

# **Anopheles culicifacies breeding in brackish waters in Sri Lanka and implications for malaria control**

Jude, P.J.<sup>a</sup> , Dharshini, S.<sup>b</sup> , Vinobaba, M.<sup>b</sup> , Surendran, S.N.<sup>a</sup> and Ramasamy, R.<sup>c</sup>

<sup>a</sup> Department of Zoology, Faculty of Science, University of Jaffna, Jaffna, Sri Lanka

<sup>b</sup> Department of Zoology, Faculty of Science, Eastern University, Chenkaladi, Sri Lanka

<sup>c</sup> Institute of Medicine, Universiti Brunei Darussalam, Gadong, Brunei Darussalam

## **Abstract**

Background. *Anopheles culicifacies* is the major vector of both falciparum and vivax malaria in Sri Lanka, while *Anopheles subpictus* and certain other species function as secondary vectors. In Sri Lanka, *An. culicifacies* is present as a species complex consisting of species B and E, while *An. subpictus* exists as a complex of species A-D. The freshwater breeding habit of *An. culicifacies* is well established. In order to further characterize the breeding sites of the major malaria vectors in Sri Lanka, a limited larval survey was carried out at a site in the Eastern province that was affected by the 2004 Asian tsunami. Methods. Anopheline larvae were collected fortnightly for six months from a brackish water body near Batticaloa town using dippers. Collected larvae were reared in the laboratory and the emerged adults were identified using standard keys. Sibling species status was established based on Y-chromosome morphology for *An. culicifacies* larvae and morphometric characteristics for *An. subpictus* larvae and adults. Salinity, dissolved oxygen and pH were determined at the larval collection site. Results. During a six month study covering dry and wet seasons, a total of 935 anopheline larvae were collected from this site that had salinity levels up to 4 parts per thousand at different times. Among the emerged adult mosquitoes, 661 were identified as *An. culicifacies* s.l. and 58 as *An. subpictus* s.l. Metaphase karyotyping of male larvae showed the presence of species E of the *Culicifacies* complex, and adult morphometric analysis the presence of species B of the *Subpictus* complex. Both species were able to breed in water with salinity levels up to 4 ppt. Conclusions. The study demonstrates the ability of *An. culicifacies* species E, the major vector of falciparum and vivax malaria in Sri Lanka, to oviposit and breed in brackish water. The sibling species B in the *An. subpictus* complex, a well-known salt water breeder and a secondary malaria vector in the country, was also detected at the same site. Since global warming and the rise in sea levels will further increase of inland brackish water bodies, the findings have significant implications for the control of malaria in Sri Lanka and elsewhere.

## **Indexed keywords**

**EMTREE drug terms:** dissolved oxygen; sodium chloride; water

**EMTREE medical terms:** *Anopheles*; *Anopheles culicifacies*; *Anopheles subpictus*; article; breeding; chromosome structure; female; greenhouse effect; karyotyping; laboratory; larva; malaria control; malaria falciparum; male; metaphase; morphometrics; mosquito; nonhuman; pH; *Plasmodium vivax* malaria; rearing; salinity; sea level; season; sibling; Sri Lanka; Y chromosome; animal; classification; disease carrier; disease transmission; environment; growth, development and aging; malaria; physiology

**MeSH:** Animals; *Anopheles*; Breeding; Environment; Insect Vectors; Larva; Malaria; Sri Lanka

*Medline is the source for the MeSH terms of this document.*