Emergent Multiple *Anopheles* spp Surpassing Major Malaria Vectors in Zimbabwe

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ABSTRACT

**Background**

Malaria transmission has declined in most of Zimbabwe in the wake of scaled-up prevention, control and elimination interventions. However, this successful decline is made complex by being heterogeneous, with some areas experiencing resurgence, including invasion of former malaria-free highlands. This transitioning epidemiology complicates control efforts and demands systematic tracking of changing vector, composition and behaviour. Here we present findings from nationwide sentinel-based malaria vector surveillance in Zimbabwe.

**Methods**

Wild mosquitoes were captured indoors and outdoors from 18 national sentinel surveillance sites during the 2017 malaria season. The specimens were analyzed by *Anopheles* sibling species differentiation PCR and *Plasmodium falciparum* circumsporozoite ELISA.

**Results**

Despite continued malaria transmission, the expected main vectors of Zimbabwe, *Anopheles arabiensis*, *An. gambiae* ss and *An. funestus* were strikingly absent, appearing only sparingly in 5, 1 and 5 of the 18 sentinel sites, with overall mean abundances of 8.8%, 0.6% and 2.2%, and sporozoite rates of 0%, 0% and 7.4%, respectively. During the apparent malaria with no vector mosquitoes, there was marked abundance of presumed secondary vectors (*An. rufipes* (8.8%), *An. leesoni* (9.6%), *An. rivolurum* (1.0%), *An. parensis* (4.1%) and another as yet unidentified species (*An. unknown* (17.9%)). The overall abundance of these species surpassed the expected main vectors (M-W U = 61, p < 0.001, n = 2556). The *An. rufipes*, *An. leesoni*, *An. rivolurum*, *An. parensis* and *An. (unknown)*, were found at 10, 6, 4, 6 and 9 sentinel sites, with sporozoite rates of 1.2%, 1.0%, 1.8%, 1.0% and 1.7%, respectively. The emergent vectors exhibited human blood indices [mean 0.65; maximum, 0.79], which were comparable to those for the main vectors [mean, 0.67; maximum, 0.71; P = 1.000, n = 107].

**Conclusions**

Scaled-up interventions against the major malaria vectors of Zimbabwe are proving successful. However, new vectors are being identified that may demand new targeting and surveillance strategies for malaria elimination to be successful.

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