

Distribution and habitats of the *Bulinus africanus* species group, snail intermediate hosts of *Schistosoma haematobium* and *S. mattheei* in South Africa

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Abstract

As intermediate host of *Schistosoma haematobium* and *S. mattheei*, the *Bulinus africanus* group plays a major role in the transmission of urinary and bovine schistosomiasis, diseases that negatively affect the health status of millions of people and their livestock in South Africa. *Bulinus* spp. can also play a role in the transmission of cercarial dermatitis (swimmer's itch) caused by the immune reaction of incompatible hosts to the penetration of cercariae of non-human schistosomes. This can cause considerable discomfort to humans bathing in infested waters. This article focuses on the geographical distribution and habitats of this group as reflected by the samples taken from 2 930 collection sites on record in the database of the National Freshwater Snail Collection (NFSC) at the Potchefstroom Campus of the North-West University. The 414 different loci ($1/16$ -degree squares) on record, reflect an extensive distribution from the western parts of the North-West to Gauteng, Mpumalanga, Limpopo and KwaZulu-Natal Provinces and the coastal areas of the Eastern Cape Province. Details of each habitat as described by collectors during surveys, as well as altitude and mean annual temperature and rainfall of each locality, were processed and chi-square and effect size values were calculated. A decision tree constructed from all the available data indicated that temperature and altitude, followed by the type of water-body, seemed to be the more important factors that had a significant influence on the distribution of this group in South Africa. The role of the *B. africanus* group in the transmission of schistosome species is briefly discussed and the urgent need for co-ordinated surveys to update the geographical distribution of host snails, as well as the schistosome parasites in South Africa, is stressed.

Keywords: geographical distribution, habitat preferences, epidemiology of schistosomiasis, *Bulinus africanus*, *Bulinus globosus*

Introduction

As intermediate hosts of both *Schistosoma haematobium* (human urinary schistosomiasis) and *S. mattheei* (bovine schistosomiasis) freshwater snails belonging to the *Bulinus africanus* group play a major economic role in South African rural communities in the endemic areas of South Africa. When he revised the *B. africanus* group (= subgenus *Physopsis*, Krauss, 1848) Mandahl-Barth (1957) recognised only the two species, *B. (P.) africanus* (Krauss) and *B. (P.) globosus* (Morelet) in Southern Africa. This author considered the copulatory organ to provide the most reliable taxonomic character. After a study of the inter- and intra-population variation in this organ, Brown (1966) came to the conclusion that the penis sheath of *B. africanus* was considerably longer and thicker than the preputium while in *B. globosus* it was just the opposite in the majority of specimens. However, intermediate individuals were reported for Angola (Wright, 1963) and Zambia (Hira, 1974) and many intermediate individuals, especially from areas in the former Transvaal Province are on record in the database of the National Freshwater Snail Collection (NFSC) of South Africa. Of the 2 930 samples on record for this group 508 could be identified as *B. africanus* and 800 as *B. globosus* while the remainder was considered to be from intermediate populations. This report there-

fore focuses on the geographical distribution and habitats of this group as such, as reflected by the 2 930 samples in the database of the NFSC. Details of each habitat, as well as mean altitude and mean annual temperature and rainfall for each locality, were processed to determine chi-square and effect size values. An integrated decision tree that could make a selection of those variables that could maximally discriminate between this group and all the other species in the database was also constructed. The results indicated that temperature and type of water-body seemed to be some of the major factors determining the distribution of this group in South Africa. The ecological implications of the range of values reported by several authors for the demographic parameter r (intrinsic rate of natural increase) are also discussed. The possibility of a hybrid schistosome that could become more widespread and the fact that schistosomiasis is considered as one of South Africa's most neglected health hazards are briefly discussed. The urgent need for co-ordinated surveys to update the geographical distribution of freshwater snails in general and of intermediate host in particular, as well as of the schistosome parasites, is brought to attention.

Methods

Data pertaining to the habitats and geographical distribution of the *B. africanus* group were extracted from the database of the NFSC, which dates from 1956 up to the present. Only those samples for which the collection sites could be pinpointed on the 1:250 000 topo-cadastral map series of South Africa, were included in the analysis. The majority of these samples were collected during

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