

SCIENTIFIC NOTE

Occurrence of *Anopheles (Nyssorhynchus) rangeli* (Gabaldon *et al*) and *Anopheles (Nyssorhynchus) evansae* (Brethes) (Diptera: Culicidae) in an Eutrophized Dam

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ABSTRACT - This is the first record of immature stages of species belonging to the subgenus *Nyssorhynchus* (Blanchard) in eutrophized breeding habitats. Larvae of *Anopheles (Nys.) evansae* (Brethes), *Anopheles (Nyssorhynchus) rangeli* (Gabaldon *et al*), *Culex nigripalpus* (Theobald) and *Culex quinquefasciatus* (Say) (Diptera: Culicidae) were collected in a rural eutrophized dam in Rio de Janeiro State, in Southeastern Brazil. Eutrophication was substantiated by the low diversity of mosquitoes, the high incidence of *Cx. quinquefasciatus* (42%) and of *Daphnia* sp. and, the high levels of both organic nitrogen (0.28 mg/l) and total phosphorus (0.02 mg/l).

KEY WORDS: Brazil, polluted breeding habitat

The subgenus *Nyssorhynchus* (Blanchard) includes the main Neotropical vectors of malaria in the genus *Anopheles*, such as *A. darlingi* (Root) and *A. aquasalis* (Curry). Immatures of *Nyssorhynchus* are usually found in natural and man-made breeding habitats (Deane *et al* 1948, Forattini, 1962, 2002, Faran & Linthicum 1981, Rubio-Palis 2000). Nonetheless, there are no indications *Nyssorhynchus* species are able to exploit eutrophized breeding habitats. Eutrophication is one of the most important human-induced modifications affecting aquatic systems in the biosphere (Pinto-Coelho *et al* 2005). In fact, eutrophication in lakes, reservoirs, estuaries and rivers is a worldwide increasing phenomenon. Water eutrophication has been assessed by using individual parameters (e.g., total phosphorus, total nitrogen) or comprehensive indices (e.g., total nutrient status index). Among the factors influencing water eutrophication, nutrient enrichment, hydrodynamics, and environmental factors are the major ones. Environmental factors such as temperature, salinity, carbon dioxide, element balance, and microbial biodiversity can be easily assessed on eutrophicated water bodies (Yang *et al* 2008).

Mosquito larvae and pupae were collected in a rural artificial dam in the municipality of Paraíba do Sul, Rio de Janeiro State, in Southeast of Brazil (22°13'27.49"S 43°14'43.97"W, 529 m) from December 2004 to December 2005. The estimated dam's area is of 560 m², surrounded by farms dealing with animal and agricultural activities. Mosquito immature collections were done once a month by dipping a white enamel pan on three portions of the margins

of the dam. In each portion three dippings were made in a total of nine dippings per month. Third and fourth instars and pupae were reared up to adults and identified based on their morphology (Consoli & Oliveira 1994, Forattini 2002).

A total of 241 adult mosquitoes were obtained during twelve-month larval collections. The identified species were *Culex quinquefasciatus* (Say) (42.3%), *Anopheles evansae* (Brethes) (24.5%), *Culex nigripalpus* (Theobald) (19.1%) and *Anopheles rangeli* (Gabaldon *et al*) (14.1%). Even though there are different interpretations on the limits of concentration of phosphorus for each trophic level, the low diversity of mosquito species, the high incidence of *Cx. quinquefasciatus* and *Daphnia* sp., the high levels of organic nitrogen (0.28 mg/l) and total phosphorus (0.02 mg/l) indicated dam eutrophication. Eutrophication of this dam in particular is very likely to be related to the animal and plant agricultural activities in the dam's margins.

Former studies were carried out on the biology of *Nyssorhynchus* group without, however, measuring trophic levels of breeding habitats. Previous observations were mostly focused on breeding habitat size, type, presence of vegetation, phytoplankton, chlorine and pH levels (Deane *et al* 1948, Forattini, 1962, 2002, Faran & Linthicum 1981, Rubio-Palis 2000). Several species of *Nyssorhynchus* have been reported on breeding habitats rich in organic matter, including *A. rangeli* and *A. evansae* (Galvão *et al* 1942, Deane *et al* 1948, Forattini 1962, Faran 1980) or with conditions indicative of an eutrophicated environment (Buxton 1934). However,

these previous reports are inaccurate and insufficient to characterize eutrophized trophic levels, probably because organic matter is mostly associated with the visual amount of vegetation. These reports are therefore insufficient to show the potentiality for the *Nyssorhynchus* species to explore eutrophicated environments.

This is the first report for two species of the subgenus *Nyssorhynchus*, i.e., *A. rangeli* and *A. evansae* in eutrophized breeding habitats. This characterization is important to monitor the capacity to explore eutrophized breeding habitats, posing major dispersion risks for those species that are potential malaria vectors.

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