

THE OCCURRENCE OF *SCHISTOSOMA MATTHEEI* IN THE SOUTH-WESTERN TRANSVAAL

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ABSTRACT

JOUBERT, P. H., HAMILTON-ATTWELL, V. L. & KRUGER, F. J., 1987. The occurrence of *Schistosoma mattheei* in the south-western Transvaal. *Onderstepoort Journal of Veterinary Research*, 54, 603-605 (1987).

To determine whether *Schistosoma mattheei* is present in the south-western Transvaal, sixty habitats were searched for the intermediate host snail, *Bulinus africanus*. Ten populations of this snail were located, 2 of which were infected with *S. mattheei*. Eggs of one of these isolates, originating from a spring in the Mooi River, were examined with an optical microscope. Scanning electron micrographs of the teguments of adult male worms and the terebratorial membranes of miracidia are described. These parasites are morphologically similar to some previously described from another habitat in the same geographical area and both populations can be regarded as typical *S. mattheei*.

INTRODUCTION

Bulinus africanus, the intermediate host for the parasite *Schistosoma mattheei* which infects primarily cattle, and *Schistosoma haematobium*, which causes urinary bilharziasis in man, are common in the south-western Transvaal (Gear, Pitchford & Van Eeden, 1980). Although bilharziasis is known to be non-endemic for humans in this part of the country, very little has been done to determine whether *S. mattheei* is well represented in this area. Several localities from which *B. africanus* were previously recorded were therefore visited in an attempt to find infected snails. Owing to the prolonged drought, however, many of the smaller rivers and streams were dry during the time of the survey in 1985/86 and the number of habitats suitable for *B. africanus* were thus rather limited, but we succeeded in locating a few populations.

Previous studies were undertaken to describe *S. mattheei* from one of these habitats (Sterkstroom, near Ventersdorp) on the basis of tegumental characteristics of adult male worms (Kruger, Hamilton-Attwell & Schutte, 1986a), as well as egg morphology (Kruger, Schutte, Visser & Evans, 1986b). In their study Kruger *et al.* (1986a) observed that *S. mattheei* populations (including that at Sterkstroom) allopatric to *S. haematobium* were devoid of tegumental spines on the tubercles, whereas those sympatric to *S. haematobium* had spined tubercles. They further postulated that the presence of tegumental spines in *S. mattheei* could possibly be regarded as a character inherited from *S. haematobium* as a result of cross-breeding between the 2 parasite species. They stated that this hypothesis could only be proved beyond doubt if further studies were undertaken on allopatric populations of *S. mattheei*. For this reason we describe *S. mattheei* from a spring in the Mooi River in terms of characteristics currently being used for species identification.

METHODS

A snail survey was undertaken in the south-western Transvaal (south of 26° 00' and west of 26° 15') during March/April 1985 and 1986, a time of the year when snail densities are at their maximum. Specimens of *B. africanus* were screened in the laboratory on several occasions for cercarial shedding. Cercariae from all populations resembling those of the family Schistosomatidae were used to infect *Praomys (Mastomys) coucha*. These definitive hosts were perfused, as described by Jackson,

Dettman & Higgins-Opitz (1982). Adult male schistosomes were fixed in Karnovsky's solution for 24 h (Bullock, 1984) and post-fixed in 2 % osmium tetroxide (30 min) and 2 % uranyl acetate (1 h). After dehydration through a 70 %-100 % ethanol series the material was critical point-dried, glued to stubs and gold sputter-coated for studying by means of a Cambridge Stereoscan 250. Eggs of *S. mattheei* were obtained by macerating the livers of infected mice in a 0.9 % saline solution and washing the suspension with water through a helminth filter (Visser & Pitchford, 1972). After hatching, miracidia were killed with Parducz fixative (2 % osmium tetroxide and mercuric chloride) (Parducz, 1966) for 5 min., washed and fixed in Karnovsky's solution, concentrated on a 100 nm Nucleopore filter and dehydrated in ethanol. Further preparation for SEM study was done according to the method used for the adult schistosomes.

RESULTS

Although other freshwater snail species were present in nearly all of the 60 selected habitats, only 10 populations of *B. africanus* could be found. Snails from 5 of these populations shed forked-tailed cercariae, but only 2 of the 5 were positively identified as *S. mattheei*. One population was located in a spring which forms the uppermost source of the Mooi River in the Ventersdorp district (26° 12' S 27° 10' E), while the other originated from a tributary of the Skoonspruit on the farm Sterkstroom in the same district (26° 20' S 26° 50' E) (Fig. 1). Cercariae from snails of the remaining 3 populations were longifurcate types resembling those of avian schistosomes of the genus *Trichobilharzia*.

A representative egg of the parasites from the Mooi River spring is illustrated in Fig. 2, and the tegument of an adult male worm from the same habitat in Fig. 3. The terebratorium of a *S. mattheei* miracidium from the above locality is shown in Fig. 4.

DISCUSSION

The approximately 200 eggs examined during this study showed little variation in shape and, being morphologically similar to those of *S. mattheei* from Sterkstroom described by Kruger *et al.* (1986b), may therefore be regarded as typical *S. mattheei*.

During the study of adult male worms from the Mooi River, it became clear that the tegumental tubercles of all specimens are completely spineless (Fig. 3). This is characteristic of *S. mattheei* (Tulloch, Kuntz, Davidson & Huang, 1977; Hamilton-Attwell & Van Eeden, 1981; Kruger *et al.* 1986a). Morphologically, the parasites from the Mooi River display the same tegumental characteristics as those from Sterkstroom near Ventersdorp studied by Kruger *et al.* (1986a). Since both these populations occur allopatric with *S. haematobium*, the observation on the similarity of tegumental characteristics

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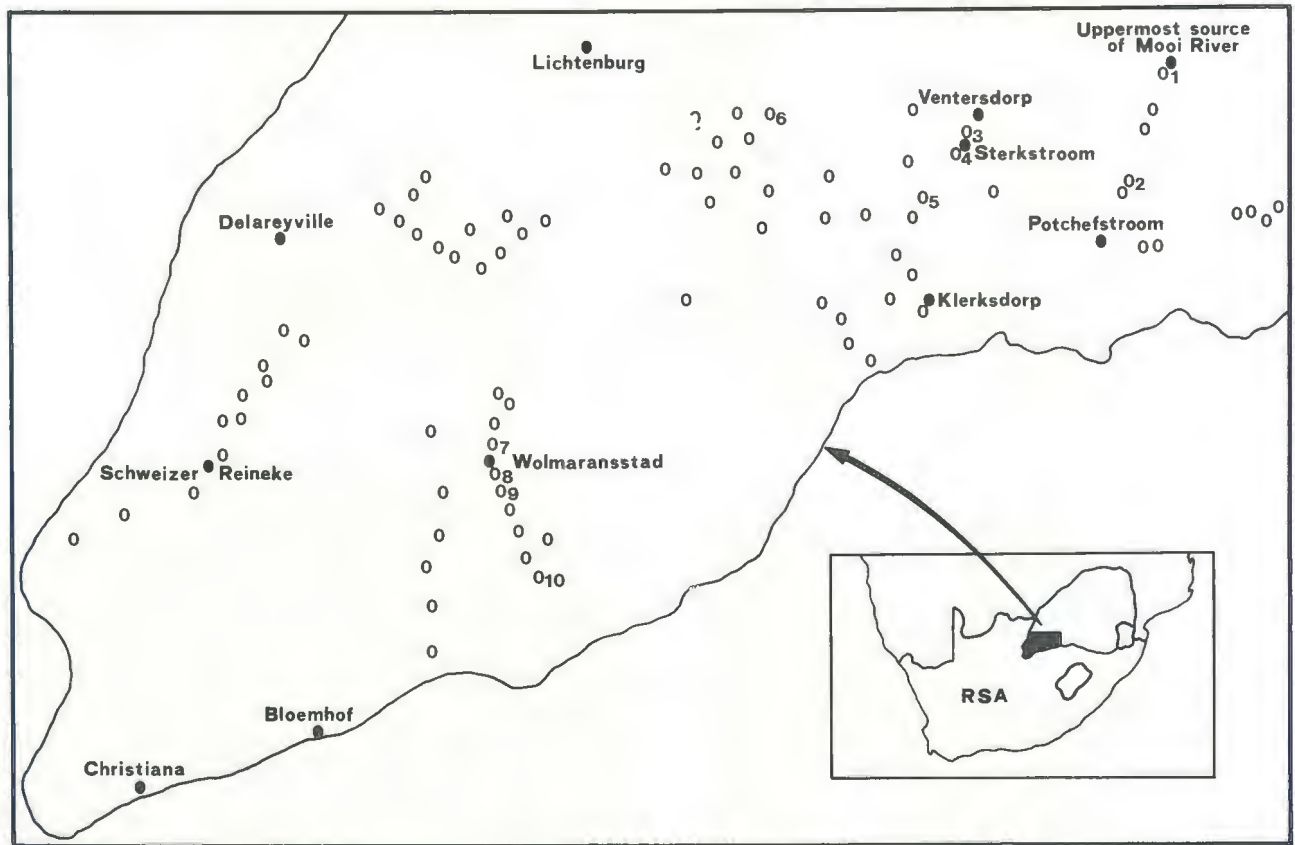


FIG. 1 The south-western Transvaal in which the snail surveys were undertaken. [0 = recorded distribution of *B. africanus* (Gear, Pitchford & Van Eeden, 1980), 1–10 = habitats in which *B. africanus* were found during our surveys, 1 & 4 = habitats in which *S. mattheei* were present]

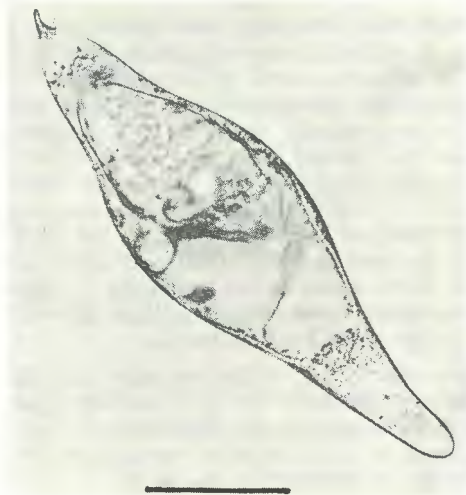


FIG. 2 An egg of *S. mattheei* from the spring in the Mooi River. bar = 50 μm

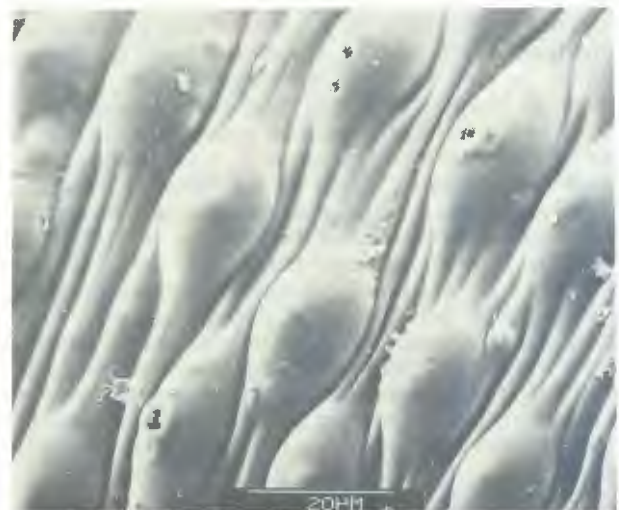


FIG. 3 Scanning electron micrograph of the tegument of an adult *S. mattheei* male from the Mooi River

lends support to the hypothesis of Kruger *et al.* (1986a) that the presence of tubercle spines in certain *S. mattheei* isolates is a character inherited from *S. haematobium*. Cross-breeding between the 2 schistosome species do occur (Pitchford, 1961) and since their ranges of distribution overlap to a large extent, it seems possible that the only morphologically homogeneous *S. mattheei* might be found in the few areas where they occur allopatric to *S. haematobium*.

A possible method of distinguishing between the miracidia of *S. mattheei* and *S. haematobium* is currently being investigated (F. J. Kruger, in preparation). According to this technique, the number of anastomoses per μm^2 on the terebratorial membrane of a miracidium

might be used for species identification. The information obtained from a number of electron micrographs indicates that the miracidia from the Mooi River population are identical with those of *S. mattheei* from Sterkstroom. This technique holds promise and may possibly provide an additional method by which the 2 schistosome species can be identified.

The results indicate that the species from the Mooi River spring is *S. mattheei* and that this isolate, as well as the one from Sterkstroom near Ventersdorp, are both typical *S. mattheei*. Both these habitats are on the perimeter of the species distribution range and it is possible

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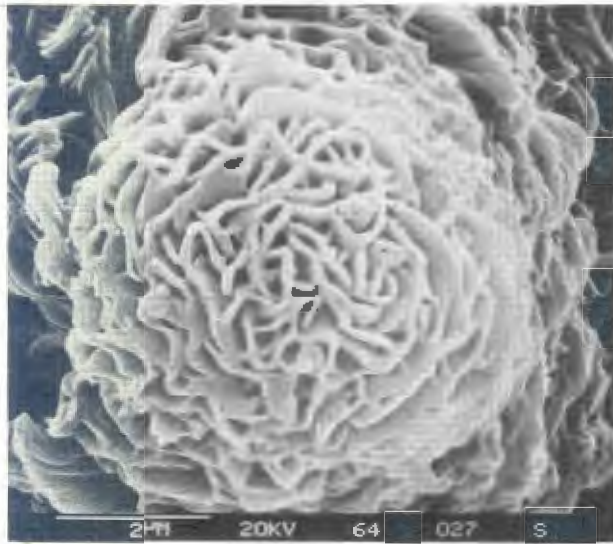


FIG. 4 Scanning electron micrograph of the terebratorial membrane of a miracidium of *S. mattheei* from the Mooi River

that the number of populations is limited in this area because of environmental pressure exerted on the species. There is the possibility, however, that the population density of *S. mattheei* in the south-western Transvaal might increase with sufficient rain in forthcoming seasons.

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