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RESEARCH ON THE MOSQUITOES OF PORTUGAL (*Diptera, Culicidae*)
VI — THE MOSQUITOES OF ALENTEJO

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SUMMARY

In this paper, the writers present the results of a mosquito survey of the Alentejo, carried out in the Summer of 1976 and based on more than 6,800 specimens (about 1,280 adult mosquitoes and 5,560 larvae and pupae) caught throughout the Province. Besides much new distributional data, nine species and subspecies are recorded for the first time from the Alentejo: *Anopheles (A.) petragnanii, Aedes (Aedm.) v. vexans, Ae. (F.) echinus, Culex (Cx.) p. pipiens, Cx. (Cx.) theileri, Cx. (M.) h. hortensis, Cx. (N.) impudicus, Cx. (N.) territans* and *Culiseta (Cs.) annulata*. With these additions, the list of the Alentejo mosquitoes is now thougth to comprise seventeen members. Under each taxon, the material examined and its known distribution are given and some taxonomic and bioecological notes are added. Finally, after considering the mosquito fauna of Alentejo from a zoogeographical viewpoint, the epidemiological importance of each species as a potential vector of disease agents is briefly revised by the writers.

RESUMO

Neste trabalho, os autores apresentam o resultado de um inquérito culicideológico do Alentejo, realizado durante o Verão de 1976, com base em mais de 6800 espécimes (cerca de 1280 adultos e 5560 larvas e pupas) colhidos através de toda a província. Para além de numerosos dados novos relativos à distribuição geográfica das espécies presentes, nove espécies e subespécies são aqui assinaladas pela primeira vez no Alentejo: *Anopheles (An.) petragnanii, Aedes (Aedm.) v. vexans, Ae. (F.) echinus, Culex (Cx.) p. pipiens, Cx. (Cx.) theileri, Cx. (M.) h. hortensis, Cx. (N.) impudicus, Cx. (N.) territans* e *Culiseta (Cs.) annulata*. Com estas novas adições, julga-se que a lista dos mosquitos do Alentejo passa a compreender dezassete membros. A propósito de cada taxon, referem-se o material examinado e a distribuição conhecida, juntando-se ainda algumas notas taxonómicas e bioecológicas. Por fim, após considerarem a fauna culicideológica do Alentejo de um ponto de vista zoogeográfico, os autores revêem sucintamente a importância epidemiológica de cada uma das espécies presentes.

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1. INTRODUCTION

So far as we know, the first mosquito records from Province of Alentejo were published by Jorge & Sarmento [1], as early as 1906: *Anopheles maculipennis sensu lato*, from Arronches and Caiola river (Elvas) and *Aedes detritus* (as *Culex nemorosus*), from Alcácer do Sal. Braga [2], in his important monograph published in 1931, extended the range of *An. maculipennis s.l.* in the Alentejo to Mértola, Nisa and Portalegre and recorded *Culiseta longiareolata* (as *Theobaldia*) also from Mértola and *Aedes caspius* from Alcácer do Sal. Two years later, Landeiro & Cambournac [3] were able to show that the member of the *maculipennis* group prevalent in the Alentejo was in fact *An. atroparvus* (treated as *maculipennis* var.), this being widely distributed in the Province, from Nisa to Mértola and from Mourão to Alcácer do Sal. In his thesis published in 1942, Cambournac [4] added *Anopheles claviger sensu lato* to the mosquito fauna of the Alentejo, recording this species from S. Domingos Mines (*circa* Aljustrel). Finally, in two recent papers concerning nine new portuguese mosquito records, the present writers [5, 6] added four other species to the Alentejo: *Aedes vittatus*, from six eastern localities, *Culex univittatus*, widely distributed throughout the Province, *Uranotaenia u. unguiculata*, from the Ferreira do Alentejo area, and *Aedes berlandi*, from Nisa.

The results presented in this paper are based on the examination of about 6,840 specimens (658 adult females and 622 adult males plus 5,560 larvae and pupae) caught throughout the Alentejo in the summer of 1976. Besides

much new distributional data, nine species are here added to the eight mosquitoes previously recorded from Alentejo: *Anopheles (An.) petragnanii* Del Vecchio, 1939, *Aedes (Aedimorphus) v. vexans* (Meigen, 1830), *Aedes (Finlaya) echinus* Edwards, 1920, *Culex (Cx.) p. pipiens* L., 1758, *Culex (Cx.) theileri* Theo., 1903, *Culex (Maillotia) h. hortensis* Ficalbi, 1889, *Culex (Neoculex) impudicus* Ficalbi, 1890, *Culex (N.) territans* Walker, 1856 and *Culiseta (Cs.) annulata* (Schrank, 1776).

2. GAZETTEER OF COLLECTING LOCALITIES

During the present mosquito survey of the Alentejo, material was caught from 104 different localities, which approximate coordinates and altitudes are given in the list below. This list also includes all the published localities from which mosquitoes are known in this Province. Those localities marked with an asterisk were also surveyed by other Authors while two asterisks indicate those localities, not surveyed by the present writers.

Map 1 shows the collecting localities with the corresponding numbers in the list

	LOCALITIES	LATITUDE (N)	LONGITUDE (W)	ALTITUDE (m)
1	Abela	38° 00′	8° 34′	100
2	Alandroal **	38° 42′	7° 23′	200
3	Alcácer do Sal *	38° 22′	8° 31′	50
4	Alcáçovas River	38° 27′	8° 08′	100
5	Alcarrache River	38° 20′	7° 16′	150
6	Aljustrel *	37° 53′	8° 08′	200
7	Alter do Chão **	39° 12′	7° 37′	200
8	Amareleja (5 km E of)	38° 10′	7° 12′	200
9	Amieira	38° 17′	7° 33′	150
10	Ardila River	38° 10′	7° 18′	200
11	Arronches *	39° 07′	7° 18′	200
12	Aviz **	39° 02′	7° 52′	200
13	Aviz (10 km N of)	39° 06′	7° 58′	150
14	Barragem de Campilhas	37° 50′	8° 38′	100
15	Barragem do Maranhão	39° 01′	7° 59′	50
16	Barragem Monte da Rocha	37° 45′	8° 17′	100
17	Barragem Odivelas	38° 11′	8° 06′	100
18	Barragem Roxo	37° 55′	8° 05′	100
19	Barragem Santa Clara *	37° 30′	8° 27′	100
20	Barrancos *	38° 08′	6° 59′	200
21	Beirã	39° 24′	7° 26′	400
22	Beja *	38° 01′	7° 53′	200
23	Cabeço de Vide (4 km S of)	39° 07′	7° 33′	200
24	Cabrela	38° 26′	8° 28′	50
25	Campo Maior **	39° 00′	7° 05′	200
26	Canhestros River	38° 02′	8° 07′	100
27	Castelo de Vide	39° 23′	7° 28′	600
28	Castelo de Vide (4 km NW of)	39° 26′	7° 27′	600
29	Castro Verde	37° 41′	8° 05′	200
30	Castro Verde (15 km N of)	37° 50′	8° 07′	150
31	Chança River	37° 56′	7° 15′	150
32	Crato **	39° 15′	7° 38′	200
33	Degebe River (Vendinha)	38° 27′	7° 41′	200
34	Divor River (5 km N of Arraiolos)	38° 46′	8° 00′	200
35	Elvas *	38° 53′	7° 10′	200
36	Entradas	37° 46′	8° 02′	100
37	Enxoe River	37° 59′	7° 37′	100
38	Ermidas — Sado	38° 00′	8° 23′	50
39	Estremoz **	38° 50′	7° 35′	400
40	Estuário do Sado	38° 25′	8° 38′	50
41	Évora *	38° 33′	7° 54′	200
42	Fadagosa (Sever River)	39° 29′	7° 25′	200
43	Faniça River	38° 50′	8° 12′	100
44	Ferreira do Alentejo *	38° 03′	8° 07′	150
45	Fronteira *	39° 03′	7° 38′	200
46	Gavião **	39° 27′	7° 50′	200
47	Gema River	37° 50′	8° 28′	90
48	Grândola **	38° 10′	8° 34′	100
49	Grândola River	38° 10′	8° 36′	100
50	Guadiana River (W of Mourão)	38° 22′	7° 22′	100
51	Juromenha (5 km N of)	38° 47′	7° 13′	200
52	Lagoa S.^{to} André	38° 05′	8° 47′	sea coast
53	Lavre River	38° 45′	8° 23′	200
54	Limas River	37° 52′	7° 32′	150
55	Lucefeci River	38° 43′	7° 29′	150
56	Maranhão River	39° 00′	8° 00′	100
57	Marateca	38° 34′	8° 40′	50
58	Marvão *	39° 22′	7° 23′	600
59	Marvão (5 km S of)	39° 21′	7° 25′	600
60	Mértola *	37° 38′	7° 40′	200
61	Minas S. Domingos	37° 40′	7° 30′	150
62	Mira River	37° 33′	8° 16′	200
63	Monforte	39° 03′	7° 26′	200
64	Monte dos Viseus	37° 42′	7° 52′	150
65	Montes Velhos	37° 46′	8° 11′	100
66	Montemor **	38° 38′	8° 11′	200
67	Montemor-o-Novo *	38° 38′	8° 13′	200
68	Montoito (6 km N of)	38° 33′	7° 35′	200
69	Mora *	38° 57′	8° 08′	100
70	Mourão **	38° 22′	7° 20′	100
71	Murtigão River	38° 05′	7° 06′	200
72	Nisa *	39° 27′	7° 36′	250
73	Nisa River	39° 30′	7° 32′	500
74	Odeceixe	37° 27′	8° 46′	50
75	Odemira *	37° 36′	8° 42′	100
76	Odemira (15 km N of)	37° 39′	8° 34′	100
77	Odivelas	38° 10′	8° 07′	50
78	Odivelas River	38° 15′	8° 22′	50
79	Oeiras River	37° 32′	8° 00′	200
80	Oriola	38° 17′	7° 53′	200
81	Ouguela	39° 05′	7° 02′	200
82	Pardiela River	38° 39′	7° 42′	200
83	Pavia	38° 52′	8° 01′	150
84	Pias	38° 04′	7° 28′	200
85	Portalegre **	39° 15′	7° 26′	600
86	Portalegre (5 km S of)	39° 15′	7° 27′	200
87	Portalegre (9 km N of)	39° 19′	7° 28′	600
88	Portel *	38° 18′	7° 42′	200
89	Póvoa	38° 13′	7° 20′	200
90	Pulo do Lobo	37° 49′	7° 37′	50
91	Redondo *	38° 39′	7° 31′	220
92	Reguengos **	38° 25′	7° 32′	200
93	Retiro	38° 55′	7° 02′	200
94	Safara	38° 06′	7° 13′	200
95	Santa Eulália	39° 00′	7° 15′	200
96	Santa Eulália (5 km N of)	39° 03′	7° 16′	200
97	Santana	39° 36′	7° 43′	100
98	Santa Vitória	37° 57′	8° 01′	150

	LOCALITIES	LATITUDE (N)	LONGITUDE (W)	ALTITUDE (m)
99	Santiago do Cacém *	38° 01′	8° 41′	200
100	S. Cristóvão	38° 27′	8° 18′	100
101	Seda River	39° 12′	7° 47′	200
102	Serra da Ossa	38° 44′	7° 36′	500
103	Sines	37° 57′	8° 52′	50
104	S. Matias	38° 06′	7° 53′	150
105	S. Miguel do Pinheiro	37° 33′	7° 50′	150
106	Sousel **	38° 57′	7° 40′	200
107	Tera River	38° 50′	7° 44′	200
108	Terges River	37° 50′	7° 52′	100
109	Tolosa	39° 25′	7° 40′	250
110	Torrão	38° 17′	8° 13′	50
111	Toutalga River	38° 08′	7° 22′	150
112	Veiros	38° 57′	7° 30′	200
113	Viana do Alentejo *	38° 20′	8° 00′	200
114	Vidigueira *	38° 12′	7° 48′	200
115	Vila Boim	38° 51′	7° 17′	400
116	Vila Nova de Milfontes	37° 42′	8° 47′	50
117	Vila Viçosa *	38° 47′	7° 26′	400
118	Xarrama River	38° 20′	8° 04′	150

3. LIST OF SPECIES AND SUBSPECIES

Table 1, which is thought to include all the published information on the subject, lists the seventeen mosquito species and subspecies now known from the Alentejo, with the indication of these recorded for the first time from this Province and the number of new locality records. In spite of the present intensive survey, it is always possible that other species yet occur in such a vast area.

4. SYSTEMATIC ACCOUNT

From the general taxonomic point of view, we followed essencially the Catalogue by Knight & Stone [7] and its supplement (Knight [8]), as well as the revisions by Edwards [9, 10], Clavero [11], Aitken [12], Rioux [13] and Senevet & Andarelli [14, 15, 16]. Other taxonomic contributions, however, are also taken into account under the corresponding taxa.

Chaetotaxic nomenclature according to the system developed by Belkin [17].

4.1. **Anopheles (Anopheles) atroparvus** Van Thiel, 1927

An. atraparvus was recorded from the Alentejo already by Landeiro & Cambournac, in 1933 [3].

MATERIAL EXAMINED. ABELA, 10 ♀ 8 ♂ plus 41 larvae, 17.VIII.76; ALCÁCER DO SAL, 24 larvae, 8.IX.76; ALCÁÇOVAS RIVER, 1 larva, 7.IX.76; ALCARRACHE RIVER, 2 ♀ 1 ♂ plus 11 larvae, 28.VIII.76; AMARELEJA, (5km

TABLE I

List of mosquito species and subspecies known from Alentejo

GENERA	SUBGENERA	SPECIES AND SUBSPECIES	NEW RECORDS FOR ALENTEJO	
			TAXA	LOCALITIES
Anopheles	*Anopheles*	*An. atroparvus* Van Thiel, 1927	–	54
		An. petragnanii Del Vecchio, 1939	+	2
Aedes	*Aedimorphus*	*Ae. vexans vexans* (Meigen, 1830)	+	1
	Finlaya	*Ae. echinus* Edwards, 1920	+	3
	Ochlerotatus	*Ae. berlandi* Séguy, 1921	–	–
		Ae. caspius caspius (Pallas, 1771)	–	9
		Ae. detritus (Haliday, 1833)	–	2
	Stegomyia	*Ae. vittatus* (Bigot, 1861)	–	2
Culex	*Culex*	*Cx. pipiens pipiens* Linnaeus, 1758	+	65
		Cx. theileri Theobald, 1903	+	68
		Cx. univittatus Theobald, 1901	–	–
	Maillotia	*Cx. hortensis hortensis* Ficalbi, 1889	+	2
	Neoculex	*Cx. impudicus* Ficalbi, 1890	+	30
		Cx. territans Walker, 1856	+	1
Culiseta	*Allotheobaldia*	*Cs. longiareolata* (Macquart, 1838)	–	22
	Culiseta	*Cs. annulata* (Schrank, 1776)	+	4
Uranotaenia	*Pseudoficalbia*	*U. unguiculata unguiculata* Edwards, 1913	–	–
TOTALS		17	9	263

E of), 3 larvae, 23.VIII.76; AMIEIRA, 1 ♀ 10 larvae, 25.VIII.76; ARDILA RIVER, 4 ♀ 5 ♂ 50 larvae, 23.VIII.76; ARRONCHES, 1 larva, 31.VIII.76; AVIZ (10km NW of), 6 larvae, 1.IX.76; BARRAGEM DE CAMPILHAS, 1 ♀ (*DR. A. FILIPE* coll.), 18.VIII.72 plus 11 larvae, 18.VIII.76; BARRAGEM DO MARANHÃO, 1 ♀, 28.VIII.72 (*DR. A. FILIPE* coll.); BARRAGEM MONTE ROCHA, 6 larvae, 19.VIII.76; BARRAGEM DO ROXO, 1 ♂ (*DR. A. FILIPE* coll.), 28.VIII.72 plus 5 larvae, 31.VIII.75; BARRAGEM SANTA CLARA, 1 ♂, 28.VIII.72; BARRANCOS, 5 ♀ 3 ♂ plus 10 larvae, 23.VIII.76; BEJA, 1 ♂ 3 larvae, 19 and 25.VIII.76; CABEÇO DE VIDE (4km S of), 3 larvae, 1.IX.76; CABRELA (MARATECA RIVER), 5 larvae, 8.IX.76; CANHESTROS RIVER (S of FERREIRA DO ALENTEJO), 4 larvae, 24.VIII.76; CASTELO DE VIDE (4km NW of), 7 larvae, 2.IX.76; CASTRO VERDE, 9 ♀ 1 ♂ 9 larvae, 19.VIII.76; CHANÇA RIVER, 5 ♀ 6 ♂ 22 larvae, 21.VIII.76; CRATO (SEDA RIVER), 5 larvae, 3.IX.76; DEGEBE RIVER (VENDINHA), 2 ♀ 2 ♂ 16 larvae, 28.VIII.76; ELVAS, 3 larvae, 27.VIII.76; ENXÓE RIVER, 1 ♀ 6 larvae, 21.VIII.76; ERMIDA, 10 larvae, 17.VIII.76; FANIÇA RIVER (S of BROTAS), 16 larvae, 9.IX.76; FERREIRA DO ALENTEJO, 1 ♂ 4 larvae, 29.VIII.72 (*DR. A. FILIPE* coll.) and 23.VIII.76; FRONTEIRA, 1 ♀ 1 larva, 1.IX.76; GRÂNDOLA RIVER, 4 ♀ 3 ♂ 79 larvae, 17.VIII.76; GUADIANA RIVER (W of MOURÃO, 2 ♂ 9 larvae, 28.VIII.76; LAGOA SANTO ANDRÉ, 7 ♀ 8 ♂ 20 larvae, 17.VIII.76; LIMAS RIVER (S of SANTA IRIA), 5 ♂ 57 larvae, 21.VIII.76; LUCEFECI RIVER (SW of BENCATEL), 2 larvae, 28.VIII.76; LUCEFECI RIVER (N of TERENA), 6 ♀ 1 ♂ 29 larvae, 28.VIII.76; MARANHÃO RIVER (2km S of MARANHÃO), 2 ♀ 2 ♂ 12 larvae, 1.IX.76; MARATECA, 3 larvae 13.IX.76; MARVÃO (5km S of), 1 ♀ 7 larvae, 2.IX.76; MÉRTOLA, 2 ♂ 24 larvae, 20.VIII.76; MINAS DE S. DOMINGOS, 5 larvae, 21.VIII.76; MIRA RIVER, 5 ♀ 6 ♂ 14 larvae, 19.VIII.76; MONFORTE (AVIZ RIVER), 3 ♀ 8 larvae, 31.VIII.76; MONTE DOS VISEUS, 10 larvae, 20.VIII.76; MONTES VELHOS, 4 ♂, 28.VIII.72 (*DR. A. FILIPE* coll.) plus 1 larva, 19.VIII.76; MONTEMOR-O--NOVO (CANHA RIVER), 18 larvae, 8.IX.76; MONTOITO, 5 ♀ 2 ♂ 25 larvae, 28.VIII.76; MORA, 8 larvae, 9.IX.76; MURTIGÃO RIVER, 5 ♀ 37 larvae, 23.VIII.76; NISA, 5 larvae, 3.IX.76; ODECEIXE, 1 larva, 18.VIII.76; ODEMIRA (15km N of), 2 ♀ 1 ♂ 18 larvae, 18.VIII.76; OEIRAS RIVER, 5 ♀ 3 ♂ 32 larvae, 20.VIII.76; ORIOLA, 1 ♀ 11 larvae, 7.IX.76; OUGUELA, 6 ♀ 10 ♂ 23 larvae, 31.VIII.76; PARDIELA RIVER (S of S. MIGUEL DE MACHEDE), 3 ♂ 30 larvae, 30.VIII.76; PIAS, 2 ♂, 16.IX.71 (*DR. A. FILIPE* coll.) and 6.I.77; PORTALEGRE (9km N of), 1 ♂ 14 larvae, 2.IX.76; PÓVOA, 1 ♀ 18 larvae, 23.VIII.76; PULO DO LOBO (LIMAS RIVER), 8 ♀ 9 ♂ 60 larvae, 21.VIII.76; RETIRO (CAIA RIVER), 7 larvae, 5.IX.76; SANTA EULÁLIA (5km N of), 6 larvae, 31.VIII.76; SANTANA (BOTE RIVER), 1 larva, 3.IX.76; SANTIAGO DO CACÉM, 1 larva, 17.VIII.76; S. CRISTÓVÃO, 1 ♀ 2 ♂ 31 larvae, 8.IX.76; SINES, 18 ♀, 30.III.76; SEDA RIVER, 1 ♀ 2 ♂ 21 larvae, 1.IX.76; SERRA DA OSSA (S of ESTREMOZ), 1 ♀ 12 larvae plus 1 pupal pelt, 30.VIII.76; SEVER RIVER (FADAGOSA), 7 ♀ 2 ♂ 16 larvae, 2.IX.76; S. MIGUEL DO PINHEIRO (CARREIRAS RIVER), 11 larvae, 20.VIII.76; TERA RIVER (W of ESTREMOZ), 1 ♀ 18 larvae, 30.VIII.76; TERGES RIVER (ENTRADAS), 6 ♂ 21 larvae, 19.VIII.76; TERGES RIVER (VALE DO AÇOR), 1 ♂ 16 larvae, 20.VIII.76; TOLOSA, 15 larvae, 3.IX.76; TORRÃO, 2 larvae, 7.IX.76; TOUTALGA RIVER, 1 ♂ 10 larvae, 23.VIII.76; VEIROS, 3 larvae, 1.IX.76; VIDIGUEIRA, 1 ♂, 25.VIII.76; XARRAMA RIVER, 2 larvae, 7.IX.76.

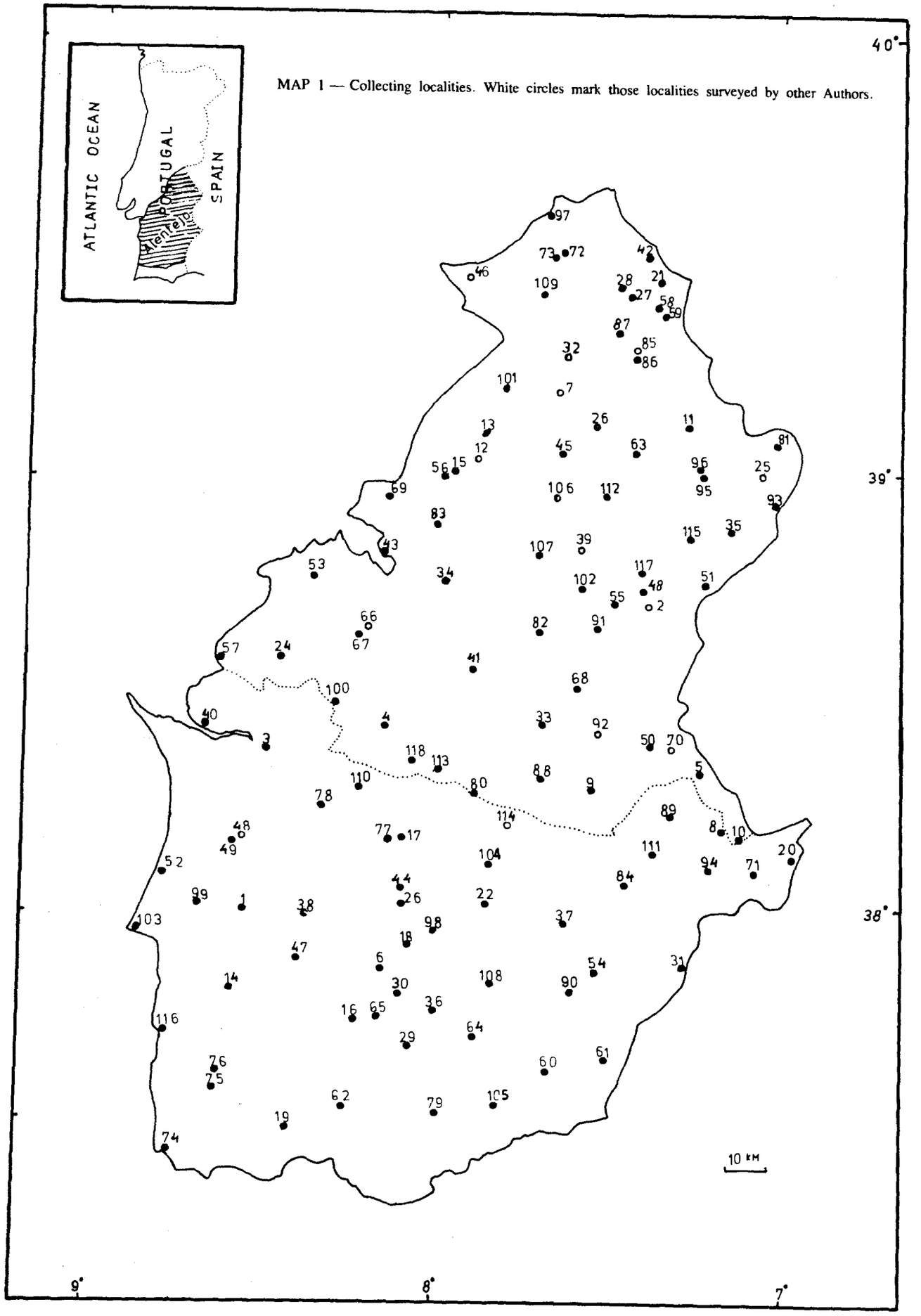
DISTRIBUTION. This member of the *maculipennis* complex is widely distributed in Europe, becoming more abundant in the brackish waters of the litoral (Knight & Stone, *op. cit.*; White [18]; Bates [19]; Buonomini & Mariani [20]; Rioux [21]). In Portugal, it is known as one of the most common and widespread species of mosquitoes (Landeiro & Cambournac, *op. cit.*).

Map 2 shows the known distribution of *atroparvus* in the Alentejo.

TAXONOMIC NOTE. *An. atroparvus* was the only member of the *maculipennis* complex found in the Alentejo, as it could be ascertained through the examination of several ovipositions from different localities and the analysis of some quantitative meristic larval characters. As to these ones, the following values were recorded in the larvae (mean, standard deviation, number of observation in parentheses and observed range, respectively): inner clypeals with 4.06 ± 1.28 (48) branches, range 2-8; posterior clypeals with 4.29 ± 1.44 (42) branches, range 2-7; abdominal seta 1 II differenciated, with 14.97 ± 2.10 (36) branches, range 10-19; the four antepalmate setae on abdominal segment IV plus V with a total number of branches of 10.83 ± 2.02 (30), range 8-14. Acessory tergal plates on the abdominal segments either present or lacking.

In that concerns the male terminalia, the outer spine of the dorsal lobe of the harpagone (32 observations) is somewhat variable, being double in 26 instances, single in other 4 cases and triple twice. Also, although this spine is usually pointed, it was rounded at tip in 5 instances. Besides, it must be noted that such variations are found in specimens from the same breeding place and, at time, even on the two sides of the same terminalia.

BIOECOLOGICAL NOTE. *An. atroparvus* was the most common of all the mosquitoes of Alentejo, at least at the time of the present survey. Larvae of this species were found in 93 out of the 170 mosquito breeding places recorded in the Province, which gives the high «relative breeding index» (Ribeiro *et al.* [22]) of RBI = 54.71 percent.



MAP 1 — Collecting localities. White circles mark those localities surveyed by other Authors.

TABLE 2

Larval associations in the mosquitoes of Alentejo

		An. atroparvus	*An. petragnanii*	*Ae. v. vexans*	*Ae. echinus*	*Ae. berlandi*	*Ae. c. caspius*	*Ae. detritus*	*Ae. vittatus*	*Cx. p. pipiens*	*Cx. theileri*	*Cx. univittatus*	*Cx. h. hortensis*	*Cx. impudicus*	*Cx. territans*	*Cs. longiareolata*	*Cs. annulata*	*Ur. u. unguiculata*	Number of Breeding-places recorded
Anopheles	*atroparvus*	8	2	1	—	—	5	—	1	32	62	10	—	24	1	6	—	1	93
	petragnanii	2	—	—	—	—	—	—	—	1	—	—	—	2	1	—	—	—	2
Aedes	*v. vexans*	1	—	—	—	—	1	—	—	1	1	1	—	—	—	—	—	—	1
	echinus	—	—	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—	3
	berlandi	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—		1
	c. caspius	5	—	1	—	—	—	—	1	8	3	3	—	1	—	1	—	—	10
	detritus	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	2
	vittatus	1	—	—	—	—	1	—	2	6	2	—	—	—	—	3	—	—	10
Culex	*p. pipiens*	32	1	1	—	—	8	1	6	20	37	10	2	14	1	16	3	1	88
	theileri	62	—	1	—	—	3	1	2	37	3	9	2	18	—	8	2	1	89
	univittatus	10	—	1	—	—	3	—	—	11	9	1	—	3	—	2	1	—	17
	h. hortensis	—	—	—	—	—	—	—	—	2	2	—	—	—	—	1	—	—	2
	impudicus	24	2	—	—	—	1	—	—	14	18	3	—	—	1	1	2	1	34
	territans	1	1	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	1
Culiseta	*longiareolata*	6	—	—	—	—	1	—	3	16	8	2	1	1	—	7	1	—	26
	annulata	—	—	—	—	—	—	—	—	3	2	1	—	2	—	1	—	—	4
Uranotaenia	*u. unguiculata*	1	—	—	—	—	—	—	—	1	1	—	—	1	—	—	—	—	1

An. atroparvus is a well-known ground-breeder, even though it is sometimes also found in cement tanks. In the Alentejo, the following kinds of larval biotopes were recorded for this species, by decreasing order of frequency: pools in river beds (35), river margins and streams (28), rock-pools (9), cement tanks (7), ricefields (6), wells (4), ground-pools (2), an earth drain and a dam. The pH of the breeding water was measured in 89 instances most of the record values (about 85 percent) being in the range 6.7–7.0, with extremes 5.5 and 9.0. In near 70 percent of the instances, the biotopes were well exposed to sun, though some shade was usually provided by grasses and aquatic vegetation. Filamentous green algae and horsetails were recorded in 48 and 37 larval biotopes, respectively.

In 8 *atroparvus* breeding sites (8.57 percent) no other mosquito was found. In the remainder biotopes, 11 other species were recorded (Table 2), though 4 species of genus *Culex* were the most common associates: *C. theileri* (62 times), *C. p. pipiens* (32), *C. impudicus* (24) and *C. univittatus* (10).

Figs. 1, 2, 5, 6 and 8 show several larval biotopes of *An. atroparvus* in the surveyed area.

90 adults of *An. atroparvus* (49 ♀ 41 ♂) were caught as such, while the remainder adults were reared from larva or pupa in the field laboratory. Of them, 21 (3 ♀ 18 ♂) were caught resting inside human habitations, other 45 (18 ♀ 27 ♂) were caught at rest inside animal shelters, while other 6 ♀ and 18 ♂ were collected in the outside (8 ♂ resting on shoubs in the open, 6 ♀ 9 ♂ at rest on abandoned man-made shelters, and 1 ♂ caught in a New Jersey light-trap). As to those 45 adult mosquitoes from animal shelters, 7 ♀ 6 ♂ were found in cow-houses, 6 ♀ 6 ♂ in stables and 5 ♀ 15 ♂ in rabbit-hutches.

These data seem to be in accordance with the views of Cambournac [4] and others as to the relative exophily and zoophagy of *An. atroparvus*.

4.2. **Anopheles (Anopheles) petragnanii** Del Vechio, 1939

In Portugal, *An. petragnanii* was only known from Algarve, where it was recorded for the first time by Coluzzi *et. al.* [23] and, later, by Ramos *et al.* [24].

As for Algarve, this is the only member of the *claviger* complex known to occur in Alentejo.

MATERIAL EXAMINED. MARVÃO (5 km S of), 1 ♂ 1 larva plus 1 pupal pelt, 2.IX.76; PORTALEGRE (9 km N of), 1 ♂ 11 larvae plus 2 pupal pelts, 2.IX.76.

DISTRIBUTION. According to Coluzzi *et al. (op. cit.), An. petragnanii* is a widespread species within the Western Mediterranean Subregion which obviously includes southern Portugal.

Fig. 1 — Rice fields at Odeceixe, breeding area of *Anopheles atroparvus*, *Culex impudicus* and *Cx. univittatus*.

Fig. 2 — Collecting larvae of *Aedes caspius caspius* and its associates *Culex theileri* and *Cx. impudicus* from a pool in Grândola river bed.

Map 2 shows the two known records of *An. petragnanii* in Alentejo, both in the Serra de S. Mamede.

TAXONOMIC NOTE. Our *petragnanii* specimens from Alentejo exhibit the characters which enabled us to identify this species within the *claviger* complex (Coluzzi [25]; Coluzzi *et al. op. cit.*).

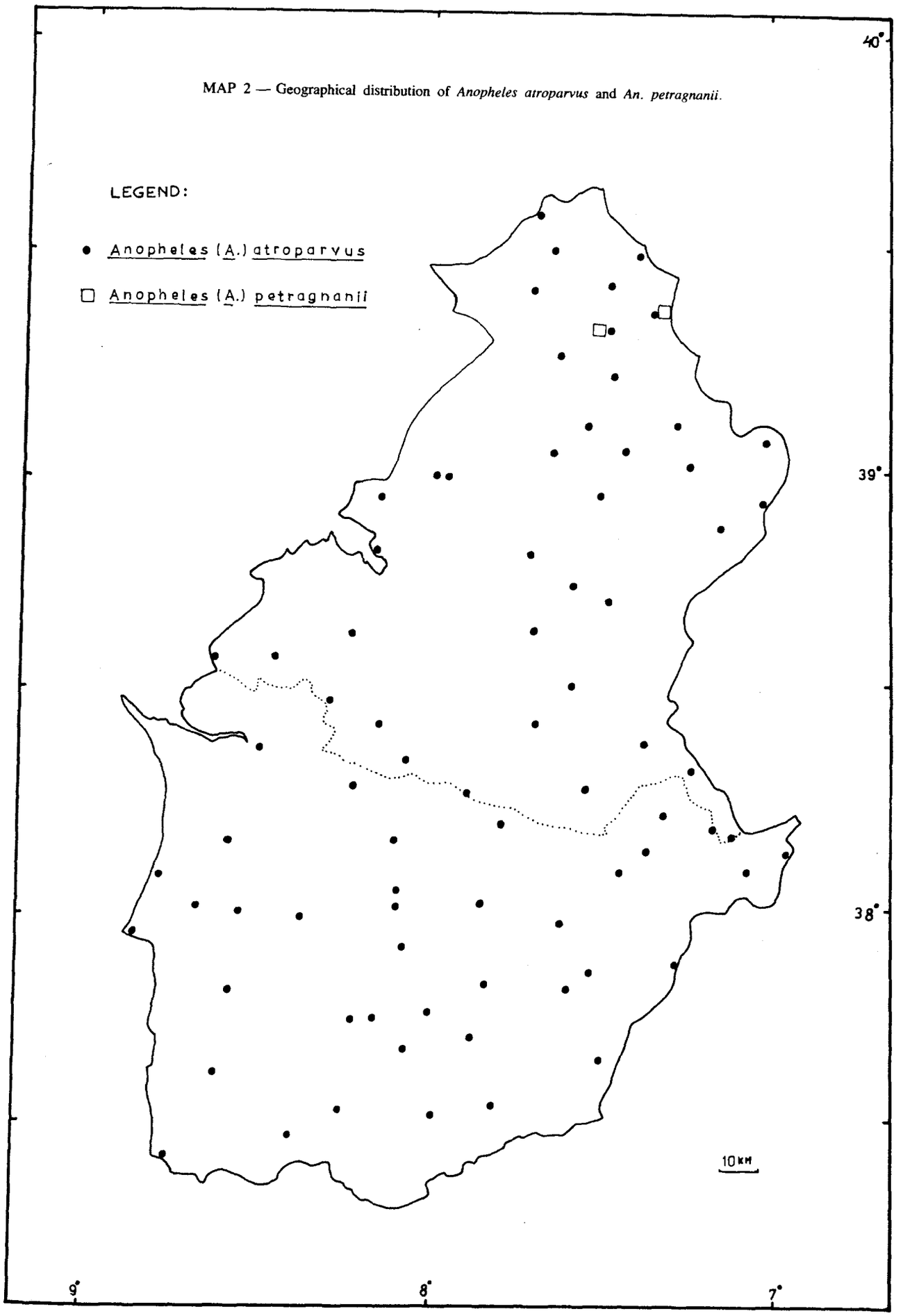
In the larva, the postclypeals are usually single (mean 1.1) and abdominal setae 2 IV and 2 V have 2 or 3 branches (mean 2.36; n = 47). In the pupa, also spine A of segment IV is stout and pointed, similar to that of seg. V. In the male terminalia, the inner (posterior) parabasal spine is single, not duplicated, and the outer (anterior) lobe of the harpagone has 2 or 3 pointed spines.

BIOECOLOGICAL NOTE. *An. petragnanii* seems to be a quite rare mosquito in southern Portugal, with a very discontinous distribution restricted to some of the small elevations (the serras) in the area. This was, in fact, the case for the serras of Caldeirão and Monchique, in Algarve, as it is now the case for the serra of S. Mamede, in Alentejo, where *petragnanii* ocurred at about 600 meters in altitude.

As in Algarve, larval *petragnanii* bred along shaded mountain streams of limpid, rapid flowing water, with some *Lemna* and filamentous green algae. The pH of the breeding water was 6.0 and 5.5 in the two larval biotopes recorded. As associates larvae of *An. atroparvus* and *Cx. impudicus* were recorded twice while *Cx. p. pipiens* and *Cx. territans* were present in only one breeding site (Table 2).

Our adult specimens were reared in the laboratory.

MAP 2 — Geographical distribution of *Anopheles atroparvus* and *An. petragnanii*.



4.3. **Aedes (Aedimorphus) vexans vexans** (Meigen, 1830)

Aedes v. vexans was already known from northern Portugal (Braga, *op. cit.*), being recorded for the first time from Alentejo.

MATERIAL EXAMINED. GUADIANA RIVER (W of MOURÃO), 1 larva, 28.VIII.76.

DISTRIBUTION. *Ae. v. vexans* is in fact a complex, widely distributed throughout the major zoogeographical regions (Belkin, *op.cit.*; Knight & Stone, *op. cit.*), of which were already described the subspecies *nipponii* and *arabiensis* [26].

Map 3 shows the only known locality recorded for *Ae. v. vexans* in the surveyed area.

TAXONOMIX NOTE. Our sole larva has had-setae 4,5 and 7C with 2/2, 3/3 and 10/12 branches, respectively. Comb of abdominal segment VIII with 9 spines in a double row. Siphon with index 2.3; tuft 1S with 6 branches, inserted well distad to pecten, on the apical 1/3 of siphon. Seta 1X bifid on both sides of saddle.

BIOECOLOGICAL NOTE. The *Ae. v. vexans* larva bred in a ground-pool of clear water near the margin of the Guadiana River, with filamentous green algae and horsetails. The pH of the breeding water was 6.0.

Larvae of *An. atroparvus, Ae. c. caspius, Cx. p. pipiens, Cx. teileri* and *Cx. univittatus* were also breeding in association with *Ae. v. vexans*.

4.4. **Aedes (Finlaya) echinus** (Edwards, 1920)

Ae. echinus was recorded for the first time from Portugal by Braga *(op. cit.)*, being a new record for the Alentejo.

MATERIAL EXAMINED. AVIZ, 1 ♀ 1 ♂ plus 1 larval pelt, 8.IX.76; CASTRO VERDE, 3 ♀ 4 ♂ 4 pupal pelts plus 5 larvae, 24.IX.76; NISA, 1 ♀ 2 ♂ plus 1 larva and 3 larval pelts, 3.IX.76.

DISTRIBUTION. *Ae. echinus* seems to be a species endemic to the Mediterranean Subregion of the Palaearctic. In Portugal, it is expected to occur mainly south of the Estrela-Montejunto mountains.

Map 3 shows the only three localities known for *echinus* in the Alentejo.

TAXONOMIC NOTE. The question of distinguishing between *Ae. echinus* (Edws) and *Ae. geniculatus* (Olivier) is not yet definitely resolved.

As they seem to be the most interesting features for separating the fourth instar larvae of these species, we give here the figures (mean, standard deviation, number of observations and range of variation, respectively) for quantitative characters in the *echinus* larvae of Alentejo: number of pecten teeth 22.41 ± 2.30 (22; 17−27); ratio between length of pecten to length of siphon 0.40 ± 0.03 (22; 0.34−0.49); ratio between distance from base to subventral tuft to length of siphon 0.48 ± 0.02 (22; 0.45−0.53); number of branches of the submedian dorsal (stelate) setae of first abdominal segment 6.12 ± 0.48 (17; 6−8). Other particulars in our larvae are: siphon index 1.72 ± 0.09 (10; 1.53−1.85); ratio between length of blade and length of base of largest comb spines in eighth abdominal segment 1.14 ± 0.15 (11; 0.83−1.33); ratio of length of antenna to head 0.42 ± 0.044 (10; 0.36−0.53).

In the adult, the shape of the scutellar scales seems not to be a suitable taxonomic character, as it is liable to much polymorphic variation within the same local population.

BIOECOLOGICAL NOTE. *Ae. echinus* is a well known tree-hole breedes. In the three Alentejo records for the species, it was breeding in association with *Ae. berlandi* in one instance while it was breeding alone in the other two (Table 2).

Ae. echinus is though to be mainly a zoophilic species.

4.5. **Aedes (Ochlerotatus) berlandi** Séguy, 1921

The only known records of *Ae. berlandi* in our country, including Nisa, in the Alentejo (Map. 3) are those by Ribeiro *et al.* [6], to whose article readers are referred for informations concerning this tree-hole breeding species.

4.6. **Aedes (Ochlerotatus) caspius caspius** (Pallas, 1771)

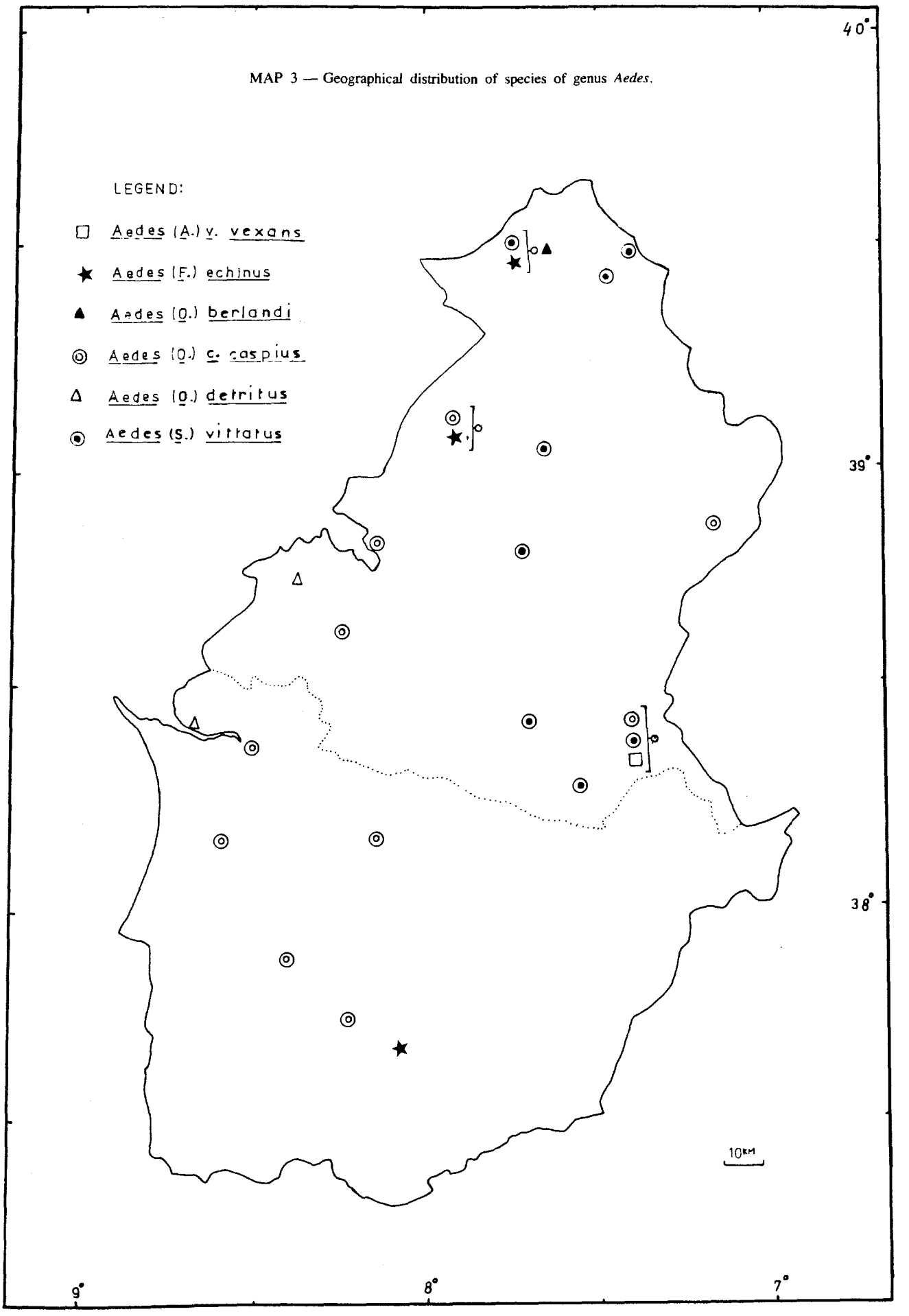
Ae. c. caspius was recorded for the first time in our country by Braga [2] from several localities, including Alcácer do Sal in the Alentejo (M. Sarmento coll.).

MATERIAL EXAMINED. ALCÁCER DO SAL, 1 ♀, 18.IX.76; AVIZ (10km NW of), 2 ♀, 1.IX.76; ELVAS, 1 ♀, 30.VIII.76; FANIÇA RIVER, 4 ♀ 1 larva, 9.IX.76; GEMA RIVER, 2 larvae, 28.VIII.76; MONTEMOR, 3 ♀, 8.IX.76; MORA, 7 ♀ 10 ♂, 9.IX.76; ODIVELAS, 11 ♀ 20 ♂ plus 99 larvae, 7.IX.76; ODIVELAS RIVER, 10 ♀, 7.IX.76; TERA RIVER, 3 ♀ 2 larvae, 30.VIII.76.

DISTRIBUTION. The view of Gutsevich *et al.* [27], that *Ae. dorsalis* (Meigen) must be treated as a subspecies of *Ae. c. caspius* (Pallas) cannot be accepted owing to the simpatry of both forms in the Palaearctic Region, being so, the nominal subspecies is distributed throughout the Holartic Region while *Ae. caspius meirai* Ribeiro *et al.* [22] is endemic to the Cape Verde archipelago.

Map 3 shows the known distribution of *c. caspius* in the surveyed area.

MAP 3 — Geographical distribution of species of genus *Aedes*.



TAXONOMIC AND BIOECOLOGICAL NOTE. The Alentejo populations of *Ae. c. caspius* show the well-known marked polymorphism of this species. Several quantitative characters of *c. caspius* from Alentejo were already examined in the comparasion with supspecies *meirai* from Cape Verde [22].

The seven larval biotopes recorded for *c. caspius* in the surveyed area (RB1 = 5.88) are inland, fresh water biotopes, confirming the tolerance of this halophilic species for water with 0.5 g/l NaCl and less. The breeding places were variably shaded and consisted of six pools in river beds and a rock-pool in river margin. The breeding water was usually clean, with pH ranging from 6.0 to 7.0, while the occurrence of *Lemna*, filamentous green algae and horsetails were recorded a few times. The larvae of the following mosquito species were also found in association with larval *c. caspius: Culex p. pipiens* (6 times), *Anopheles atroparvus* (3), *Cx. theileri* (2) and *Aedes v. vexans, Aedes vittatus, Cx. univittatus* and *Cx. impudicus* only once.

Fig. 2 shows a typical breeding place of *Ae. caspius caspius* in the Alentejo.

Several adults of *c. caspius* were caught in three localities, either resting or biting man in the open by day.

4.7. **Aedes (Ochlerotatus) detritus** (Haliday, 1833)

According to Braga [2], the first Portuguese record of *Ae. detritus* was that by Jorge & Sarmento [1], from Alcácer do Sal (as *Culex nemorosus*). This remained the only published record of the species for the Alentejo.

MATERIAL EXAMINED. ESTUÁRIO DO SADO, 11 ♀ 14 ♂ plus 86 larvae, 8.IX.76; LAVRE RIVER, 1 larva, 9.IX.76.

DISTRIBUTION. *Ae. detritus* is a halophilic species of the coastal and inland saline areas of the Palaearctic Region. In Portugal, it is known from Caminha, in the extreme North, to the coast of Algarve [2, 24, 28], in the South.

TAXONOMIC AND BIOECOLOGICAL NOTE. Adults of *Ae. detritus* are distinguished at once from those of *Ae. c. caspius* by having legs speckled instead of ringed. The abdominal tergites may have only 1 or 2 pale scales among the brown ones or the tergites may have the typical aspect of "salt and pepper" beyond the somewhat variable in width and always present basal pale band. As in the specimens from the Algarve, the venter is almost all pale, with only a few dark scales in middle and lateroapically, and there are always a variable amount of pale scattered scales in the proboscis.

In the larvae, the branching of head-setae 5 and 6 in *detritus* will separate this species from *caspius*.

In the main larval biotope now recorded for *detritus*, it bred in association with halophilic vegetation (*Arthrocnenon* sp.) but no other mosquito larvae, in the water of salt works with a salt content of 68.4 g/l (NaCl) and pH = 6.0 (Fig. 3). In the other breeding place, apparently with nonbrackish water, *Ae. detritus* was associated with *Cx. p. pipiens* and *Cx. theileri* (Table 2).

4.8. **Aedes (Stegomyia) vittatus** (Bigot, 1861)

The occurrence of *Ae. vittatus* in our country as well as in the Alentejo was already treated in a previous paper by the present writers (Ribeiro *et al.* [5]). To these records there is now to add Tera River as an eighth locality for this species in the surveyed area where a few *vittatus* larvae were also found in 30.VIII.76.

Fig. 3 — Salt works in the estuary of Sado river, characteristic breeding site of *Aedes detritus*. The salt content of the breeding water was 68.40 g/l (NaCl).

Fig. 4 — Rock pools in the margins of the Guadiana river, breeding area of *Aedes vittatus* and its associate *Culiseta longiareolata*.

Map 3 shows the known distribution of *Ae. vittatus* in the Alentejo and Fig. 4 shows a typical breeding place of the species.

With its known 10 larval biotopes from the Alentejo, *Ae. vittatus* has a relative breeding index RBI = 5.88.

According to Prof. F. J. C. Cambournac, *Ae. vittatus* also occurs in the Serra da Estrela [29].

4.9. **Culex (Culex) pipiens pipiens** Lineu, 1758

Culex p. pipiens was recorded for the first time in our country by Sarmento & França [33], in 1901, from Lisboa. The other Portuguese researchers recognized that *Cx. p. pipiens* was a very common mosquito, being stated already by Braga *(op. cit.)*, in 1931, that it was in fact extremely common all over the country. Notwithstanding, *Cx. p. pipiens* is here recorded for the first time from the Alentejo.

MATERIAL EXAMINED. About 450 adult females and males and 2,200 larvae and pupae of *Cx. p. pipiens* were examined from the 65 localities recorded for the species during the present survey. ABELA, 1 ♀ 3 larvae, 17.VIII.76; ALCÁÇOVAS RIVER, 1 ♂ 72 larvae, 7.IX.76; ALCARRACHE RIVER, 1 larva, 28.VIII.76; ALJUSTREL, 3 ♀ 1 ♂, 31.VIII.75; AMIEIRA, 1 ♀ 4 ♂ 16 larvae, 27.VIII.76; ARRONCHES, 2 ♂ 12 larvae, 31.VIII.76; AVIZ (10 km NW of), 23 larvae, 1.IX.76; BARRANCOS, 11 ♀ 14 ♂ 46 larvae, 23.VIII.76; BEIRÃ (VIDE RIVER), 4 ♀ 17 ♂ 108 larvae, 2.IX.76; BEJA, 20 ♀ 14 ♂ 38 larvae, 19.VIII.76 and 25.VIII.76; CABEÇO DE VIDE (4 km S of), 10 larvae, 1.IX.76; CABRELA (MARATECA RIVER) 1 ♀ 1 ♂ 6 larvae, 8.IX.76; CANHESTROS RIVER, 3 ♀ 4 ♂ 15 larvae, 24.VIII.76; DJEBE RIVER (VENDINHA), 55 larvae, 28.VIII.76; DIVOR RIVER (5 km N of ARRAIOLOS), 28 larvae, 30.VIII.76; ELVAS, 1 ♀ 3 ♂ 40 larvae, 25.VIII.76 and .IX.76 respectively; ENXÓE RIVER, 8 ♀ 8 ♂ 72 larvae, 21.VIII.76; ERMIDA, 4 ♀ 2 ♂ 12 larvae, 17.VIII.76; ÉVORA, 5 ♀ 6 ♂ 12 larvae, 30.VIII.76; FADAGOSA, 93 larvae, 2.IX.76; FANIÇA RIVER (S of BROTAS) 41 larvae, 9.IX.76; FERREIRA DO ALENTEJO, 50 larvae, 23.VIII.76; GEMA RIVER (11 km S of ALVALADE), 2 ♀ 3 ♂, 18.VIII.76; GUADIANA RIVER (W of MOURÃO), 1 ♂ 6 larvae, 28.VIII.76; JUROMENHA (5 km N of), 14 larvae, same date; LAGOA DE STO. ANDRÉ, 2 ♀ 1 ♂ 15 larvae, plus 1 larval pelt, 17.VIII.76; LAVRE RIVER, 7 ♀ 11 ♂ 20 larvae, 9.IX.76; MARANHÃO RIVER (2 km S of MARANHÃO) 2 ♀ 4 ♂ 36 larvae, 1.IX.76; MARATECA, 1 ♀ 1 ♂ 51 larvae, 13.IX.76; MARVÃO, 1 ♂, 2.IX.76; MARVÃO (5 km S of), 1 ♂ 25 larvae, 2.IX.76; MONFORTE (AVIZ RIVER), 1 ♂ 39 larvae, 31.IX.76; MONTE DOS VISEUS, 8 larvae, 20.VIII.76; MONTES VELHOS, 11 larvae, 19.VIII.76; MONTEMOR-O-NOVO (CANHA RIVER), 19 ♀ 17 ♂ 150 larvae, 8.IX.76; MONTOITO (6 km N of), 49 larvae, 28.VIII.76; MORA, 37 larvae, 9.IX.76; NISA, 2 ♀ 16 ♂ 23 larvae, 3.IX.76; ODEMIRA, 3 ♀ 19 larvae, 18.VIII.76; ODIVELAS, 30 larvae, 7.IX.76; PAVIA, 1 larva, 30.VIII.76; PIAS, 2 larvae, 23.VIII.76; PORTALEGRE (5 km S of), 11 ♀ 8 ♂ 22 larvae, 2.IX.76; PORTALEGRE (9 km N of), 5 ♀ 7 ♂ 66 larvae, same date; PORTEL, 2 ♀ 6 ♂, 25.VIII.76; PÓVOA, 4 ♀ 4 ♂ 74 larvae, 23.VIII.76; REDONDO, 19 ♀ 21 ♂ 64 larvae, 28.VIII.76; SAFARA, 1 ♂ 22 larvae, 23.VIII.76; SANTA EULÁLIA, 1 ♀ 1 ♂ 26 larvae, 31.VIII.76; SANTA EULÁLIA (5 km N of), 33 larvae, 31.VIII.76; SANTANA (BOTE RIVER), 3 larvae, 3.IX.76; SANTA VITÓRIA, 46 larvae, 24.VIII.76; SANTIAGO DO CACÉM, 4 ♀ 5 ♂ 80 larvae, 17.VIII.76; S. CRISTÓVÃO RIVER, 4 ♀ 8 ♂ 65 larvae, 8.IX.76; SEDA RIVER (N of SEDA), 2 larvae, 1.IX.76; SERRA DE OSSA (S of ESTREMOZ), 1 ♀ plus 1 pupal exuvia, 30.VIII.76; S. MATIAS, 15 ♀ 17 ♂ 27 larvae, 25.VIII.76; TERA RIVER (W of ESTREMOZ) 26 larvae, 30.VIII.76; TERGES RIVER (VALE DO AÇOR), 4 ♀ 4 ♂, 20.VIII.76; TOLOSA, 8 ♀ 7 ♂ 49 larvae, 3.IX.76; TORRÃO, 21 ♀ 27 ♂ 241 larvae, 7.IX.76; VIANA DO ALENTEJO, 11 larvae, same date; VIDIGUEIRA, 2 ♀ 1 ♂, 25.VIII.76; VILA BOIM, 1 ♀ 2 ♂ 28 larvae, 30.IX.76; VILA VIÇOSA, 1 ♀ 1 ♂ 32 larvae, 28.VIII.76.

DISTRIBUTION. *Cx. pipiens pipiens* is widely distributed throughout the Holarctic Region, the East and South African Subregion (of the Ethiopian) and the NE of the Chilean Subregion (of the Neotropical). Being one of the most common mosquitoes in our country, it is also one of the most generalized species within the surveyed area (Map 4).

TAXONOMIC NOTE. In 35 male terminalia examined, the mean DV/D ratio (Barr's method [30]) was −0.11, with values ranging from −0.23 to +0.07, typical of *Cx. p. pipiens*. The mean number of hairs of tergum IX (92 observations) was 9.32, with range 4−14.

In the female wing, the mean value of the ratio between the length of the upper fork cell to its stem was 4.73, with range 4.00−6.13, also a figure thought to be characteristic of *Cx. p. pipiens*.

Finally, in the larva, the mean number of branches per tuft (172 observations) of the two most basal pairs of subventral tufts of siphon was 2.45, with range 1.50−3.75, also characteristic of *pipiens sensu stricto*. Other particulars of our larvae are (mean, range in parenthesis and number of observation, respectively): siphon index 4.68 (3.57−6.33) 47; number of pecten teeth in siphon 13.20 (9−19) 80.

BIOECOLOGICAL NOTE. 88 breeding places were recorded for *Cx. p. pipiens* during the present survey (RBI = 51,76), as follows: rock-pools (22), river margins (19), pools in river beds (18), small streams and fountains (9) and cement tanks (7), rice fields (2), drums (2) and 9 other biotopes of several kinds such a dam, a well and an ornamental vase.

The breeding water was either clean or turbid, even poul water in a few instances. The pH ranged from 5.5 to 8.5, with 75 per cent of the figures between 6.0 and 7.0. In a little more than half of the breeding places were recorded several kinds of vegetation such a filamentous green algae, horstails, grasses, *Lemna* sp. and fallen leaves.

Larvae of the following species were found breeding in association with *Cx. p. pipiens: An. atroparvus* (32 times), *Culiseta longiareolata* (16); *Cx. impudicus* (14), *Cx. theileri* (37), *Cx. univittatus* (10), *Ae. c. caspius* (8), *Ae. vittatus* (6), *Cs. annulata* (3), *Cx. h. hortensis* (2), and *An. petragnanii, Ae. v. vexans, Ae. detritus, Cx. territans* and *Uranotaenia u. unguiculata* only once. In 20 of the *pipiens* larval biotopes no larvae of other mosquito species were found.

Figs. 5, 7 and 8 show typical breeding places of *Cx. p. pipiens* in the Alentejo.

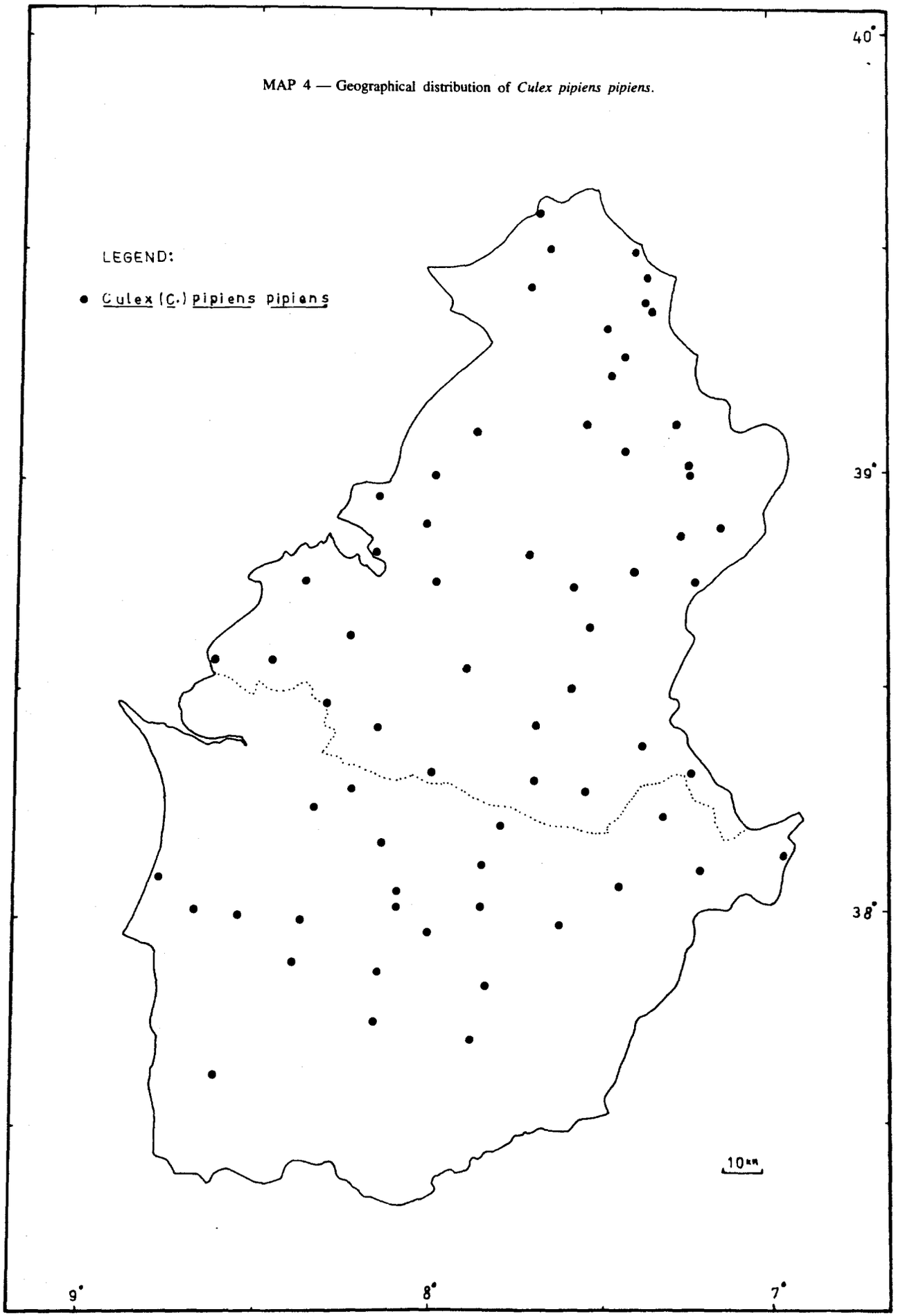
68 adults of *pipiens* (34 ♂ 34 ♀) were caught as such, of which 4 females were biting man in the outside and the remainder were at rest mostly in outdoor shelters.

4.10. **Culex (Culex) theileri** Theobald, 1903

Cx. theileri was recorded for the first time in Portugal (as *tipuliformis*) by Braga [2] from several localities in the northern half of the country, and later by Cambournac [28], in the area of Águas de Moura. More recently, the present writers also reported *theileri* from several localities in the Algarve [24].

MATERIAL EXAMINED. ABELA, 11 ♀ 13 ♂ 16 larvae, 17.VIII.76; ALCÁCER DO SAL, 8 larvae, 8.IX.76; ALCÁÇOVAS RIVER, 1 larva, 7.IX.76; ALCARRACHE RIVER, 2 ♀ 3 ♂ 17 larvae, 28.VIII.76; AMARELEJA, 1 larva, 23.VIII.76; AMIEIRA, 1 ♀ 2 ♂ 59 larvae, 25.VIII.76; ARDILA RIVER, 2 ♀ 3 ♂ 37 larvae, 23.VIII.76; ARRONCHES, 2 ♀ 1 ♂ 4 larvae, 31.VIII.76; BARRAGEM MONTE DA ROCHA, 2 larvae, 19.VIII.76; BARRAGEM DO ROXO, 1 larva, 31.VIII.75; BEJA, 2 ♀ 2 ♂ 22 larvae, 19.VIII.76 and 25.VIII.76; CABRELA, 8 larvae, 8.IX.76; CANHESTROS RIVER, 3 larvae, 24.VIII.76; CASTRO VERDE, 1 ♂ 19 larvae, 19.VIII.76; CHANÇA RIVER, 2 larvae, 21.VIII.76; CRATO (SEDA RIVER), 2 ♂ 28 larvae, 3.IX.76; DEJEBE RIVER, 8 ♀ 3 ♂ 33 larvae, 28.VIII.76; DIVOR RIVER, 19 larvae, 30.VIII.76; ELVAS, 1 ♀, .IX.76; ENTRADAS, 6 ♂ 20 larvae, 19.VIII.76; ERMIDA, 1 ♀, 17.VIII.76; FADAGOSA, 14 larvae, 21.IX.76; FANIÇA RIVER, 2 larvae, 9.IX.76; FRONTEIRA, 1 ♀ 2 ♂ 2 larvae, 1.IX.76; GRÂNDOLA RIVER, 6 larvae, 17.VIII.76; GUADIANA RIVER, 3 ♀ 1 ♂ 19 larvae, 28.VIII.76; JUROMENHA, 2 larvae, 28.VIII.76; LAGOA STO. ANDRÉ, 1 ♀ 9 larvae, 17.VIII.76; LAVRE RIVER, 1 larva, 9.IX.76; LIMAS RIVER, 4 larvae, 28.VIII.76; LUCEFECI RIVER (SW of BENCATEL), 3 ♀ 4 ♂ 28 larvae, 28.VIII.76; MARANHÃO RIVER, 7 ♀ 2 ♂ 2 larvae, 1.IX.76; MARATECA, 1 larva, 13.IX.76; MARVÃO, 14 larvae, 2.IX.76; MINAS S. DOMINGOS, 9 ♀ 7 ♂ 32 larvae, 21.VIII.76; MONFORTE, 1 ♀ 9 larvae, 31.VIII.76; MONTE DOS VISEUS, 1 larva, 20.VIII.76; MONTES VELHOS, 1 larva, 19.VIII.76; MONTEMOR-O-NOVO (CANHA RIVER), 3 ♀ 6 ♂ 46 larvae, 8.IX.76; MONTOITO, 1 ♂ 15 larvae, 28.VIII.76; MORA, 3 larvae, 9.IX.76; MURTIGÃO RIVER, 1 larva, 23.VIII.76; NISA RIVER, 1 ♀ 4 ♂ 25 larvae, 2.IX.76; ODEMIRA, I larva, 18.VIII.76; OEIRAS RIVER, 2 ♀ 3 ♂ 33 larvae, 20.VIII.76; ORIOLA, 1 ♀ 20 larvae, 7.IX.76; OUGUELA, 7 ♀ 8 ♂ 16 larvae, 31.VIII.76; PARDIELA RIVER, 5 larvae, 30.VIII.76; PIAS, 1 larva, 23.VIII.76; PÓVOA, 21 larvae, 23.VIII.76; RETIRO, 3 larvae, 5.IX.76; SANTA EULÁLIA (5km N of), 4 ♀ 4 ♂ 20 larvae, 31.VIII.76; SANTANA, 1 larva, 3.IX.76; SANTA VITÓRIA, 2 larvae, 24.VIII.76; SANTIAGO DO CACÉM, 2 larvae, 17.VIII.76; S. CRISTÓVÃO, 3 ♀ 1 ♂ 10 larvae, 8.IX.76; SEDA RIVER, 2 ♀ 3 ♂ 21 larvae, 1.IX.76; S. MIGUEL DO PINHEIRO, 5 ♀ 5 ♂ 23 larvae, 20.VIII.76; TERA RIVER, 1 larva, 30.VIII.76; TERGES RIVER, 2 ♀ 4 larvae, 20.VIII.76; TOLOSA, 9 ♀ 3 ♂ 51 larvae, 3.IX.76; TORRÃO, 2 larvae, 7.IX.76; TOUTALGA RIVER, 15 larvae, 23.VIII.76; VEIROS, 1 ♀, 1.IX.76;

MAP 4 — Geographical distribution of *Culex pipiens pipiens*.



VIANA DO ALENTEJO, 5 larvae, 7.IX.76; VIDIGUEIRA, 2 ♀ 1 ♂ 4 larvae, 25.VIII.76; XARRAMA RIVER, 7 ♀ 7 ♂ 12 larvae, 7.IX.76.

DISTRIBUTION. *Cx. theileri* is widely distributed throughout the Mediterranean Subregion (of the Palaearctic) and the East and South African Subregion (of the Ethiopian), with an extension into the northernmost Oriental Region). In our country, *Cx. theileri* is one of the most generalized and common species of mosquitoes [31], in company of *An. atroparvus* and *Cx. p. pipiens*.

Map 5 shows the known distribution of *theileri* within the surveyed area.

TAXONOMIC NOTE. Throughout its wide area of distribution, *Cx. theileri* exhibits a marked variation, specially in that concerns the markings on legs and wings, also present in the specimens from Algarve and Alentejo. If that variation is of any taxonomic significance or if it is only of a polymorphic nature remains yet to be seen.

In that concerns the larvae, however, it seems that Portuguese specimens don't differ from Angolan larvae [32]. The following is the branching of head-setae in our larvae from the Alentejo (mean, standard deviation, number of observations in parenthesis and range, respectively): head-seta 7 with 7.39 ± 1.22 (49) 5−10 branches; head-seta 6 with 2.32 ± 0.51 (56) 2−4 branches; head-seta 5 with 3.33 ± 0.67 (54) 2−5 branches; head-seta 4 with 2.05 ± 0.62 (56) 1−3 branches; head-seta 8 with 4.60 ± 0.90 (50) 2−7 branches; head-seta 9 with $6.76 \pm \pm 0.97$ (46) 5−9 branches. Other particular in our larvae are as follows: number of teeth in the comb of abdominal segment VIII 31.10 (91) 12−44; siphon index 4.74 (63) 4.10−8.30; number of subventral tufts (1S) on siphon 10.11 (62) 7−12; seta 1X with 2.81 (118) 2−5 branches.

BIOECOLOGICAL NOTE. *Cx. theileri* was one of the most common and widespread of the mosquitoes of the Alentejo, its larvae being present in 89 out of the 170 larval biotopes recorded (relative breeding index RBI = = 52.35).

Cx. theileri is a ground-breeder, as it is shown by the kinds of larval biotopes recorded for this species in the Alentejo: pools in river beds (44 biotopes), river margins (12), rock-pools (10), small streams, drains and springs (6), rice fields (5), cement tanks and other artificial containers (4), wells (2) and other ground-water breeding places (6). The pH of the breeding water (85 observations) ranged from 5.5 to 9.0, with figures from 6.0 to 7.0 in 72 instances (84.71 per cent). Filamentous green algae were recorded in 40 *theileri* biotopes, horsetails were present 34 times and *Lemna* sp. was recorded in 11 breeding sites.

In only 3 out of the 89 larval biotopes of *theileri* (3.36 per cent) no other mosquito larvae were found. In the remainder breeding places 12 other species were recorded (Table 2) even though *An. atroparvus* (62 biotopes), *Cx. p. pipiens* (37), *Cx. impudicus* (18), *Cx. univittatus* (9) and *Cs. longiareolata* (8) were the most common associates.

Figs. 2, 5, 6, 7 and 8 illustrate the breeding area of *Cx. theileri* in the Alentejo.

10 adults of *Cx. theileri* (9 ♀ 1 ♂) were caught as such, in the wild. 7 of the female were resting in stables, the other two females entered a New Jersey trap and the male were resting in an outdoor shelter.

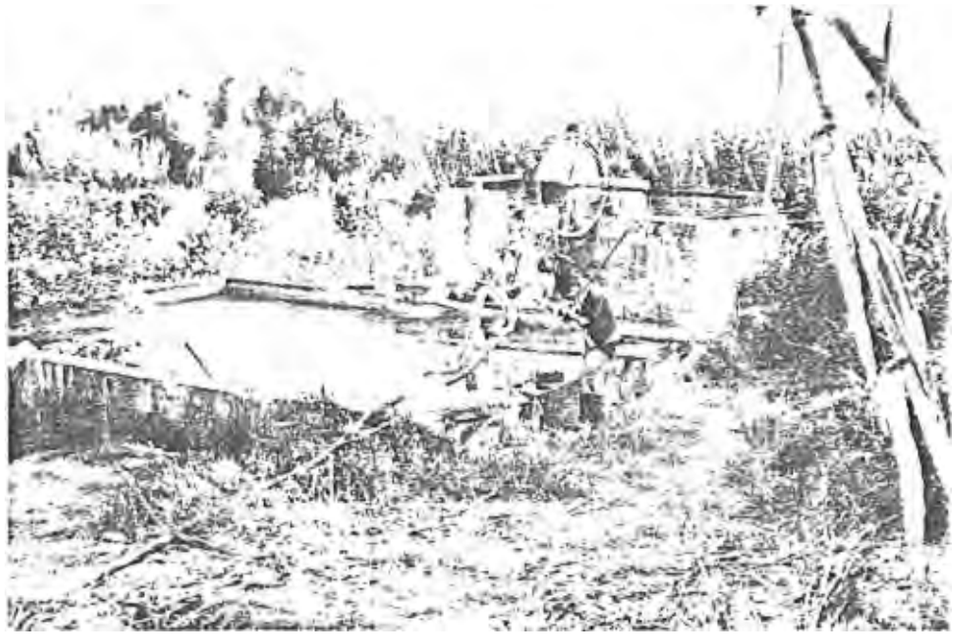


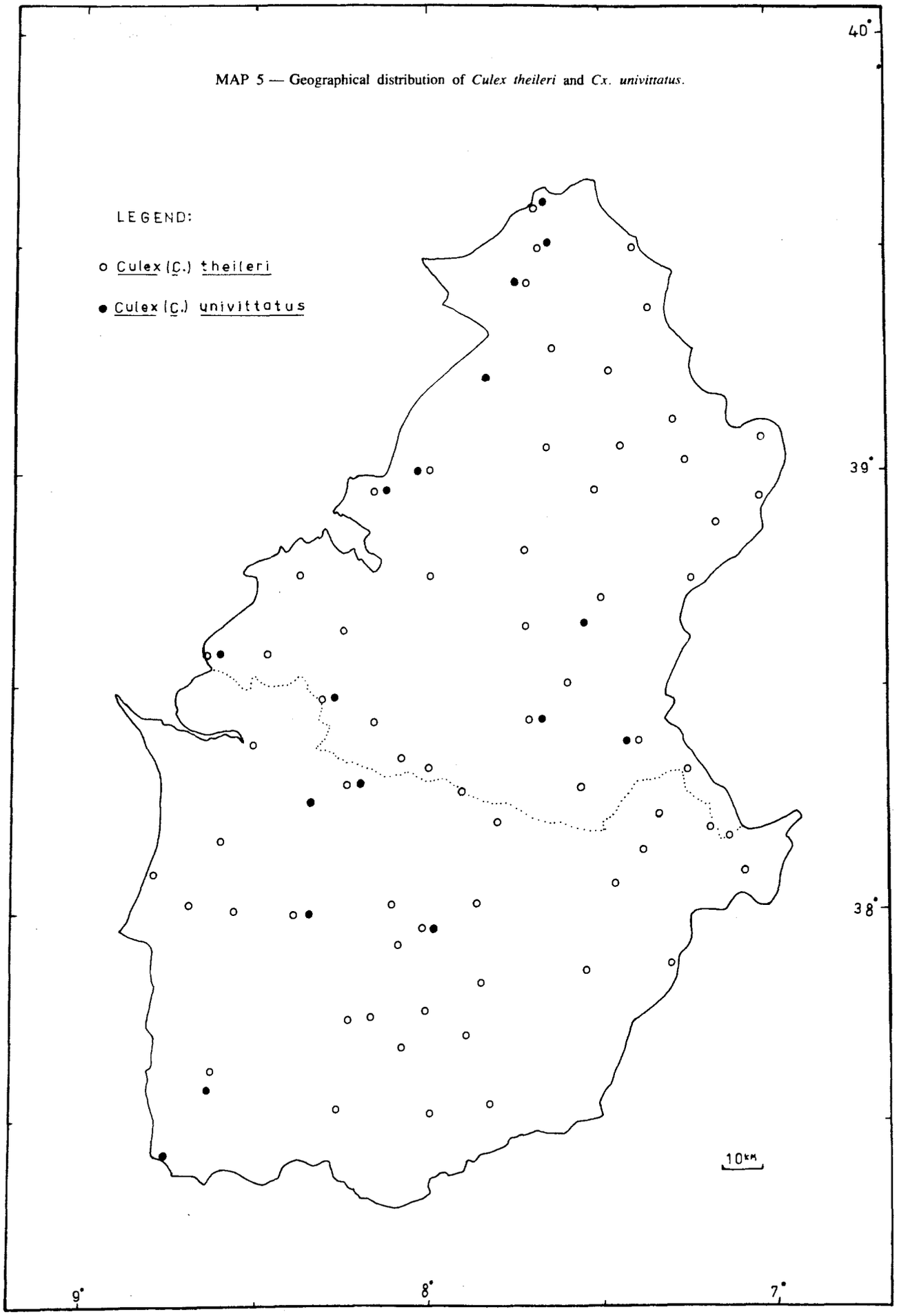
Fig. 5 — A typical cement tank at Santiago do Cacém, common kind of larval biotope of *Anopheles atroparvus, Culex pipiens pipiens, Cx. theileri* and *Culiseta longiareolata*.

Fig. 6 — Collecting larvae of *Anopheles atroparvus* and *Culex theileri* from pools in Chança river bed, near Vila Verde de Ficalho.

Fig. 7 — Collecting larvae of *Culex pipiens pipiens*, *Cx. theileri*, *Cx. univittatus*, *Cx. impudicus* and *Culiseta annulata* from small, grassy ground pools near Odemira.

Fig. 8 — General view of the Sever river valley, breeding area of *Anopheles atroparvus*, *Cx. pipiens pipiens*, *Cx. theileri* and *Cx. impudicus*.

MAP 5 — Geographical distribution of *Culex theileri* and *Cx. univittatus*.



4.11. **Culex (Culex) univittatus** Theobald, 1901

Cx. univittatus was recorded for the first time from Portugal and from the Alentejo by the present writers in a previous paper [5] where this species is throughly delt with and to which the reader is referred.

Figs. 1 and 7 illustrate the breeding area of *Cx. univittatus* in the Alentejo.

Map 5 shows the known distribution of this species in the surveyed area, where the 17 recorded larval biotopes recorded give for *univittatus* RBI = 10.00.

4.12. **Culex (Maillotia) hortensis hortensis** Ficalbi, 1889

Cx. h. hortensis was recorded for the first time in Portugal by Braga [2], though it had not yet been recorded from the Alentejo.

MATERIAL EXAMINED. MARVÃO (5km S of), 1 larva, 2.IX.76; TORRÃO, 2 larvae, 7.IX.76.

DISTRIBUTION. *Cx. h. hortensis* is a Palaearctic species extending from India, U.S.S.R. and Iran to the Canary Islands and the Madeira Islands, where the nominal subspecies gives place to subspecies *maderensis*.

Map 6 shows the two locality records for *hortensis* in the Alentejo, where it is undoubtly a quite rare species.

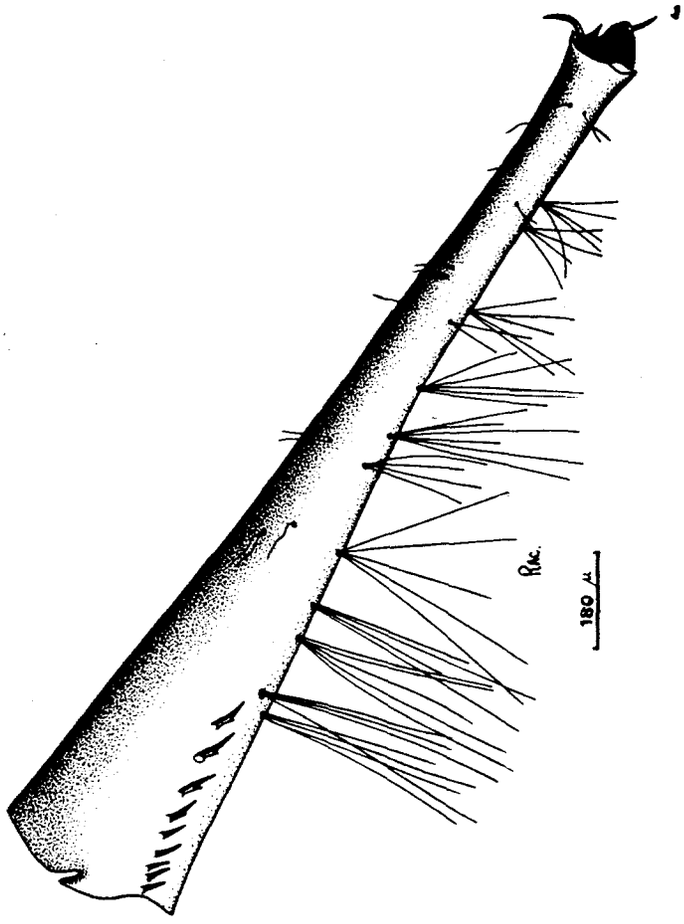


Fig. 9 — *Culex (N.) hortensis hortensis* Ficalbi. Siphon of larva.

TAXONOMIC NOTE. In our three larvae, head-seta 7 has 5−7 branches, head-seta 6 is 3 or 4−branched, head-seta 5 is always bifid, there are 34−37 teeth in the comb of abdominal segment VIII and the siphon, with an index of about 6, hairs 11 or 12 subventral tufts which are, at most, three times as long as the diameter of siphon at the insertion level (Fig. 9).

It seems that the last two characters are of taxonomic significance, distinguishing between the nominal subspecies and subspecies *maderensis* which has 15 or more subventral tufts four or more times as long as diameter of siphon.

BIOECOLOGICAL NOTE. Only two *hortensis* breeding places were recorded, a rock-pool and a small stream, with clean water and pH 6.0−6.5.

Cx. p. pipiens and *C. theileri* were the associated mosquito species in both larval biotopes while *Cs. longiareolata* was present in only one of them.

4.13. **Culex (Neoculex) impudicus** Ficalbi, 1890

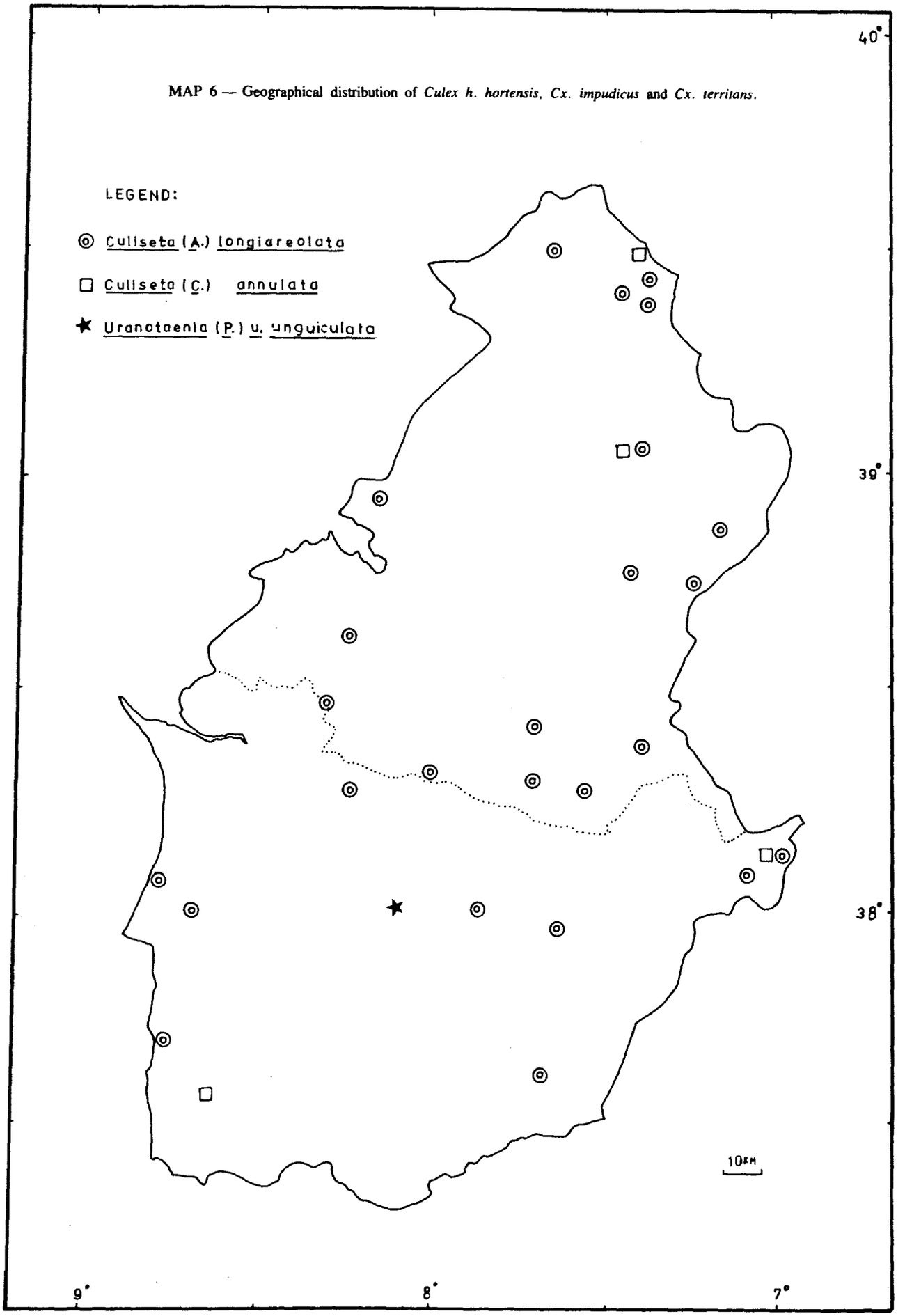
Though it is by no means sure, it is admitted that this species was, firstly recorded in our country by Braga [2]. In any case, *Cx. impudicus* had not yet been recorded from Alentejo.

MATERIAL EXAMINED. AMIEIRA, 1 ♀, 25.VIII.76; AVIZ (10km NW of), 20 larvae, 1.IX.76; BARRAGEM MONTE DA ROCHA, 1 ♂, 19.VIII.76; CABRELA, 1 ♀ 21 larvae, 8.IX. 76; CANHESTRO RIVER, 7 larvae, 24.VIII.76; CASTELO DE VIDE (4km NW of), 4 ♀ 5 ♂, 2.IX.76; FRONTEIRA, 2 larvae, 1.IX.76; GRÂNDOLA RIVER, 22 larvae, 17.VIII.76; LIMAS RIVER, 8 larvae, 21.VIII.76; LUCEFECI RIVER, 9 larvae, 28.VIII.76; MORA, 1 larva, 9.IX.76; NISA RIVER, 1 ♀, 2.IX.76; ODECEIXE, 4 larvae, 18.VIII.76; ODEMIRA, 1 larva, 18.VIII.76; ODEMIRA (15km N of) 3 ♀ 1 ♂ 17 larvae, 18.VIII.76; OUGUELA, 1 ♂, 31.VIII.76; PARDIELA RIVER, 1 ♂ 2 larvae, 30.VIII.76; PORTALEGRE (9km N of), 5 ♀ 7 ♂ 1 larva, 2.IX.76; PORTEL, 2 ♂, 25.VIII.76; PÓVOA, 11 larvae, 23.VIII.76; REDONDO, 2 ♂, 28.VIII.76; SAFARA, 1 ♀, 20 larvae, 23.VIII.76; SANTA EULÁLIA, 2 larvae, 31.VIII.76; SANTANA (BOTE RIVER), 4 larvae, 3.IX.76; S. CRISTÓVÃO RIVER, 1 ♀ 2 ♂ 8 larvae, 8.IX.76; SERRA DA OSSA, 1 ♀ 1 ♂ 6 pupal pelts plus 12 larvae, 30.VIII.76; SEVER RIVER, 2 larvae, 2.IX.76; TERA RIVER (W of ESTREMOZ), 1 ♀, 30.VIII.76; TOUTALGA RIVER, 27 larvae, 23.VIII.76; VEIROS, 16 ♀ 15 ♂ 57 larvae, 1.IX.76; VILA BOIM, 2 ♀ 1 ♂ 2 larvae, 30.VIII.76.

DISTRIBUTION. Described from Sardinia *C. impudicus* is typically a species of the Mediterranean Subregion (of the Palaearctic).

In the Alentejo, *Cx. impudicus* is a fairly common and generalized species, as it is shown in Map 6.

MAP 6 — Geographical distribution of *Culex h. hortensis*, *Cx. impudicus* and *Cx. territans*.



TAXONOMIC NOTE. In the larva, the mean ratio between the length of the most basal subventral tuft and diameter of siphon at the insertion level (43 observations) was 2.26 with range 1.41 – 3.50. This character seems to be of diagnostic value in the separation of *Cx. impudicus* from *Cx. territans* (see under this species). Siphon with index 7.27 – 8.69, mean 7.75, bearing about 10 (8 – 11) subventral tufts.

In the adult, the pale apical bands on abdominal tergites are much reduced, sometimes even interrupted in middle. In any case, however they are always broadned to the sides. The male terminalia are quite typical of the species. Males of *Cx. impudicus* may even be separated from *territans* males at the naked eye owing to the unusually hairy last abdominal segments of the former (Fig. 10).

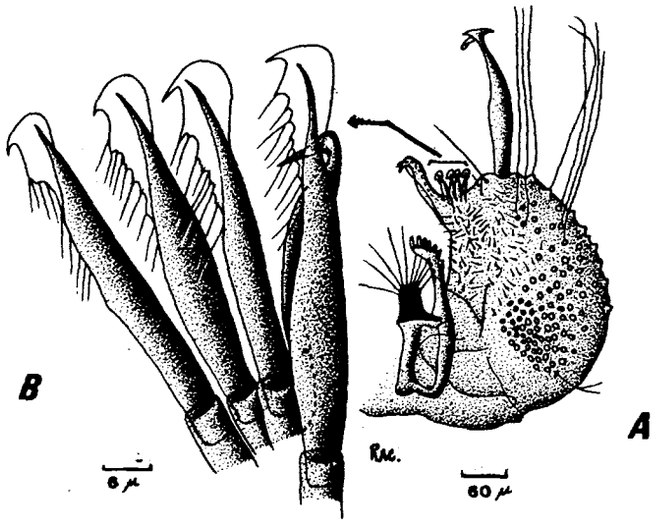


Fig. 10 — *Culex* (*N.*) *impudicus* Ficalbi. Male terminalia. A — General view. B — Detail of parabasal spines of coxite.

BIOECOLOGICAL NOTE. 31 out of the 34 breeding places of *Cx. impudicus* recorded in the Alentejo (RBI = = 20.00) were ground water biotopes: pools in river bed (11 biotopes), small streams, drains and springs (8), river margins (6), rice fields (3), rock-pools (2) and a well. The 3 artificial breeding places recorded were a cement tank, a drum and a barrel with stored water for domestic uses.

The pH of the breeding water ranged from 5.5 to 7.5 in the 34 larval biotopes, being 6.5 – 7.0 in half of them. Filamentous green algae, horsetails, *Lemna* sp. and nenuphars were recorded as associated aquatic vegetation in 18, 11 and 5 *impudicus* biotopes, respectively.

Larvae of ten other mosquito species were found in the breeding places of *Cx. impudicus* (Table 2), of which the most frequent were: *An. atroparvus* (24 times), *Cx. theileri* (18) and *Cx. p. pipiens* (14).

Figs. 1, 2, 7 and 8 illustrate the breeding area of *Cx. impudicus* in the Alentejo.

4 adult females and 3 males were caught in the wild, at rest: one of the females in an outdoor artificial shelter and the remainder specimens on the vegetation near *impudicus* breeding sites.

4.14. Culex (Neoculex) territans Walker, 1856

Recorded as a Portuguese mosquito by Braga [2] (as *Cx. apicalis* Adams which is in fact a Nearctic species) and later by Cambournac from Águas de Moura [28], *Cx. territans* is here recorded for the first time from Alentejo where it is in any case a quite rare species.

MATERIAL EXAMINED. PORTALEGRE (9km N of), 1 ♂ 1 larva, 2.IX.76.

DISTRIBUTION. *Cx. territans* is a species widely distributed in the Holarctic Region, though it seems to be uncommon in the Mediterranean Subregion (of the Palaearctic).

In the Alentejo, the only now known record of this species is in the Marvão Serra, at about 600 meters in altitude (Map 6).

TAXONOMIC NOTE. The male terminalia enabled us to distinguish surely between our only *territans* specimen and the much more common *impudicus*. In any case, differently from *territans*, the apical pale bands on abdominal tertergites were not broadned to the sides. In the larva, the shorter basal tufts of siphon, only about 0.92 of siphon breadth, confirmed the diagnosis.

BIOECOLOGICAL NOTE. The only breeding place here recorded for *Cx. territans* is a shaded mountain stream of limpid, rapid flowing water with pH = 6.0. Larvae of *An. atroparvus*, *An. petragnanii*, *Cx. p. pipiens* and *Cx. impudicus* were found as associates in the same biotope.

4.15. Culiseta (Allotheobaldia) longiareolata (Macquart, 1838)

Cs. longiareolata was one of the first species to be recorded from Portugal, as early as 1901, by Sarmento & França [33], also cited from the Alentejo already by Braga [2].

MATERIAL EXAMINED. AMIEIRA, 1 ♂, 25.VIII.76; BARRANCOS, 1 ♀ 1 ♂ 13 larvae, 23.VIII.76; BEIRÃ (VIDE RIVER), 16 larvae, 2.IX.76; BEJA, 2 ♀ 7 larvae, 19, 22 and 25.VIII.76; CASTELO DE VIDE, 1 ♂ 3 larvae, 2.IX.76; DEGEBE RIVER (VENDINHA), 4 larvae, 28.VIII.76; ELVAS, 7 larvae, 27 and 30.VIII.76; ENXÓE RIVER, 1 ♀, 21.VIII.76; GUADIANA RIVER (W of MOURÃO), 1 larva, 28.VIII.76; JUROMENHA (5km N of), 20 larvae, 28.VIII.76; LAGOA SANTO ANDRÉ, 3 ♀ 3 ♂ 2 larvae, 17.VIII.76; MARVÃO, 2 ♀ 3 ♂ 15 larvae, 2.IX.76; MONFORTE (AVIZ RIVER) 2 larvae, 31.VIII.76; MONTEMOR-O-NOVO (CANHA RIVER),

53 larvae, 8.IX.76; MORA, 1 ♀, 9.IX.76; NISA, 4 larvae, 3.IX.76; PORTEL, 8 ♀ 10 ♂ 29 larvae, 25.VIII.76; SANTIAGO DO CACÉM, 1 larva, 17.VIII.76; SÃO CRISTÓVÃO, 14 larvae, 8.IX.76; TORRÃO, 9 larvae, 7.IX.76; VIANA DO ALENTEJO, 3 larvae, 7.IX.76; VILA NOVA DE MILFONTES, 4 larvae, 18.VIII.76; VILA VIÇOSA, 3 larvae, 28.VIII.76.

DISTRIBUTION. *Cs. longiareolata* has a wide area of distribution which includes central an southern Palaearctic Region, from Azores to northwestern India, and the Subsaharian and Southafrican portions of the East-South African Subregion (of the Ethiopian) [22].

As it is shown on Map 7, *Cs. longiareolata* is one of the generalized species in the Alentejo.

TAXONOMIC NOTE. *Cs. longiareolata* exhibits a marked polymorphism throughout its wide area of distribution.

In our larvae from Alentejo, the figures found for some quantitative characters were as follows (mean, standard deviation, range and number of observations, respectivelly): head-seta 6 with 1.06 ± 0.23 branches (1 or 2) 36; head-seta 5 with 1.19 ± 0.58 (1 – 4) 36; head-seta 4, with 2.50 ± 0.72 (1 – 4) 32; number of pecten teeth $10.00 \pm \pm 2.33$ (7 – 14) 32; ratio between length of siphon and length of pecten 1.58 ± 0.13 (1.35 – 1.80); ratio between length of subventral tuft and diameter of siphon $0.48 \pm \pm 0.07$ (0.41 – 0.63) 12; number of tufts outside the barred area on tenth abdominal segment 1.94 ± 1.29 (0 – 4) 16.

In the 18 *longiareolata* females examined from Alentejo, there was the habitual polymorphism of the abdominal markings, though in most specimens the abdominal tergites were almost completely covered by pale yellowish scales. A white ring was always present on first tarsal segment and, almost always, also on fourth.

BIOECOLOGICAL NOTE. 26 larval biotopes of *Cs. longiareolata* were recorded from the Alentejo, giving a relative breeding index for this species RBI = 15.29. Half of the breeding places were artificial containers (cement tanks, drums and drinking-fountains) showing the marked association of this species to man. 8 out of the 13 remainder ground-water biotopes were rock-pools, the others being small streams and springs (3) and pools in river beds (2).

The breeding water was usually clean, most often without any macroscopic vegetation (filamentous green algae were recorded in 5 biotopes), usually exposed to the sun and a pH ranging from 6.0 to 7.0 in 22 out of the 24 biotopes examined.

As it is shown no Table 2, most of the species occurring in the Alentejo were found breeding in association with *longiareolata* at one time or another, though larval *Cx. p. pipiens* (12 times), *Cx. theileri* (8) and *An. atroparvus* (6) were the most frequent ones. In 7 out of the 26 breeding sites of *longiareolata* no other mosquito larvae were recorded.

Figs. 4 and 5 illustrate two typical larval biotopes of *Cs. longiareolata* in the Alentejo.

As it is usual with the zoophagic and exophilic species, no adults were caught by the writers in the wild.

4.16. **Culiseta (Culiseta) annulata** (Schrank, 1776)

As for the preceding species, *Cs. annulata* was one of the first species to be recorded from Portugal, also by Sarmento & França [34], though it had not yet been cited from the Alentejo.

MATERIAL EXAMINED. BARRANCOS, 6 larvae, 23.VIII.76; FADAGOSA, 1 ♀, 2.IX.76; MONFORTE, 1 larva, 31.VIII.76; ODEMIRA, 2 larvae, 18.VIII.76.

DISTRIBUTION. *Cs. annulata* seems to be mainly a species of the European Subregion (of the Palaearctic), though it can be found in the Mediterranean Subregion as a relatively rare mosquito).

This is also the case for the Alentejo, where *longiareolata* is by far the most common and widespread representative of the genus (Map 7).

TAXONOMIC NOTE. In the adult, there were no pale scaling of the fifth vein nor there were scattered pale scales on abdominal tergites, characters which permit the distinction between adults of *annulata* and *subochrea*. In the larva, the mean ratio of distance between head-setae 4 to distance between head-setae 5 was 0.93 with range 0.60 – 1.11 (5 observations), thus confirming the unreliability of this character for the separation of that two species (Ribeiro *et al.* [6]). On the other hand, the ratio of length of siphon tuft to siphon breadth was 0.92.

The branching of head-setae in our *annulata* larvae were as follows (mean, standard deviation, range and number of observations): head-seta 7 with 10.91 ± 4.04 (6 – 15) branches, 11; head-seta 6 with 1.92 ± 0.95 (1 – 3) 13; head-seta 5 with 6.27 ± 1.95 (3 – 9) 11 and head-seta 4 with 4.11 ± 0.78 (3 – 5) 9.

BIOECOLOGICAL NOTE. The only 4 larval biotopes recorded for *Cs. annulata* in the Alentejo were ground water pools along river margins, shaded at least by dense grasses or shrubs and trees along the water lines. The breeding water was limpid in two instances and greenish owing to microscopic algae in the other, with pH 6.5 – 7.0.

In these biotopes, *annulata* was breeding in association with *Cx. p. pipiens* (3 times), *Cx. theileri* and *Cx. impudicus* (2 each) and once with *Cx. univittatus* and *Cs. longiareolata*.

MAP 7 — Geographical distribution of species of genus *Culiseta* and *Uranotaenia*.

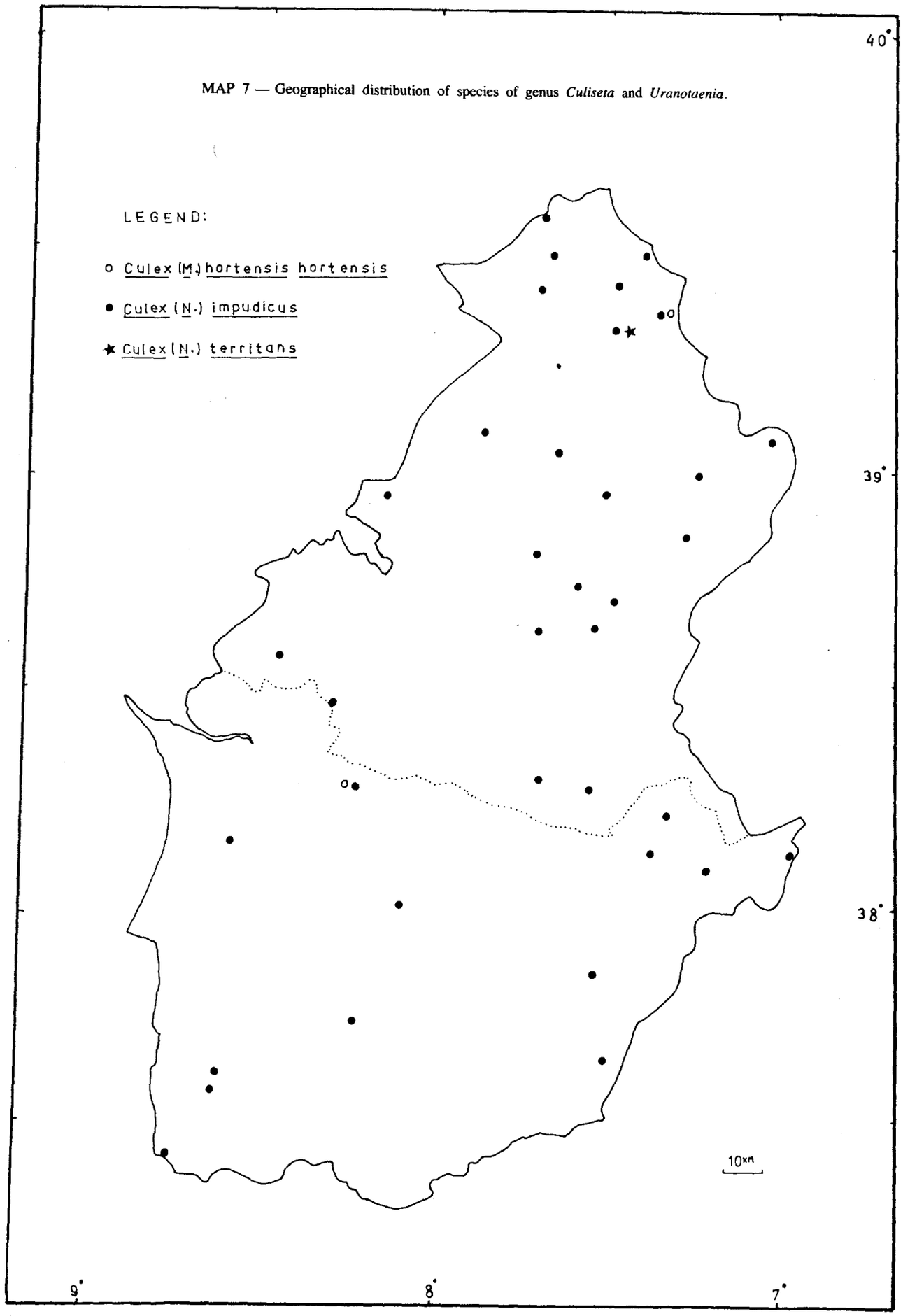


Fig. 7 shows a breeding place of *Cs. annulata* in the Alentejo.

The engorged *annulata* female was caught at rest by day in a poultry house, among several other specimens of *An. atroparvus*.

4.17. **Uranotaenia (Pseudoficalbia) unguiculata unguiculata** Edwards, 1913

U. u. unguiculata is known in our country through the record of one male *ex pupa* from the Canhestros river, in the Alentejo (Map 7), already published by the present writers in a previous paper of this series (Ribeiro *et. al.* [5]).

For further information on Portuguese *U. unguiculata*, the reader is referred to this article, as no more specimens were found of this interesting and quite rare species.

5. ZOOGEOGRAPHY

6 out of the 17 mosquito species now known from the Alentejo (35.29 percent) are strictly Mediterranean forms: *An. petragnanii, Ae. echinus, Ae. berlandi, Cx. hortensis hortensis, Cx. impudicus* and *U. unguiculata unguiculata*. Moreover, *petragnanii* is even a species characteristic of the Western District of the Mediterranean Subregion (of the Palaearctic), doesn't occurring east of the Italian Peninsula.

An. atroparvus, Ae. caspius caspius, Ae. detritus and *Cs. annulata*, representing 23.53 per cent of the species, are mosquitoes characteristic of the Palaearctic Region.

Four other species, making also 23.53 per cent of the local culicides, are common both to the Mediterranean Subregion (of the Palaearctic) and to the Ethiopian Region: *Ae. vittatus, Cx. theileri, Cx. univittatus* and *Cs. longiareolata*.

Cx. territans and, probably, the form of *Ae. v. vexans* which occurs in Portugal are Nearctic and northern Palaearctic (European Subregion) mosquitoes, represented in Alentejo by occasional records.

Lastly, *Cx. pipiens pipiens* is a well known man associated and generalized mosquito which present distribution is of little zoogeographical meaning.

Summarizing these notes on the zoogeography of the Alentejo, we may say that the mosquito fauna of the area is mainly mediterranean in character, with two strong European and Ethiopian elements and a small Holarctic component.

6. RELATION TO DISEASE

An. atroparvus, the main potential vector of malaria in our country, is the most generalized (Map 2) and common of all mosquito species in Alentejo, with a relative breeding index RBI = 54.71. Its importance in the surveyed area as a potential carrier of malaria and arboviruses, thus, must be emphasised (see also Ramos *et al.* [24]; Filipe [34]).

Two other quite generalized (Map 4 and 5) and abundant species in the area are *Cx. theileri* (RBI = 52.35) and *Cx. p. pipiens* (RBI = 51.76), which potential role in the circulation of several important viruses was already summarized by the present writers in a previous paper (Ramos *et al., op. cit.*). More recently, *Cx. theileri* was also shown to be a natural carrier of canine *Dirofilaria* in the Alentejo, by Ribeiro, Ramos & Pires [31].

Cx. impudicus (RBI = 20.00) and *Cs. longiareolata* (RBI = 15.29) are zoophagic and exophilic mosquitoes so far as we know not involved in disease transmission to man or animals.

Cx. univittatus (RBI = 10.00) must be regarded as a dangerous mosquito, capable of virus transmission, namely, of the arboviruses "Sindbis" and "West Nile". On the other hand, the importance of *Ae. vittatus* (RBI = = 5.88) as a potential vector of yellow fever in the interior of the surveyed area (Map 3) cannot be disregarded (see also Ribeiro *et al.* [5]).

Ae. c. caspius (RBI = 5.88) is known to be a natural vector of the arbovirus Tahyna as well as of the myxomatosis virus which kills so many rabbits in the surveyed area. Besides, the "iridescent" virus (Buchatsky [35]) and the virus Ikyk-Kul (Bulychev *et al.* [36]), were isolated from *caspius*.

All the other mosquito species occurring in the Alentejo seem to be too rare (RBI $\leq$ 1.76) as to play a role of any practical epidemiological importance. In any case, it is to be noted that *Ae. v. vexans, Cs. annulata* and *Cx. territans* are potential vectors of several viruses pathogenic to man and animals, such as Tahyna, C.E., E.E.E. and Flandres viruses. The relation to disease of the remainder five species was already delt with in the previous papers of this series by the present writers.

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