

SHORT COMMUNICATION

Presence of the mosquito *Anopheles hyrcanus* in South Moravia, Czech Republic

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Abstract. During a survey of mosquitoes in the South Moravian lowland area, the mosquito *Anopheles hyrcanus* (Pallas) (Diptera: Culicidae) was found breeding in an ancient fishpond (Nesyt). It is not clear whether this southern Palaearctic species, a known vector of malaria in Asia which has not been recorded in the Czech Republic until this year, has gone undetected in the past or whether it has recently moved into the region as a result of climate change.

Key words. *Anopheles hyrcanus*, geographic range, Central Europe, Czech Republic.

The mosquito fauna of South Moravia, in the southeastern Czech Republic, has been intensely studied in the last decade. The region is characterized by floodplain forests and meadows on the banks of the rivers Morava and Dyje, and by several fishponds. Annual flooding creates ideal breeding places for synchronous species of mosquitoes (genera *Ochlerotatus*, *Aedes*). The catastrophic floods of 1997, 2002 and 2006 resulted in an abundance of mosquitoes (Minář *et al.*, 2001; Olejníček *et al.*, 2003; Rettich *et al.*, 2007). Regular monitoring of mosquito larvae has served as a basis for targeted mosquito control (Rettich *et al.*, 2007). The role of local mosquitoes as vectors of human pathogenic viruses has been studied by several teams (Danielová *et al.*, 1972, 1976; Rosický *et al.*, 1980; Hubálek *et al.*, 1998, 2000). Thirty-seven species of the subfamily *Culicinae* and six species of the subfamily *Anophelinae* have been recorded (Minář, 1973; Minář & Halgoš, 1997; Vaňhara & Rettich, 1998). In the genus *Anopheles*, *Anopheles messeae* Falleroni, *Anopheles claviger* (Meigen) and *Anopheles plumbeus* Stephens have been reported recently, whereas *Anopheles maculipennis s.s.* Meigen, *Anopheles atroparvus* van Thiel and *Anopheles labranchiae* Falleroni, known vectors of malaria in the region in the first half of the 20th century, have not been detected since the late 1960s (Minář & Rosický, 1975; Vaňhara, 1985, 1991; Vaňhara & Rettich, 1998; Olejníček *et al.*, 2003). However, detailed studies of anophelines require specific methods, such as the collection of blood-fed females for examination of their eggs. Such techniques have not been used

in the past except by Vaňhara (1985, 1991). Species records were mainly based on larval collections, sweep-net catches of adults or human-landing catches, but CDC miniature light traps supplemented with CO₂ were used in the years 2007–2008 (within the framework of the European research project EDEN [Emerging Diseases in a changing European eNvironment]). We report on the capture of a number of females of *Anopheles hyrcanus* (Pallas).

Slanisko is a nature reserve (10 ha) in the northwest Pannonian biogeographic region, on the west bank of the Nesyt fishpond near Sedlec village (48°47' N, 16°43' E), 176 m above sea level. This large mediaeval pond (322 ha), created in 1418, is the westernmost segment of the Lednické Rybníky National Nature Reserve fishpond system (Lednice fishponds), which includes four other medium-sized ponds. The average annual temperature and precipitation in the area are 9.3°C and 490 mm, respectively. The reserve is characterized by halophilic plants and insects. The littoral of the pond is partly covered by dense reed beds about 50 m in width.

We suspended CDC miniature light traps (BioQuip Products, Inc., Rancho Dominguez, CA, U.S.A.) baited with CO₂ (2 kg of dry ice in a 2700-cm³ box) 1 m above the ground in a small stand of willows adjacent to the reed beds of the pond. The traps were run from 16.00 hours to 09.30 hours mid-European time on two successive nights at 2-week intervals from spring to late autumn in 2007 and 2008. Female mosquitoes were identified according to Kramář (1958) and Becker *et al.* (2003).

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In 2007, 346 females of four genera and nine species were caught in the CO₂ traps between June and September. *Culex pipiens* L. dominated (76.9%), although a proportion of these may have been *Culex torrentium* Martini, a species that is morphologically very similar; males reared from larvae collected in the Valtice locality (near Sedlec) included both species. *Ochlerotatus cantans* (Meigen) (9.0%) (also known as *Aedes cantans*) and *Aedes vexans* (Meigen) (8.7%) were less frequent. Only two anopheline females (one *An. maculipennis* s.l., one *An. plumbeus*) were recorded. However, local conditions for mosquitoes were unfavourable in 2007 because the water table was unusually low and the pond was artificially dried out in the summer.

In 2008 (Fig. 1), 1287 mosquito females of seven genera and 14 species were captured. *Aedes vexans* and *Oc. cantans* (including *Ochlerotatus annulipes* [Meigen], also known as *Aedes annulipes*) dominated (29.4% and 21.7%, respectively). *Culex modestus* Ficalbi (11.1%) was most abundant at the end of July and the beginning of August, and *Cx pipiens* formed 8.9% of the 2008 collection. The catch in late June included six female *An. hyrcanus* (var. *pseudopictus*), and the species was consistently present in subsequent collections, amounting to a final total of 56 females (4.3% of the total mosquito catch). Two other *Anopheles* spp., *An. maculipennis* s.l. (most probably *An. messeae*) and *An. claviger* were also collected (82 females, 6.4% of total mosquitoes). Interestingly, eggs laid by blood-fed *An. maculipennis* s.l. that had been collected in stables in the region were all *An. messeae*.

The geographic range of *An. hyrcanus* s.l. in Europe extends as far north as the Pannonian plain (Ramsdale & Snow, 2000; Becker *et al.*, 2003). In countries neighbouring the Czech Republic, *An. hyrcanus* has recently been reported from Hungary (Tóth, 2003) and Slovakia (Halgoš & Benková, 2004), but not from Austria, Poland or Germany. The Sedlec locality (48°47'N) is thus the northernmost site from which it has been reported in central Europe. *Anopheles hyrcanus* is distributed below 50°N over the entire southern Palaearctic region from the Mediterranean sub-region to southeastern Asia in the Oriental region (Gutsevich *et al.*, 1970; Tanaka *et al.*, 1979). However,

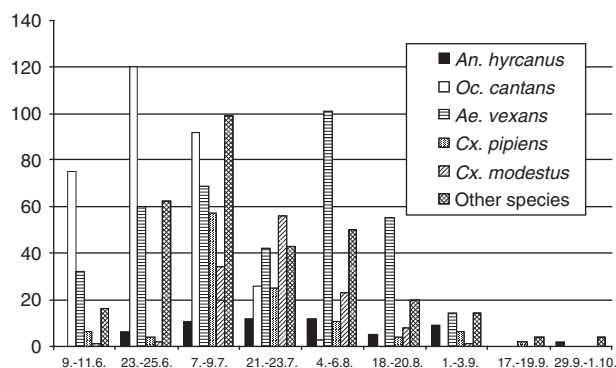


Fig. 1. Seasonal occurrence of mosquitoes at the Nesyt fishpond study site in 2008, expressed as the number of female mosquitoes caught in CDC light-CO₂ traps per 2 nights.

the taxonomy of *An. hyrcanus* s.l., including the taxonomic status of *An. pseudopictus*, has remained controversial (Ramsdale, 2001). *An. hyrcanus* s.l. is an important vector of malaria in some parts of Central Asia and the Far East (Rosický & Weiser, 1952; Gutsevich *et al.*, 1970).

Larvae of the species develop in shallow water basins overgrown with vegetation, especially in reed beds and rice fields (Becker *et al.*, 2003). Larvae have not been found in the surroundings of the Nesyt fishpond, but suitable breeding sites and ecological conditions are probably present. Although miniature CDC light-CO₂ traps were used in this area for the first time in 2007, no *An. hyrcanus* were caught in that year, perhaps because the pond was completely dry that summer.

It is possible that this new recording simply reflects the use of a new sampling technique, but it is also conceivable that the species has moved northwards as a consequence of the current trend in climate warming (Olejníček *et al.*, 2003; Minář *et al.*, 2007).

Addendum: During the review process, the presence of *Anopheles hyrcanus* in South Moravia in the years 2005–2007 was reported by Votýpka *et al.* (2008).

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