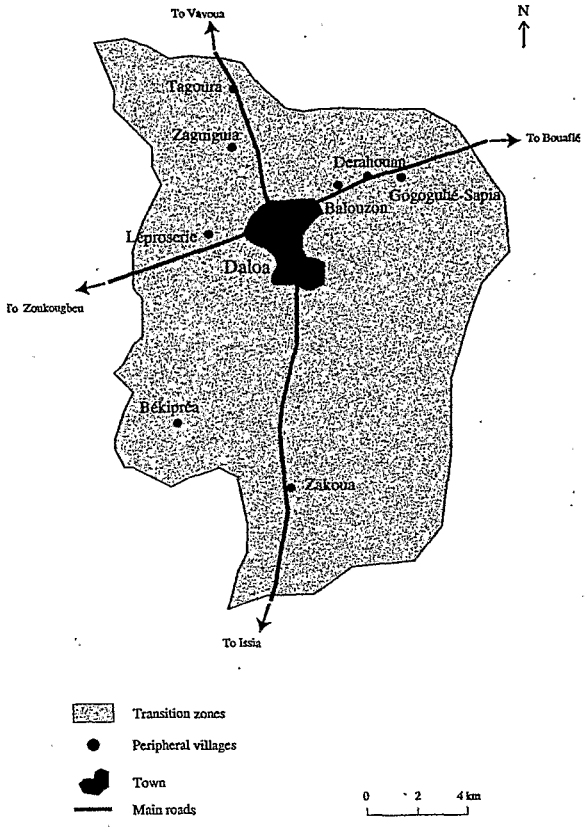

Fig. 1. Study area of transmission of human African trypanosomiasis in Côte d'Ivoire.

Results

Three species of tsetse were caught: *G. p. palpalis*, *G. pallicera pallicera* and *G. nigrofusca nigrofusca*. The average ADT (flies/trap/day) of *G. p. palpalis* was 1·1 in urban areas, 10·1 in the peripheral villages and 11·9 in the transition zones. Monthly variations of ADT were insignificant in the urban zone but more pronounced in the outlying villages and the transition zones (Fig. 2).

Urban risk levels (1·5) were very low compared to those in the peripheral villages (235·5) and in the intervening transition zones (1082·4). Moreover, marked monthly variations were observed (Fig. 3). Risk levels

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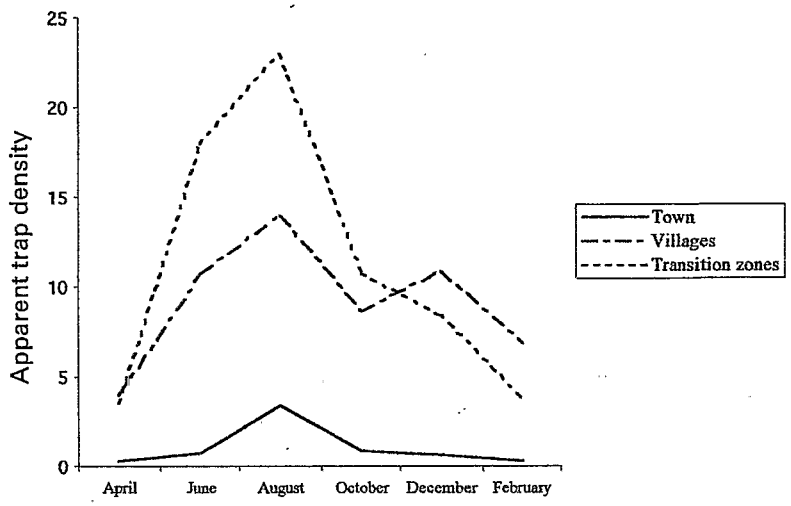

Fig. 2. Monthly variations of averaged apparent densities of tsetse in the different areas of Daloa (Côte d'Ivoire) studied in 1997–98.

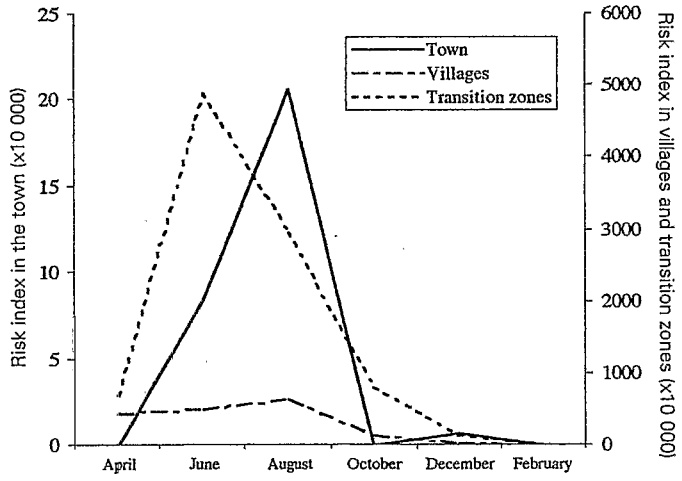

Fig. 3. Monthly variation of epidemiological risk of sleeping sickness transmission in the different areas of Daloa (Côte d'Ivoire) studied in 1997–98.

were maximal (4888·7) in June in the transition zones, but maximal in August in the urban zone (20·6) and the outlying villages (644·3). In all areas there was a secondary peak of risk in December, during the harvest of coffee and cocoa, when *G. p. palpalis* densities were also high.

Discussion

Urbanization did not bring about the cessation of HAT transmission, but it did result in the concentration of tsetse in the town outskirts, where environmental and man–vector contact conditions remain conducive to their survival. The high tsetse density contributes to a high epidemiological risk, but intensity of the transmission remains low. The epidemiological risk index does not allow a direct evaluation of HAT transmission; it only implies the existence of conditions more or less conducive to transmission.

Although HAT is mainly associated with rural areas, transmission can also occur in urban areas, as reported by CHALLIER (1962) and GOUTEUX *et al.* (1986). Urban environmental changes reduce the extent of potential tsetse biotopes, but the pattern of urban land use in Côte d'Ivoire forest-zone towns leads to an increase in human population density and favours man–fly contact. Despite the few cases of HAT detected, results from Daloa suggest that surveillance should be maintained, since conditions now exist which still favour urban/peri-urban transmission.

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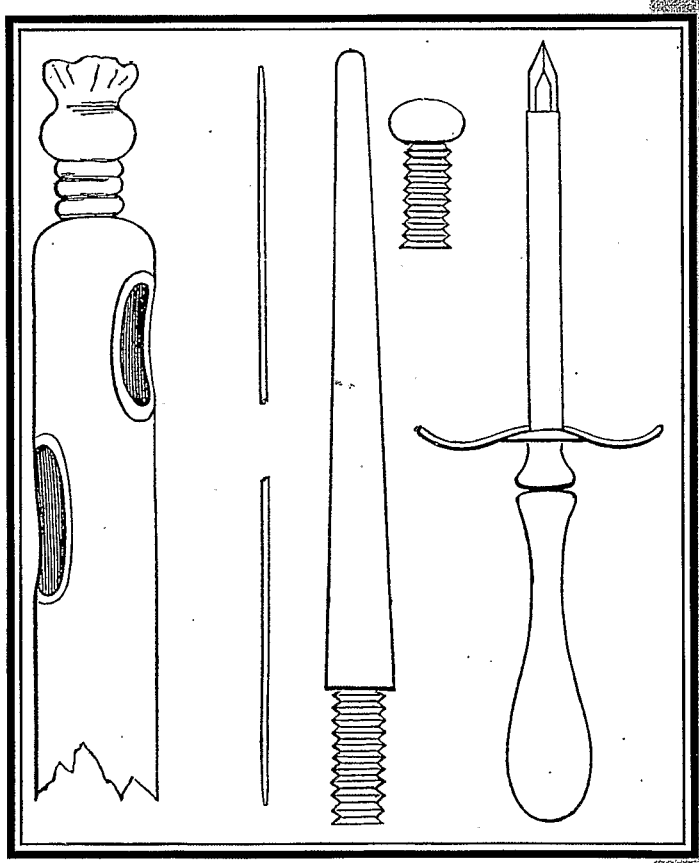

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