

## BIONOMICS AND CYTOGENETICS OF *ANOPHELES SERETSEI* ABDULLA-KHAN, COETZEE, AND HUNT, A NEW SPECIES FROM NORTHERN BOTSWANA

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**ABSTRACT.** Morphological analysis of anopheline mosquitoes from Kasane, Botswana, revealed a new species, *Anopheles seretsei*, that is closely related to *Anopheles azevedoi* and *Anopheles listeri*. A description of the type locality and biological characteristics of *An. seretsei* is given. Comparisons are made with *An. listeri* and *An. azevedoi*. The banding patterns of the giant polytene chromosomes of *An. seretsei* were compared with those of *An. listeri* and found to be homosequential.

**KEY WORDS** *Anopheles seretsei*, *Anopheles azevedoi*, *Anopheles listeri*, polytene chromosomes, Botswana, bionomics

### INTRODUCTION

A recent survey of the mosquitoes from Kasane, Botswana, revealed a new species, *Anopheles seretsei* Abdulla-Khan, Coetzee, and Hunt (1998), that is morphologically very similar to *Anopheles listeri* De Meillon and *Anopheles azevedoi* Ribeiro. The present paper summarizes our knowledge of the distribution and biological characteristics of the 3 species and presents a photomicrograph of the polytene chromosomes of *An. listeri*.

### DISTRIBUTION

*Anopheles listeri* is widespread in southern Africa, occurring in Zimbabwe, South Africa, Namibia, and southern Angola (Gillies and De Meillon 1968, Fig. 57). This species was collected in Botswana at the Mowana Lodge, Chobe, in a cattle enclosure and pigpen (Fig. 1).

Gillies and Coetzee (1987, Fig. 28) provide a map of the distribution of *An. azevedoi* showing several records along the arid coastal belt of Angola (Ribeiro 1969, 1974; Ribeiro and Ramos 1975) and one from the Uppington District of the Northern Cape Province, South Africa (De Meillon and Van Eeden 1976).

*Anopheles seretsei* is known only from the type locality, Kasane, Chobe District, northeastern Botswana. Collections were made at 4 sites: Chobe Safari Lodge (17°48'S, 25°09'E), Mowana Lodge (17°48'S, 25°11'E), and a cattle enclosure and a pigpen on Kazangula Road (17°48'S, 25°19'E) (Fig. 1). *Anopheles seretsei* was collected only at the Mowana Lodge and the cattle enclosure. The area is in close proximity to the Zambezi and Chobe rivers and includes 2 saline hot springs on the Chobe riverside, the activity of these springs depends on the rainfall in the region. The mean altitude for Kasane is 935 m above sea level and the temperature range during the rainy season is 19–30°C. *Anopheles seretsei* has not been collected from any other area.

### ADULT BIOLOGY

Little is known about the adult biology of *An. listeri* other than that in Namibia, the adults frequently occur in houses and readily bite humans (Gillies and De Meillon 1968). De Meillon (1931) thought that *An. listeri* might be implicated in epidemic malaria in Namibia, despite the negative results of a small number of dissections for malaria parasites.

In Angola, adults of *An. azevedoi* were captured resting in houses, outdoors, particularly in crevices in the ground, in rocky cliffs, and also in vegetation. Females were also collected biting humans outdoors (Ribeiro and Ramos 1975). Salivary gland dissections for sporozoites were carried out on 109 females with negative results (Ribeiro and Ramos 1975).

Adult females of *An. seretsei* were collected biting humans indoors (Mowana Lodge) and feeding on cattle in enclosures (Kazangula Road).

### LARVAL BIOLOGY

*Anopheles listeri* has high tolerance of salinity, with the larvae being found in saline water that is >1.5 times (52.5 g NaCl/liter) the concentration of seawater (Ribeiro and Ramos 1975). However, Gillies and De Meillon (1968) state that the larvae are found in open sunlit pools and do not mention tolerance to salt water.

*Anopheles azevedoi* frequently occurs in highly saline pools along the southwestern coast of Angola. Larval habitats range from tidal pools, saline canals, and salt pans to brackish wells (Ribeiro 1974, Gillies and Coetzee 1987). The salinity of the most common larval breeding sites approaches that of seawater (35–36 g NaCl/liter); however, some larvae have been found in water with salinity of up to 400% that of seawater. In conditions of low salinity, *An. azevedoi* occurs in association with *An. listeri* (Ribeiro 1974, Ribeiro and Ramos 1975). In

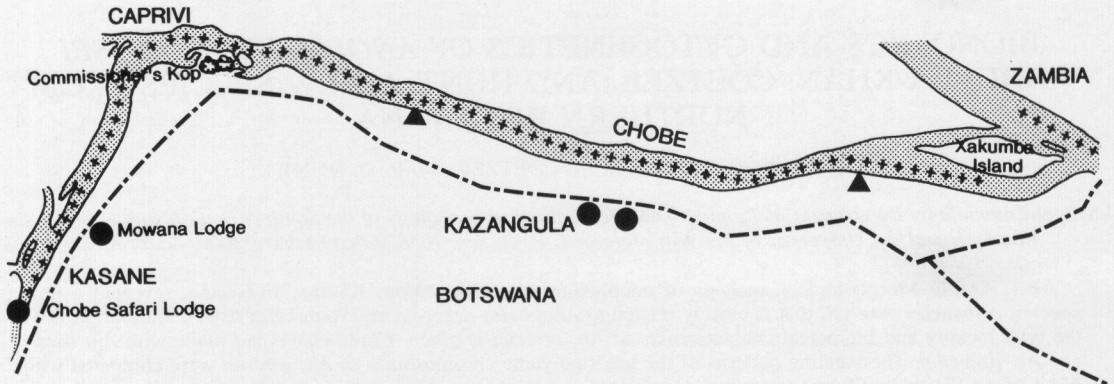


Fig. 1. Map of the Chobe District, northeastern Botswana, showing 4 collection points (●) and the localities of 2 hot springs (▲).

the upper Karoo, Northern Cape Province, South Africa, the larvae of *An. azevedoi* were found in saline pools (14.1 g NaCl/liter) in association with fairly large numbers of *An. listeri* (De Meillon and Van Eeden 1976).

The larval habitat of *An. seretsei* is unknown, but is probably in saline hot springs. X-Ray diffraction analysis of soil samples taken from the hot springs around Kasane showed the presence of halite (NaCl). In the laboratory, egg batches obtained from wild females were divided 50:50 into bowls containing either distilled water or 25% seawater equivalent (8 g NaCl/liter). All 1st instar larvae died in the distilled water and survived to adulthood in 25% seawater, suggesting that *An. seretsei* is an obligatory saltwater breeder.

## CYTOGENETICS

Giant polytene chromosomes are found in ovarian nurse cells of half-gravid anopheline females (Coluzzi 1968). The banding patterns on these chromosomes have, in many cases, provided a taxonomic tool for the identification of morphologically similar species, for example, the *Anopheles gambiae* Giles complex (Coluzzi et al. 1979) and the *Anopheles marshallii* (Theobald) complex (Lambert 1979).

The  $F_1$  female progeny of the *An. seretsei* that were not preserved for museum specimens were held in cages for 5 days before being offered a blood meal. Those that became half-gravid were dissected and the ovaries stored in Carnoy's pre-

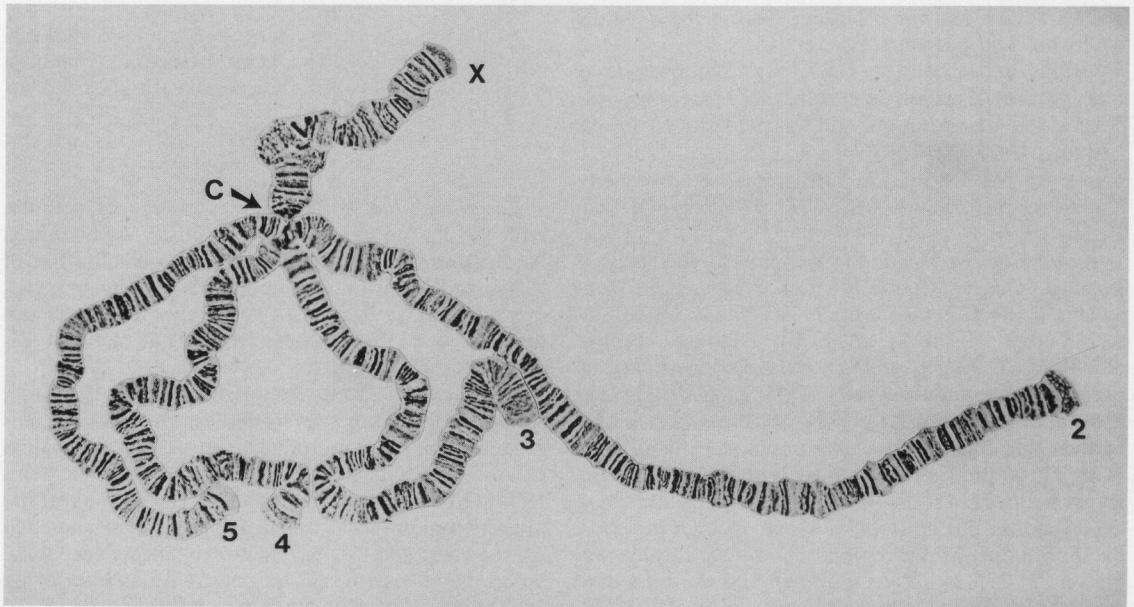


Fig. 2. The polytene chromosome complement of *Anopheles listeri* from Sautini, Northern Province, South Africa. C, centromere.

servative (Hunt and Coetzee 1986). Chromosome preparations were made according to the method of Green and Hunt (1980). Due to some difficulty in stimulating ovarian development in unmated females, only 5 ovaries were obtained from *An. seretsei*. Of these, only 2 preparations had chromosomes that could be scored. These were compared with the chromosomes of *An. listeri* (Fig. 2) from Sautini, Northern Province, South Africa. No differences were seen in the banding patterns of the 2 species. A similar situation exists in the *An. gambiae* complex where *Anopheles quadriannulatus* (Theobald) species A and B share homosequential banding sequences (Hunt et al. 1998). The polytene chromosomes of *An. azevedoi* are unknown.

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