

Contribution to the mosquito fauna of the Greek island of Samos

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Abstract

Mosquito collections were carried out on the Greek island of Samos in early June 2001. Nine mosquito species were recorded: *Anopheles claviger* Meigen, *An. marteri marteri* Senevet & Prunelle, *An. marteri sogdianus* Keishishian, *Culex hortensis* Ficalbi, *Cx. mimeticus* Noé, *Cx. pipiens* Linnaeus, *Culiseta longiareolata* (Macquart), *Cs. subochrea* (Edwards) and *Coquillettidia buxtoni* (Edwards). The latter species, although predicted to be in Greece based on its known distribution, is herein formally reported for the first time. All data presented herein comprise new distribution records due to lack of previous mosquito faunal surveys on Samos.

Key words: Mosquitoes, Samos, Greece.

Introduction

The Greek Island of Samos lies in the eastern Aegean Sea, less than 2 km from the coast of Asia Minor (Turkey) (Figure 1). It is the eighth largest of the Greek Aegean Islands at 475 km², with 159 km of coastline. The island is verdant, and comprises a mountainous western part, with flatter coastal plains to the east. Prior to this study, the mosquito fauna of Samos was completely unknown, but reports of mosquitoes posing a biting nuisance led to governmental mosquito control measures in the east and south east of the island. Its close proximity to Turkey and the reported high densities of mosquitoes at certain times of the year led to local concerns that the inhabitants of Samos may be exposed to mosquito-borne diseases, particularly malaria. This short study formed part of a larger objective to document the presence of members of the Maculipennis Complex in Greece (Linton *et al.*, in press). Here we wanted to establish whether *An. sacharovi*, a historical vector of malaria in Greece and a current effective vector in Turkey (Kasap, 1990; Alten *et al.*, 2000) and other regions of Europe and the Middle East (see Sedaghat *et al.*, 2003), was present on the island.

Materials and Methods

Mosquito collections were conducted on Samos in early June 2001. Link-reared adult mosquitoes, with associated larval and / or pupal exuviae, serve as vouchers for this work and are

housed in the mosquito collections of the Natural History Museum, London (BMNH). Adult mosquitoes were identified according to the keys of Darsie & Samanidou-Voyadjoglou (1997) and Samanidou-Voyadjoglou & Harbach (2001).

Results and Discussion

Nine mosquito species, belonging to four genera (*Anopheles*, *Culex*, *Culiseta* and *Coquillettidia*), were collected (Table 1). Mosquito larvae were collected from three localities in central Samos (Figure 1; Table 1): the village of Pirgos (site 1), the River Imvarsos between Pirgos and Koumadarei (site 2) and in the Mytilinion stream, north of the village of Mitilini (site 3). Many potential mosquito-breeding habitats yielded no larvae. Most of the riverbeds across the island were already completely dry as a result of low rainfall the preceding winter and, in the swampy areas of Potokaki and Limnonaki in the east and southeast of the island, respectively (Figure 1), there was evidence of recent insecticide applications. Lack of larvae in these areas, and the generally low densities of mosquitoes across the island, indicates that current mosquito control efforts for nuisance mosquitoes on the island are effective.

Culex species collected as larva included *Cx. hortensis*, *Cx. mimeticus* and *Cx. pipiens*. *Culex hortensis* was the most widespread and abundant

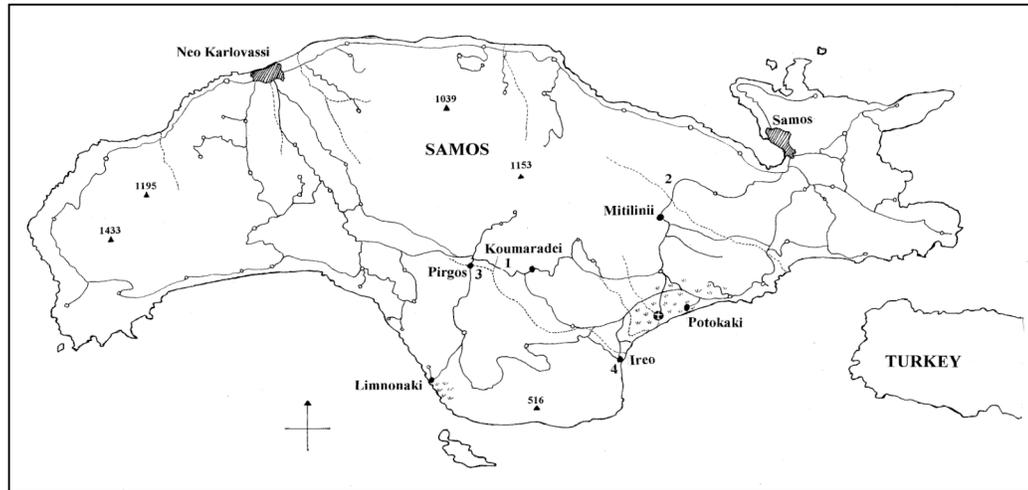


Figure 1: Map of the Greek Island of Samos, showing the four sites mosquitoes were collected in this study. Species captured are given in Table 1.

Site	Collection Locality	Habitat	Species collected	Date
1	Imvarsos River, Pargos-Koumadarei	Partially shaded, rocky-based stream pool with scarce amounts of green algae and no vegetation. Clear, fresh water.	<i>An. marteri marteri</i> <i>An. marteri sogdianus</i>	3.vi.01
		Partially shaded, sandy-based stream pool with floating dead vegetation. Clear, fresh water.	<i>Culiseta longiareolata</i> <i>Culex hortensis</i>	3.vi.01
		Partially shaded, rocky-based stream pool with scarce amounts of floating vegetation. Clear, fresh water.	<i>Anopheles claviger</i>	5.vi.01
		Partially shaded, rocky-based stream pool with no or scarce amounts of floating vegetation. Clear, fresh water.	<i>Culiseta longiareolata</i>	5.vi.01
		Partially shaded, sandy-based stream pool with scarce amounts of floating vegetation. Clear, fresh water.	<i>An. marteri marteri</i> <i>Culiseta longiareolata</i>	5.vi.01
		Partially shaded, sandy-based stream pool with abundant floating green filamentous algae. Clear, fresh water.	<i>An. marteri marteri</i> <i>An. marteri sogdianus</i>	5.vi.01
		Partially shaded, rocky-based stream pool with scarce amounts of floating vegetation, including green filamentous algae. Clear, fresh water.	<i>Culiseta longiareolata</i> <i>An. marteri marteri</i>	5.vi.01
		2	Mytilinion Stream, north of Mitilini village	Sunlit sludgy-bottomed stream pool with no vegetation. Clear, fresh water.
Sunlit rocky pool at stream margin with scarce amounts of floating vegetation and green algae. Stagnant, clear water. Oily film on water surface.	<i>Culex hortensis</i>			4.vi.01
Sunlit, rocky-based stream pool with scarce amounts of floating vegetation. Stagnant water heavily colored by organic pollutants.	<i>Culiseta longiareolata</i> <i>Culex hortensis</i> <i>Culex mimeticus</i>			4.vi.01
3	Pargos village	Heavily shaded, cement-based stream pool under bridge with floating leaves but no vegetation, but scarce amounts of filamentous green algae. Clear, fresh water	<i>Culiseta subochrea</i> <i>Culex hortensis</i>	3.vi.01
4	Ireo village	Coastal guesthouse with chickens and domestic pets within grounds. Light winds. Human bait.	<i>Coquillettidia buxtoni</i> <i>Culex pipiens</i>	3.vi.01

Table 1: Larval habitats and collection details for species of mosquitoes found on the Island of Samos between 3 and 5 June 2003. Sites 1-3 correspond to larval collections, whereas species collected at site 4 were captured in a human landing collection. Site numbers correspond to those on Figure 1.

species in the larval collections, and was present in both clear and polluted waters (Figure 1; Table 1). *Culiseta longiareolata* (Macquart) was highly abundant in sites 1 & 2, whereas *Cs. subochrea* (Edwards) was detected in low numbers in sites 2 & 3 (Figure 1; Table 1). The three *Anopheles* species detected (*An. claviger* Meigen and the sibling species *An. marteri marteri* Senevet & Prunelle and *An. marteri sogdianus* Keshishian) were only found at site 1 (Figure 1; Table 1). No members of the *Anopheles maculipennis* group were collected.

A single specimen of *Coquillettidia buxtoni* (Edwards) was collected along with several *Cx. pipiens*, biting the senior author in the vicinity of a domestic chicken run on the outskirts of the coastal village of Ireo (site 4) (Figure 1; Table 1). In the annotated checklist of Greek mosquitoes presented by Samanidou-Voyadjoglou & Darsie (1997), the inclusion of *Coquillettidia buxtoni* was based only on purported distributions, thus herein we formally confirm the presence of this species in Greece for the first time. In the same paper, the occurrence of *Culiseta subochrea* was noted only from the literature from the 1930's and no recent voucher specimens were available. Personal experience in Samos and on the Greek mainland has shown however that this species is fairly common, and is often found breeding in sympatry with *Cs. longiareolata* (G. Koliopoulos & Y. Linton, pers. obs.). Voucher specimens for all species collected in this study are housed in the Culicid collections of the Natural History Museum, London.

Of the nine mosquito species collected, few are of medical importance. Although *An. claviger* has been shown to be involved in malaria transmission, it is thought to be only an occasional vector in Turkey (Postiglione *et al.*, 1972; Postiglione *et al.*, 1973). Despite the presence of *An. claviger* in Samos, their low density and the absence of other efficient vectors including *An. sacharovi* and *An. superpictus* makes it highly unlikely that malaria could be a potential health risk to the island's population, despite its close proximity to Turkey where malaria remains endemic (Alten *et al.*, 2000). *Anopheles claviger* is also known to vector viruses of the Bunyamwera group in Norway and thus could potentially also act as a vector of this or other viruses in southern Europe (Traavik *et al.*, 1985).

The role that mosquitoes play in the transmission of arboviruses transmitted to both humans and animals are becoming increasingly important with West Nile virus (WNV) currently recognized as Europe's most important mosquito borne virus. Of the confirmed mosquito vectors of WNV, only *Cx. pipiens* (found positive in Romania (Tsai *et al.*, 1998)) occurs in Samos, although a number of ornithophilic mosquitoes including other common *Culex* and *Culiseta* species may also be involved in the transmission of this virus (Lundström, 1999). The Tahyna virus has been isolated from *Cx. pipiens* in Romania (Arcan *et al.*, 1974). Studies on Sindbis virus, for which antibodies have been detected in humans in Greece (Pavlatos & Gordon-Smith, 1964), showed that *Cx. pipiens* (Francy *et al.*, 1989) and other species of *Culiseta* (Niklasson *et al.*, 1984) are involved in the transmission of this virus. Species of *Culex* and *Culiseta* could therefore potentially act as vectors for these viral diseases in Samos or in other areas of Greece.

Although this survey represents only a snapshot view of the mosquito fauna of Samos, this represents the only mosquito faunal survey of the island. This data contributes knowledge to the geographic distribution of mosquitoes in Europe, and is of particular interest to those actively involved in control of mosquito and mosquito-borne diseases in Greece.

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