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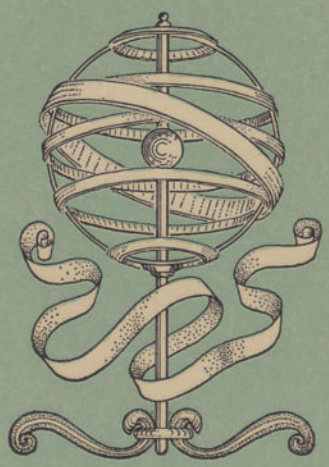

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SILVAS — C. T. G., scarl

Research on the mosquitoes of Angola

VI — The genus *Anopheles* Meigen, 1818 *(Diptera, Culicidae)*. Check-list with new records, keys to the females and larvae, distribution and bioecological notes (1)

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(Recebido em 15-V-1974)

In this paper the writers revise our knowledge concerning the genus *Anopheles* in Angola including, besides all the available data from the literature, personal unpublished data gathered by the writers during several years of collecting throughout the territory and based on the identification of more than 7,000 specimens. The list of the Angolan *Anophelines*, so, is increased from 32 to 48, 14 species, 3 subspecies and 1 form being now recorded for the first time in Angola: *A. caliginosus, A. concolor, A. cinctus, A. nili, A. leesoni, A. rivulorum, A. distinctus, A. theileri, A. demeilloni, A. flavicosta, A. longipalpis, A. schwetzi,* species A (*A. gambiae* complex), *A. cydippis, A. rhodesiensis rhodesiensis, A. wellcomei wellcomei, A. rufipes rufipes* and *A. nili* Congo form. Keys for females and forth instar larvae of the Angolan Anophelines are now proposed, taking into account the peculiar characteristics of the Angolan populations, as they are known to us. Under each Anopheline, the material examined by the writers and the localities from which the species is known are indicated, 403 new localities being recorded. Distribution maps for each species are also presented and considered in connection with a tentative zoogeographical sketch of Angola now proposed by the writers. Lastly, besides some bioecological notes concerning each Anopheline, the writers consider the medical importance of the Angolan species, namely as malaria vectors, according to the available data from literature as well as to personal unpublished data.

Neste trabalho, os autores fazem uma revisão dos nossos conhecimentos actuais relativos ao género *Anopheles* em Angola, incluindo, para além de todos os dados bibliográficos disponíveis, os dados ainda inéditos obtidos ao longo de vários anos de colheitas através do território e baseados na identificação de mais de 7000 espécimes. A lista dos anofelineos angolanos é assim aumentada de 32 para 48 elementos, assinalando-se 14 espécies, 3 subespécies e 1 forma nova para Angola: *A. caliginosus, A. concolor, A. cinctus, A. nili, A. leesoni, A. rivulorum,*

(1) A synopsis of this paper was presented to the Sociedade Portuguesa de Medicina Tropical, Lisbon.

A. distinctus, A. theileri, A. demeilloni, A. flavicosta, A. longipalpis, A. schwetzi, espécies A (complexo *A. gambiae), A. cydippis, A. rhodesiensis rhodesiensis, A. wellcomei wellcomei, A. rufipes rufipes* e *A. nili* forma do Congo. Apresentam-se chaves para as fêmeas e larvas no quarto estádio dos anofelíneos angolanos, tendo-se em conta as características particulares das populações locais e de acordo com o conhecimento delas adquirido pelos autores. Para cada anofelíneo indicam-se o material examinado pelos autores e as localidades donde é actualmente conhecido, registando-se um total de 403 novas localidades. São também apresentados mapas de distribuição para cada espécie, procurando os autores relacionar aquela com a zoogeografia de Angola, de que propõem um primeiro esboço. Finalmente, além de incluírem algumas notas bioecológicas relativas a cada anofelíneo, os autores consideram a importância médica das espécies angolanas, particularmente como vectoras do paludismo, com base nos dados bibliográficos disponíveis e, bem assim, em algumas observações pessoais ainda inéditas.

1 — *INTRODUCTION*

Our knowledge of the Angolan *Anopheles* was summarized in 1956 by A. F. Gândara (1, 2). Since then, besides a few other contributions, a considerable amount of new data could be gathered by the writers' team during several years of collecting, which remain unpublished.

In this paper, we intend to give an up to date picture of the present knowledge of the genus in Angola, including all published data as well as all the new information resulting from the identification of 7,000 specimens (about 2,600 adults and 4,500 larvae) caught throughout the territory. Though more intensive collecting is still necessary, species distribution maps are already presented, along with a tentative zoogeographical division of Angola. Lastly, the available information on the role of the Angolan Anophelines as vectors of malaria and other mosquito born diseases is briefly considered.

2 — *HISTORICAL OUTLINE*

The study of the Angolan mosquitoes was started in 1903 by B. Roque (3), though any *Anopheles* could not then be correctly identified.

The first valid identification was carried out by Giles (4), in 1904, who recorded *A. pharoensis* among other mosquitoes caught at Benguela by Y. Massey. In 1905, Theobald (5) described *A. austenii* from material caught by F. C. Wellman in Bié (now Silva Porto). In the same year, Wellman (6, 7), records four other species for Angola (*A. wellcomei, A. funestus, A. pharoensis, A. squamosus*) and, in 1907, Wellman & Fay (8) added three other *Anopheles* to the Angolan list (*A. maculipalpis, A. gambiae* and *A. coustani*). Correia Mendes (9), in 1909 was the first Portuguese author recording a new Anopheline for Angola, *A. paludis*. The following year, it was again Theobald (10) who identified two new *Anopheles* for Angola, again from material caught by Wellman in Bié, *A. marshalli* and *A. brunnipes,* this one also a new species.

Thus, until 1910, eleven Anophelines were known from Angola, two of them described from there, which is remarkable for the epoch. Unfortunately, from 1910 till 1956 very little interest was given to this important subject and the list of species, after the revision of Sant'Anna (11) in 1920, in even shortned by different authors (12, 13, 14, 15). During this period, the main contributions were that of B. de Mesquita (12, 13), who recorded two more taxa for Angola in 1941 (*A. obscurus* and *A. pretoriensis*) and that of De Meillon (16), in 1947, whose revision of the genus, besides adding *A. argenteolobatus* to the Angolan list, would become a basic tool for the entomological surveying of Africa South of the Sahara.

In 1956, a very important contribution was given by A. F. Gândara (1, 2), assistant of the Instituto de Medicina Tropical, who revised the Angolan mosquitoes. Based on the identification of 2,227 Anophelines this author added 15 taxa to the 14 previously recorded *Anopheles,* as well as many new locality records.

After 1956, in what concerns the taxonomy of the genus, it is only to be cited that in 1960 Barros Machado (17) adds two more taxa (*A. dureni* and *A. implexus*) to the Angolan list which is increased to 32 *Anopheles* with the description of *A. azevedoi* by one of us, in 1969 (18).

3 — *GAZETTEER OF MAIN LOCALITIES*

In map 1 are shown the main collecting localities concerned in this paper, which aproximate coordinates and altitude are given below.

121 out of 147 assigned localities were surveyed by the writers, while those marked with an asterisk were only surveyed by other authors.

1	Ambrizete	7° 14′ S	12° 52′ E	sea coast
2	Babaque (at Serra da Neve)	13° 40′ S	13° 08′ E	1,500 m
3	Baía Farta	12° 37′ S	13° 13′ E	sea coast
4	Barra do Cuanza	9° 08′ S	13° 10′ E	sea coast
5	Barra do Dande	8° 29′ S	13° 24′ E	sea coast
6	Bela Vista *	12° 30′ S	16° 13′ E	1,700 m
7	Benguela	12° 35′ S	13° 25′ E	sea coast
8	Bom Jesus *	9° 09′ S	13° 34′ E	100 m
9	Brutuei	16° 02′ S	12° 52′ E	580 m
10	Buco-Zau (= Maiombe)	4° 45′ S	12° 31′ E	350 m
11	Cabinda	5° 33′ S	12° 11′ E	sea coast
12	Cabuta	9° 50′ S	14° 52′ E	750 m
13	Cabuta (20 km N of)	9° 40′ S	14° 46′ E	400 m
14	Cachimo *	8° 19′ S	21° 21′ E	800 m
15	Cachingues	13° 03′ S	16° 45′ E	1,700 m
16	Caconda *	13° 44′ S	15° 05′ E	1,700 m
17	Cacongo *	5° 20′ S	12° 20′ E	70 m
18	Cacuaco	8° 46′ S	13° 20′ E	sea coast
19	Caculama	9° 28′ S	16° 53′ E	1,250 m
20	Cainde	15° 27′ S	13° 22′ E	900 m
21	Cainde (16 km NW of)	15° 18′ S	13° 20′ E	1,350 m
22	Calai	17° 51′ S	19° 27′ E	1,050 m
23	Calulo (=Libolo)	10° 00′ S	14° 54′ E	950 m
24	Camuele	17° 50′ S	19° 18′ E	1,100 m
25	Cangandala	9° 45′ S	16° 26′ E	1,020 m
26	Cangandala (24 km E of)	10° 00′ S	16° 40′ E	1,050 m
27	Capelongo (=Vila Folgares) *	14° 53′ S	15° 04′ E	1,270 m
28	Capunda	10° 41′ S	17° 22′ E	1,130 m
29	Caraculo	15° 01′ S	12° 40′ E	440 m
30	Cariango	10° 30′ S	15° 25′ E	1,500 m
31	Carlaongo	10° 45′ S	14° 15′ E	200 m
32	Carmona (=Uíge)	7° 35′ S	15° 00′ E	850 m
33	Carmona (15 km S of)	7° 43′ S	15° 01′ E	950 m
34	Catumbela	12° 18′ S	14° 45′ E	100 m
35	Cazombo *	11° 53′ S	22° 58′ E	1,180 m
36	Ceilunga	12° 12′ S	17° 00′ E	1,700 m
37	Chão da Chela	15° 08′ S	13° 14′ E	1,120 m
38	Chicala	12° 48′ S	17° 04′ E	1,550 m
39	Chiquite	13° 46′ S	13° 07′ E	700 m
40	Chissamba (=Nova Sintra) *	12° 12′ S	17° 21′ E	1,400 m
41	Chitado	17° 19′ S	13° 55′ E	1,000 m
42	Chitato *	7° 20′ S	20° 48′ E	750 m
43	Chitembo	13° 32′ S	16° 46′ E	1,500 m
44	Cossa	7° 55′ S	21° 24′ E	760 m
45	Cuando (Barragem do)	12° 48′ S	15° 53′ E	1,700 m
46	Cuangar	17° 35′ S	18° 39′ E	1,050 m
47	Cuango	9° 06′ E	18° 05′ E	850 m
48	Cubal	13° 01′ S	14° 17′ E	900 m
49	Cuchi *	14° 38′ S	16° 58′ E	1,430 m
50	Cui (=Sumbo)	13° 39′ S	14° 12′ E	1,800 m
51	Cuito-Cuanavale *	15° 09′ S	19° 10′ E	1,280 m
52	Cutato	12° 25′ S	16° 28′ E	1,750 m
53	Dando	11° 14′ S	17° 18′ E	1,150 m
54	Dirico	17° 58′ S	20° 47′ E	1,200 m
55	Dirico (Cuito River)	17° 58′ S	20° 38′ E	1,100 m
56	Dundo	7° 22′ S	20° 50′ E	735 m
57	Duque de Bragança	9° 06′ S	15° 58′ E	1,060 m
58	Ebanga	12° 42′ S	14° 45′ E	2,000 m
59	Ebo	11° 02′ S	14° 41′ E	1,400 m
60	Equimina	13° 11′ S	12° 48′ E	sea coast
61	Gabela *	10° 51′ S	14° 22′ E	1,090 m
62	Guilherme Capelo (=Lândana)	5° 13′ S	12° 08′ E	sea coast
63	Gungo	11° 48′ S	14° 11′ E	900 m
64	Henrique de Carvalho (=Saurimo)	9° 39′ S	20° 25′ E	1,060 m

65	Impulo	13° 53′ S	13° 39′ E	800 m
66	Iona	16° 53′ S	12° 34′ E	1,000 m
67	Iona (40 km E of)	16° 44′ S	12° 48′ E	900 m
68	Lagoa Banda	8° 50′ S	13° 34′ E	100 m
69	Lago do Carvalhão	15° 45′ S	12° 05′ E	100 m
70	Lifune	8° 23′ S	13° 24′ E	50 m
71	Litu	16° 32′ S	19° 08′ E	1,100 m
72	Lobito	12° 22′ S	13° 32′ E	sea coast
73	Lomba	15° 38′ S	20° 17′ E	1,150 m
74	Longa*	14° 42′ S	18° 32′ E	1,360 m
75	Luanda	8° 49′ S	13° 13′ E	sea coast
76	Lucala	9° 18′ S	15° 13′ E	950 m
77	Lucira	13° 52′ S	12° 31′ E	sea coast
78	Luiana*	17° 32′ S	22° 59′ E	950 m
79	Luinga	8° 27′ S	15° 38′ E	1,200 m
80	Luso	11° 47′ S	19° 55′ E	1,320 m
81	Maquela do Zombo*	6° 03′ S	15° 06′ E	925 m
82	Mariano Machado*	13° 01′ S	14° 40′ E	1,750 m
83	Mavinga*	15° 50′ S	20° 21′ E	1,190 m
84	Mazozo	9° 07′ S	13° 37′ E	100 m
85	Moçâmedes	15° 12′ S	12° 09′ E	sea coast
86	Mona-Quimbundo	9° 50′ S	19° 59′ E	1,150 m
87	Morro dos Veados	8° 58′ S	13° 10′ E	sea coast
88	M'Pupa	17° 35′ S	20° 01′ E	1,150 m
89	Mucuio	14° 53′ S	12° 13′ E	sea coast
90	Mucusso	18° 00′ S	21° 27′ E	890 m
91	Mulondo*	15° 38′ S	15° 12′ E	1,200 m
92	Mumbondo	10° 10′ S	14° 09′ E	1,150 m
93	Mumbué	13° 54′ S	17° 18′ E	1,600 m
94	Munhino	14° 54′ S	12° 59′ E	900 m
95	Munhino (20 km W of)	14° 53′ S	12° 48′ E	900 m
96	Muquixe	9° 29′ S	16° 43′ E	1,200 m
97	Mutango	17° 51′ S	19° 53′ E	1,050 m
98	Muxima	9° 32′ S	13° 57′ E	20 m
99	Nangura	17° 49′ S	19° 01′ E	1,100 m
100	Naulila	17° 13′ S	14° 39′ E	1,100 m
101	Nova Lisboa (=Huambo)	12° 48′ S	15° 45′ E	1,700 m
102	Novo Redondo	11° 12′ S	13° 51′ E	sea coast
103	Novo Redondo (14 km E of)	11° 22′ S	14° 11′ E	250 m
104	Oncócua	16° 39′ S	13° 25′ E	1,080 m
105	Panda	17° 25′ S	18° 30′ E	1,000 m
106	Pereira d'Eça (=N'Giva)	17° 04′ S	15° 43′ E	1,150 m
107	Pico Azevedo	15° 28′ S	12° 26′ E	400 m
108	Ponte do Curoca	15° 45′ S	11° 50′ E	50 m
109	Porto Alexandre	15° 48′ S	11° 51′ E	sea coast
110	Portugália*	7° 19′ S	20° 49′ E	735 m
111	Quibaxe (=Dembos)*	8° 29′ S	14° 37′ E	800 m
112	Quiçama*	9° 12′ S	13° 21′ E	150 m
113	Quimbango	10° 53′ S	17° 32′ E	1,200 m
114	Quissol	9° 29′ S	16° 28′ E	1,100 m
115	Rio Bero (17 km NW of Virei)	15° 37′ S	12° 52′ E	450 m
116	Rio Chissombe	17° 45′ S	18° 26′ E	1,000 m
117	Rio Cunene (60 km S of Espinheira)	17° 9′ S	12° 00′ E	200 m
118	Rio Curoca (70 km N of Espinheira)	16° 18′ S	12° 26′ E	200 m
119	Rio Gango	10° 37′ S	15° 57′ E	1,600 m
120	Rio Lombe	9° 24′ S	16° 12′ E	1,100 m
121	Rio Giraul	15° 5′ S	12° 18′ E	150 m
122	Rio Lucala (Cassoalala)	9° 28′ S	14° 25′ E	250 m
123	Sá da Bandeira (20 km E of)	14° 55′ S	13° 29′ E	1,500 m
124	Salazar (=Dala Tando)	9° 19′ S	14° 57′ E	690 m
125	Salinas	10° 50′ S	14° 11′ E	450 m
126	Sambo*	13° 04′ S	16° 08′ E	1,710 m
127	São Nicolau	14° 16′ S	11° 39′ E	sea coast
128	Santa Cruz do Cuando	16° 24′ S	22° 00′ E	1,070 m

129	Santo António do Zaire *	6° 08′ S	12° 22′ E	sea coast
130	Santa Clara (=Otchicango)	17° 25′ S	15° 47′ E	1,100 m
131	Sanza Pombo	7° 19′ S	16° 00′ E	990 m
132	Sanza Pombo (35 km W of)	7° 31′ S	15° 51′ E	1,050 m
133	Serra da Neve	13° 42′ S	13° 08′ E	1,250 m
134	Silva Porto (=Bié)	12° 24′ S	16° 57′ E	1,700 m
135	Sousa Lara (=Bocoio)	12° 29′ S	14° 11′ E	1,100 m
136	Tando-Zinze	5° 23′ S	12° 31′ E	70 m
137	Tchivinguiro (=Chivinguiro)	15° 10′ S	13° 18′ E	1,690 m
138	Tune	17° 50′ S	20° 08′ E	1,000 m
140	Ueca	17° 55′ S	20° 30′ E	1,100 m
140	Vila Arriaga	14° 46′ S	13° 21′ E	920 m
141	Vila Gago Coutinho (=Bundas) *	14° 06′ S	21° 26′ E	1,130 m
142	Vila Nova do Seles	11° 24′ S	14° 18′ E	1,000 m
143	Vila Nova do Seles (15 km W of)	11° 20′ S	14° 15′ E	800 m
144	Vila Teixeira da Silva (=Bailundo) *	12° 12′ S	15° 52′ E	1,650 m
145	Vila Teixeira de Sousa (=Dilolo) *	10° 43′ S	22° 15′ E	1,100 m
146	Virei	15° 42′ S	12° 57′ E	450 m
147	Xandel	9° 24′ S	17° 12′ E	1,000 m

4 — *TENTATIVE ZOOGEOGRAPHICAL DIVISION OF ANGOLA*

As far as we know, the zoogeography of Angola is still very uncompletely known.

In the tentative sketch presented here we followed the basic works on the biogeography of the Ethiopian Region by Chapin (19), Moreau (20), Edwards (21), De Meillon (16) and Gillies & De Meillon (22), of the Southern Africa by Koch (23) and Davis (24) and those concerning Angola, by Hill & Carter (25), B. Machado (26) and Hall (27). Besides, personal information given by zoologists working in Angola (B. Machado and Crawford Cabral) were taken into account, as well as our own field experience along several years of entomological work in the territory.

In map 2, adapted from Moreau *(op. cit.)*, the main biotic zones in Africa South of Sahara are shown, as well as the general position of Angola within the Ethiopian Region.

In map 3, a more detailed picture of the Angolan zoogeography is tentatively proposed. As it can be seen, Cabinda, the northern third of the territory and a western stripe along the Great Escarpment, between the inland highlands and the coastal belt lowlands, are supposed to belong to the West African Subregion. The relatively small areas occupied by the Guinean Forest in the extreme north are bordered to the south by a belt of the Southern Congo Savana, while the Escarpment supports a stripe of median altitude Guinean Forest (the «fog forest»), extending southwards to about 15° S lat.

The Central and Eastern Angola, where the Bié plateau represents the western extension of the Rhodesian Highlands, is mainly occupied by a «miombo» savanna-woodland. To the West, this Rhodesian Highland Zone comes into contact with a mountainous country — the marginal mountain attaining 2,640 m in altitude — occupied by a montane biome.

Lastly, the inland above-mentioned areas are continued both west and southwards, by lowland semi-arid country belonging to the Southest Arid District of Chapin, though from about 12° S lat. northwards, significant West African faunal affinities are also to be found.

5 — *LIST OF SPECIES, SUBSPECIES AND FORMS*

The present paper, besides including all published data on the Angolan *Anopheles*, adds 14 species, 3 subspecies and 1 form to the 32 previously recorded *Anophelines*. It must be said, however, that the identification of species A (*gambiae* complex) was due to Dr. G. Davidson of the Ross Institute at London.

From the viewpoint of the geographical distribution, our knowledge on the genus in Angola is also considerably extended with 403 new locality records.

The complete list of the Anophelines now known from Angola, as well as the indication of the new records, are summarized in table 1. As to

TABLE 1

List of the Anopheline mosquitoes of Angola

subgenus	series	section	Anophelines	New records: species	subspecies	forms	localities
Anopheles	Myzorhynchus	—	A. caliginosus (De Meillon, 1943)	+			3
			A. coustani Laveran, 1900				25
			coustani group				28
			A. obscurus (Grünberg, 1905)				3
			A. paludis Theobald, 1900				–
			A. tenebrosus Dönitz, 1902				4
			A. ziemanni Grünberg, 1902				25
	Ano-theles	I	A. concolor Edwards, 1938	+			2
	Chris-tya	I	A. implexus (Theobald, 1903)				3
Cellia	Neomyzomyia	ardensis	A. ardensis (Theobald, 1905)				1
			A. cinctus (Newstead & Carter, 1910)	+			1
			A. dureni Edwards, 1938				–
			A. natalensis (Hill & Haydon, 1907)				6
			A. nili (Theobald, 1904)	+			2
			A. nili Congo form			+	2
		rhodesiensis	A. rhodesiensis rhodesiensis Theobald, 1901		+		21
			A. ruarinus Edwards, 1940				2
	Myzomyia	funestus	A. funestus Giles, 1900 (s.l.)				12
			funestus subgroup				10
			A. fuscivenosus (Leeson, 1930)				–
			A. leesoni (Evans, 1931)	+			1
			A. rivulorum (Leeson, 1935)	+			2
		marshalli-hancocki	A. austeni Theobald, 1905				3
			A. harperi Evans, 1936				2
			A. marshallii (Theobald, 1903)				10
			A. njombiensis Peters, 1955				–

subgenus	series	section	Anophelines	New records: species	subspecies	forms	localities
Cellia	Myzomyia	wellcomei	A. distinctus (Newstead & Carter, 1911)	+			11
			A. theileri Edwards, 1912	+			2
			A. wellcomei ugandae (Evans, 1934)				6
			A. wellcomei wellcomei Theobald, 1904		+		2
		demeilloni	A. demeilloni Evans, 1933	+			12
		—	A. barberellus Evans, 1932				–
			A. brunnipes (Theobald, 1910)				2
			A. flavicosta Edwards, 1911	+			2
			A. longipalpis (Theobald, 1903)	+			7
			A. schwetzi Evans, 1934	+			3
			A. tchekedii De Meillon & Leeson, 1940				–
			A. walravensi Edwards, 1930				–
	Pyretophorus	—	A. gambiae Giles, 1902				53
			species A (gambiae complex)	+			1
			A. melas (Theobald, 1903)				2
	Paramyzomyia	listeri	A. azevedoi Ribeiro, 1969				1
			A. listeri De Meillon, 1931				23
	Neocellia	—	A. maculipalpis Giles, 1902				10
			A. pretoriensis (Theobald, 1903)				18
			A. rufipes rufipes (Gough, 1910)		+		13
	Cellia	—	A. argenteolobatus Gough, 1910				13
			A. cydippis (De Meillon, 1931)	+			11
			A. pharoensis Theobald, 1901				13
			A. squamosus Theobald, 1901				26
			squamosus s.l.				5
			48	14	3	1	403
				18			TOTALS

the subgenus *Anopheles,* 8 out of the 10 Ethiopian Anophelines belonging to this group were recorded in Angola. The 38 remainder Angolan *Anopheles* belong to the much richer subgenus *Cellia,* with more than a hundred taxa in the Ethiopian Region.

With the exception of the *smithii* section, all the other sections of both subgenera are represented in the territory. It seems quite probable, however, that members of this group may also be present in the Guinean Forest biome of the northernmost Angola.

6 — *KEY TO THE FEMALES*

In the construction of the key we followed Gillies & De Meillon (22), adapting the key by these authors to the more restricted number of the Angolan Anophelines and introducing a few minor alterations applicable to the Angolan material as it is known to us.

Species are marked with an asterisk when Angolan females were not seen by the writers.

It is assumed that the taxonomic category given by the key is the lowest one compatible with the only examination of the females.

KEY TO THE FEMALES

1 — Abdominal segments with laterally projecting tufts of scales on segments II-VII	2
— Abdominal segments not so	6
2 — Hind tarsus I-V entirely dark	*argenteolobatus*
— Hind tarsus I-IV at least, with apical pale bands	3
3 — Hind tarsus I and II with definite light and dark rings in addiction to the apical pale band	*cinctus*
— Hind tarsus I and II with about distal half pale or with pale bands at apices only	4
4 — Hind tarsus V and about apical half of IV pale	*pharoensis*
— Hind tarsus V all dark or, at least, basal half dark	5
5 — Hind tarsus III and IV all white or narrowly dark basally	*implexus*
— Hind tarsus III and IV much less than apical half pale	*squamosus* *cydippis*
6 — Hind tarsus with at least last 2 segments entirely pale	7
— Hind tarsus not so	15
7 — Legs speckled	8
— Legs not speckled	9
8 — Hind tarsus III-V entirely pale	*maculipalpis*
— Hind tarsus III dark at base	*pretoriensis*
9 — Palps very shaggy and unbanded or with 1-4 irregular narrow pale bands	10
— Palps smooth with 3 pale bands, the 2 outer ones broad or rarely fused	14
10 — Palps without pale bands; no pale spot at apex of hind tibia or base of tarsus I	*caliginosus*
— Palps with 1-4 pale bands; apex of hind tibia broadly or narrowly pale	11
11 — Hind tarsus III entirely pale	*paludis*
— Hind tarsus III dark at base	12
12 — Hind tarsus I entirely dark basally or with only a few pale scales there	*tenebrosus*
— Hind tarsus I with a well-marked pale basal band	13
13 — Hind tibia with a pale streak on apex 3-5 times as long as broad; apical pale band on hind tarsus II one-eighth to two-fifths lenght of segment	*coustani*
— Pale streak on hind tibia usually narrower, one-fifteenth to one-eighth of segment: apex of fore tibia and base of fore tarsus I allways dark	*ziemanni*
14 — 3rd main dark area on 1st vein without a pale interruption	*rufipes rufipes*
— 3rd main dark area on 1st vein with a pale interruption	*theileri*

15 — Legs speckled, sometimes sparcely	16
— Legs not speckled	19
16 — 3rd main dark area on 1st vein with a pale interruption, sometimes fused with preceding pale area; scaling of abdomen very scanty, confined to 8th tergite or, rarely, to 7th	*gambiae complex*
— 3rd main dark area on 1st vein without a pale interruption; abdominal tergites fairly heavily clothed with cream or yellowish scales specially on segments VI and VII	17
17 — Hind tarsus II with about apical two-fifths to half white and the rest dark	*natalensis*
— Hind tarsus II either with less than apical two-fifths white or else proeminently marked with dark and pale bands	18
18 — No pale fringe spot oposite 1st vein; hind tarsus II-IV with apical pale rings and otherwise dark except for 1 to 2 pale spots	*ardensis*
— Pale fringe spot oposite 6th vein; hind tarsus II-IV with conspicuous dark and pale rings in addiction to apical pale bands	*dureni*
19 — Wing entirely dark or with pale spots confined to costa and 1st vein	20
— Wing not so	22
20 — Wing with at least some area of paler scales on costa or 1st vein	*rhodesiensis rhodesiensis*
— Wing entirely dark or unicolorous	21
21 — Palps with 2 well-marked pale bands, hind femur and tibia norrowly pale apically	*concolor*
— Palps and legs entirely dark	*ruarinus*
22 — Wing without a pale spot on basal half of costa	23
— Wing at least with 1 pale spot on basal half of costa	30
23 — Palps shaggy to near tip; palps entirely dark	*obscurus*
— Palps smooth except at extreme base	24
24 — Palps with apex dark; branches of 5th vein dark distally	*tchekedi*
— Palps with apex pale	25
25 — Palps with 3 pale bands, the subapical broad, about equal to apical band and often longer than the intervening dark band; branches of 5th vein pale except at fork	26
— Palps with 4 pale bands or else with 3 bands, the subapical of these being narrow and much more so than apical	27
26 — Distal half of proboscis prominently pale scaled; palps-apart from main pale bands — usually with scattered pale scales	*wellcomei wellcomei*
— Proboscis dark: pale scales on palps — apart from main pale bands-fewer, if any	*wellcomei ugandae*
27 — Stem and lower branch of 5th vein dark except for a narrow pale spot distal to fork; upper branch with a simple pale spot	*fuscivenosus* (in part)
— 5th vein with extensive pale areas; upper branch with 1 or 2 pale spots	28
28 — Hind tarsus I-IV with distinct apical pale bands; mesonotum clothed with very narrow scales and with no patch of sacles above the wing root	*distinctus*
— Hind tarsus I-IV entirely dark or with a few pale scales at apices of I-III; mesonotal scales broad, a patch of pale scales present above the wing root	29
29 — Mesonotal scales yellowish or bronze medianally and white elsewhere	*schwetzi*
— Mesonotal scales white throughout	*walravensi** (in part)
30 — Palps with apex dark or without apical distinct pale bands	31
— Palps with apex pale	32
31 — Inner prehumeral dark spot, at the base of costa, well developed, with dark scales only; pharynx with rods not longer than filaments of cones; postpharingeal processes very long, about as long as cones' filaments	*listeri*

— This dark spot at the base of costa more or less reduced and/or interrupted by scattered pale scales; pharingeal rods longer, some of them, at least, longer than cones' filaments; postpharingeal processes moderately long, shorter than filaments	*azevedoi*
32 — Wing with pale interruption on 3rd main dark area of 1st vein, sometimes fused with preceding pale area	33
— 3rd main dark area with no pale interruption	39
33 — Subapical pale band on palps very narrow, confined to apex of 3rd segments	34
— Subapical pale band on palps broad, overlaping apex of 3rd and base of 4th segments	35
34 — Base of costa with 2 pale interruptions; hind femur usually with one or more pale spots near apex	*brunnipes*
— Basal quarter of costa entirely dark; mid femur with no pale spots near apex	*walravensi* * (in part)
35 — Hind tarsus either all dark or with apical pale bands on segments I and II only	36
— Hind arsus I-IV with well-marked — even if very narrow — apical pale bands	38
36 — Fossae and lateral areas of mesonotum without scales	*harperi*
— Fossae and lateral areas of mesonotum above wing root with scattered or abundant broadish scales	37
37 — Subapical pale band on palps about equal to or slightly narrower than apical band	*njombiensis* *
— Subapical pale band on palps much narrower than apical band	*walravensi* * (in part)
38 — Apical pale bands on hind tarsus I-IV broader equalling about twice the apical width of the segments, at least	*austeni*
— Hind tarsal bands narrower, about equalling or less than width of segment	*marshalli*
39 — Wing with 2 pale spots on upper branch of 5th vein, in addition to the apical one	40
— Wing with 1 pale spot on upper branch of 5th vein in addition to the little apical one	43
40 — Apical and subapical pale bands on palps narrower, intervening dark band much broader than pale bands; small species, wing about 2.5-3.3 mm	*rivulorum* (in part)
— Apical and subapical pale bands on palps broad, so that intervening dark band is either slightly broader, about equal to or narrower than either pale band	41
41 — Apical pale band on hind tarsus IV and sometimes on segments II and III also, extending into base of succeeding segment	*barberellus*
— Bases of hind tarsus V and of other segments dark	42
42 — Apices of hind tarsus III and IV dark or at most with a few pale scales	*rivulorum* (in part)
— Apices of hind tarsus I-III, and sometimes I-IV, distinctly pale-banded	*flavicosta*
43 — Palps with apex pale and no other pale bands	44
— Palps with 3 pale bands	45
44 — Subapical pale spot on costa and 1st vein about equal to or broader than 4th main dark area; pale fringe spots present oposite veins 3, 4b, 5a and 5b	*nili* Congo form
— Subapical pale spot or costa and 1st vein narrower, usually much narrower, than 4th main dark area; no pale fringe spot present oposite vein 5a	*nili*
45 — Joints of hind tarsal segments narrowly or broadly enveloped in pale bands, at least tarsus V pale-ringed basally	*longipalpis*
— Pale banding of hind tarsus narrow and apical only	46
46 — Preacessory dark spot on 1st vein about twice as broad as pale spots on either side of it	*fuscivenosus* (in part)
— Preacessory dark spot absent or, if present, narrower or only slightly boader than adjoining pale spots	47
47 — Moderate-sized species, wing more than 3.3 mm	*demeilloni* (in part)
— Small species, wing 3.3 mm or less	*funestus* group *demeilloni* (in part)

7 — *KEY TO THE FOURTH STAGE LARVAE*

The presente key applies only to larvae in the fourth stage. As for the adults, we followed the key by Gillies & De Meillon (21) though taking into account the morphological peculiarities shown by our series. *A. caliginosus* and *A. fusicivenosus*, known only as adults, were not included. Species are marked with an asterisk when Angolan larvae were not seen by the writers.

It is assumed that the taxonomic category given by the key is the lowest one compatible with the only examination of larval material:

1 — Inner clypeal hairs close together, separated from each other by a distance much less than between inner outer clypeals 2
— Inner clypeals separated from each other by a distance about equal to or greater than between inner and outer clypeals 5

2 — Leaflets of abdominal palmate hairs III-VII simple, without serrations ... ... *implexus*
— Palmate hairs on segments III-VII with well-developed serrations 3

3 — Branching of outer clypeal hairs extending over almost whole length of stem; posterior clypeal hairs long, reaching as far as bases of inner clypeals ... ... *concolor* *
— Outer clypeals simple or branched, branching not extending to basal quarter of stem; posterior clypeals very short, not reaching much more than half-way to bases of inner clypeals 4

4 — Outer clypeal hairs with up to about 30 branches ... ... *obscurus*
— Outer clypeals with 40 or more branches ... ... *coustani* group

5 — Outer clypeal hairs with 8 or more branches 6
— Outer clypeals simple, frayed or with less than 8 branches 8

6 — Palmate hairs on abdominal segments I and II undifferentiated; inner clypeal hairs simple or with delicate fraying ... ... *argenteolobatus* (in part)
— Palmate hairs partly differentiated on segment I and fully so on segment II; inner clypeals with well-marked branching 7

7 — Filaments of abdominal palmate hairs on segments IV-VII shorter, somewhat spiky; pecten teeth usually with larger denticles, easily discernible under lowest powers of microscope ... ... *pharoensis*
— Filaments of abdominal palmate hairs longer, finely drawn out in the distal half; denticles of pecten teeth minute ... ... *squamosus*

8 — Inner clypeal hairs strongly branched in apical half 9
— Inner clypeals simple, frayed or lightly feathered, the fraying if present not mainly confined to apical half 12

9 — One long mesopleural hair feathered; palmate hairs with short blunt-tipped filaments ... ... *rufipes* (in part)
— Both long mesopleural hairs simple or occasionally one split; filaments of abdominal palmate hairs long and drawn out 10

10 — Outer clypeal hairs half or more length of inner clypeals; branches of inner clypeals largely confined to inner aspect ... ... *nili*
— Outer clypeal hairs very short, quarter or less lenght of inner clypeals; branches of inner clypeals arising from both sides of their stem 11

11 — Inner clypeal hairs with most secondary branches arising near apex ... ... *cinctus*
— Inner clypeals with most secondary branches arising about half-way up the stem ... ... *dureni* *

12 — Saddle hair with at least 5 branches... 13
— Saddle hair simple or with 2-4 branches 19

13 — Shoulder hairs mounted on large basal tubercles wich are widely separated, by a distance twice or more the width of the inner tubercles; inner shoulder hairs much flattened .. .. *ardensis* (in part)
— Shoulder hairs on basal tubercles wich are either fused or narrowly separated; inner shoulder hairs not specially flattened 14

14 — The simple, long metapleural hair flattened, stiff and lance-like, about two thirds length of feathered hair	*brunnipes* (in part)
— Metapleural hairs not so	15
15 — 2-3 accessory abdominal plates present on most abdominal segments	16
— Only 1 accessory abdominal plate present	18
16 — All clypeal hairs simple	*longipalpis* (in part)
— At least, outer and posterior clypeals with 2-4 branches	17
17 — Main abdominal plate on segment V two-thirds or less distance between bases of palmate hairs	*austeni* (in part)
— Main abdominal plate three-quarters or more distance between palmate hairs	*schwetzi* (in part)
18 — Main abdominal plate on segment V wider than distance between bases of palmate hairs and occupying one third to half lenght of segment	*flavicosta* (in part)
— Main abdominal plate not so	*marshalli* (in part)
19 — Thorax and adbdomen laterally and ventrally with numerous spicules, not arranged in belts	20
— Sides of abdominal and thorax without spicules	21
20 — Width of main abdominal plate on segment V two-thirds or less the distance between bases of palmate hairs	*distinctus* *wellcomei*
— Width of main abdominal plate on segment V about three quarters or more this distance	*theileri*
21 — Width of main abdominal plate on segment V equal to at laest three-quarters distance between bases of palmate hairs	22
— This plate narrower, usually not more than two-thirds distance between bases of palmate hairs (or hairs 1)	30
22 — Depth of main abdominal plate on segment V equal to about half depth of segment	23
— Main abdominal plate much less than half depth of segment	25
23 — Main abdominal plate on segment V more or less twice as wide as deep, normaly with no completely detached accessory plates	*funestus* subgroup
— Main abdominal plates on segment V 3 or more times as wide as deep, 1-3 accessory plates present on nearly all segments	24
24 — Saddle hair with 3-4 branches; 1 accessory abdominal plate present on most segments	*flavicosta* (in part)
— Saddle hair simple; 2 accessory abdominal plates	*leesoni*
25 — Saddle hair with 2-4 branches	26
— Saddle hair simple	29
26 — Inner clypeal hairs abruptly tapered, distal third fine and filamentous	*tchekedi* *
— Inner clypeals not so	27
27 — With 1 accessory abdominal plate	*barberellus* (in part)
— With 3 accessory abdominal plates on most segments	28
28 — Outer and posterior clypeal hairs very short, with 2-3 branches, not more than quarter length of inner clypeals	*schwetzi* (in part)
— Outer and posterior clypeals at least half length of inner clypeals, simple	*longipalpis* (in part)
29 — Inner shoulder hair greatly flattened, widely separated from median hair; inner clypeal hairs frayed or with fine branches	*natalensis*
— Inner shoulder hair not so, bases of shoulder hairs close together; inner clypeals simple	*rivulorum*
30 — Both long mesopleural hairs simple, occasionally one split into 2-3 branches	31
— 1, at least, of the long mesopleural hairs feathered or with more than 3 branches	42
31 — Inner shoulder hairs poorly developed, basal tubercles very small	*gambiae* complex
— Inner shoulder hairs well developed, arising from well formed basal tubercles	32

32 — Shoulder hairs arising from large widely spaced tubercles, inner hair greatly flattened ... *ardensis* (in part)
— Shoulder hairs not so ... 33

33 — Saddle hair with 2-4 branches ... 34
— Saddle hair simple or bifid ... 40

34 — 3 accessory abdominal plates present on most segments ... 35
— 1 accessory abdominal plate only ... 36

35 — 1st abdominal palmate hair undifferentiated, fully developed hairs with short spiky filaments ... *austeni* (in part)
— 1st abdominal palmate hair well differentiated, fully developed hairs with long filaments ... *longipalpis* (in part)

36 — The simple long metapleural hair flattened, stiff and lance-like, about two-thirds lenght of feathered hair ... *brunnipes* (in part)
— Metapleural hairs not so ... 37

37 — Bases of shoulder hairs fused ... *barberellus* (in part)
— Bases of shoulder hairs separated or, at most, touching ... 38

38 — Antenna with a group of spicules on the basal third of the inner border markedly longer than the rest ... *marshalli* (in part)
— Antena without such a group of spicules ... 39

39 — 1st abdominal palmate hair a branched hair; 2nd palmate narrow an lanceolate ... *njombiensis* *
— 1st abdominal palmate partially developed; 2nd palmate fully differentiated *walravensi* *

40 — Basal spine of mesopleural hairs poorly developed, straight ... *harperi*
— Basal spine of mesopleural hairs large, curved and sharply pointed ... 41

41 — Outer clypeal hairs with 4-7 branches ... *argenteolobatus* (in part)
— Outer clypeal hairs simple or with 2-3 branches ... *cydippis*

42 — 1 long metapleural hair simple, 1 feathered ... 43
— Both long metapleurals feathered ... 45

43 — Inner and median frontal hairs simple or with a few short branches ... *ruarinus*
— All frontal hairs feathered ... 44

44 — Antenna with a group of spicules on the basal third of the innear border markedly longer than the rest ... *rhodesiensis*
— Antenna without such a group of spicules ... *demeilloni*

45 — Without palmate hairs, these being represented on abdominal segment V by small and delicate hairs 1 with 3-8 branches, not longer than 60 mμ ... *azevedoi*
— With palmate hairs ... 46

46 — Fully developed palmate hairs tassel-like, undifferentiated ... *maculipalpis*
— Fully developed palmate hairs fan-shaped, differentiated ... 47

47 — Inner shoulder hairs poorly developed, about half length of median hair and with less than 10 branches ... *listeri*
— Inner shoulder hairs well developed, at least three-quarters length of median hairs and with more, usually much more, than 9 branches ... 48

48 — Inner clypeal hairs simple ... *pretoriensis*
— Inner clypeals minutely or conspicuously frayed ... *rufipes* (in part)

8 — *SYSTEMATIC ACCOUNT*

As in table 1, we follow here the classification adopted by Gillies & De Meillon (22), where the reader can also find all the basic morphological information concerning Angolan Anophelines, with the only exception of the recently described *A. azevedoi* (18).

8.1 — Subgenus *Anopheles* Meigen, 1818

8.1.1 — Series *Myzorrhynchus*

8.1.1.1 — *Anopheles caliginosus* (De Meillon, 1943).

New record for Angola.

MATERIAL EXAMINED: Chissombe River, 24 km NW of Cuangar, 24-IV-1965, 1 ♀; Calai, V-1965, 4 ♀; Quimbango (margins of Luando River), 16-VI-1970, 1 ♀.

DISTRIBUTION: See map 4. As the larvae of this species are unknown, some of the «*coustani* group» records may, in fact, refer to *caliginosus*.

TAXONOMIC NOTES: In Southern Angola, at least, *caliginosus* is sympatric with other members of the *coustani* group, wich agree with the recent elevation of the taxon to the specific rank (20).

BIOECOLOGICAL NOTES: A rather rare species of the Rhodesian Higland Zone (map 3).

Females were taken when biting man outdoors, at dusk, near shallow grassy swamps of overflown river margins.

8.1.1.2 — *Anopheles coustani* Laveran, 1900

Recorded in Angola, for the first time, by Wellman & Fay (8), from Bailundo district (Vila Teixeira da Silva) and later from Nova Lisboa by B. de Mesquita (12) and from Sambo by F. Colaço (28). *A. coustani sensu lato* (larval records) was also recorded from several localities by Gândara (1).

MATERIAL EXAMINED: Cabinda, 18-VIII-1970, 1 ♂; Cainde, V-1969, 1 ♂; Calai 15-IV-1965, 2 ♀; Calulo, VI-1970, 1 ♀; Camuele, 15 km W of Calai, VI-1965, IV-1966 and VI-1967, 1 ♂ plus 11 larvae; Cangandala, II-1970, 1 ♀; Carmona (=Uíge), IX-1969, 1 ♀ 1 ♂; Chipipa, 14-IV-1970, 1 ♂ plus larvae; Chiquite, 27-V-1970, 1 ♀ 1 ♂; Chitado, 21-II-1970, 1 ♀; Chitembo, VI-1970, 1 ♂; Cuando (Barragem do), 19-V-1970, 1 ♀; Cuando, 3-II-1970, 1 ♀; Cubal, IX-1970, 8 ♀ 4 ♂; Dirico, V-1965, 1 ♂; Ebanga, IX-1970, 9 ♀ 7 ♂ plus 14 larvae; Impulo, 18-III-1970, 2 ♀; Luinga, IX-1969, 1 ♂; Mona-Quimbundo, 10-IV-1970, 1 ♂; Mutango, VI-1965, IV/V-1966 and VI-1967, 1 ♂ plus 22 larvae; Nova Lisboa, V-1966 and III/IV-1970, 17 ♀ 13 ♂; Panda, IV-1965 and V-1967, 2 ♀ 1 ♂ plus 7 larvae; Porto Alexandre, V-1969, 1 ♂; Quilengues, 28-V-1971, 1 ♀; Rio Chissombe, 24-IV-1965, 2 ♀; Sousa Lara (=Bocoio), IX-1970, 1 ♀ 2 ♂; Vila Arriaga, V-1969, 3 ♀ plus 23 larvae, all new locality records, with the exception of Nova Lisboa.

Twenty-eight other localities are assigned to *coustani* group, as no adults were reared from our larvae: Barra do Cuanza, Cabuta, Cachingues, Caculama, Capunda, Cariango, Carlaongo, Cossa, Cuangar, Cuito River (15 km W of Dirico), Dirico, Dundo, Lagoa Banda, Lucala, Moçâmedes, M'Pupa, Mumbué, Mangura, Novo Redondo (44 km W of), Quimbango, Quissol, Rio Chissombe, Rio Gango, Rio Lombe, Salazar (=Dala Tando), Sanza Pombo (near Cuilo), Silva Porto and Tune.

DISTRIBUTION: Both *coustani s. str.* and *coustani* group records are plotted in map 4.

BIOECOLOGICAL NOTES: A quite common and widespread mosquito in Angola, though it is absent from the South West Arid Zone (see map 3).

Adults are mainly exophilic and bite readily both man and cattle. Examinations of salivary glands for malaria parasites in Angola were always negative (see table 2).

Larvae were found to breed in low numbers among vegetation in grassy edges of slow-flowing streams and drains and in the swampy margins of overflown rivers. The *pH* of the breeding-water, mesured in four larval biotopes, was 5.4-6.

Plate I, fig. 1, shows a typical breeding-place of *A. coustani sensu stricto.*

8.1.1.3 — *Anopheles paludis* Theobald, 1900

C. Mendes (9) recorded *A. paludis* for the first time in Angola from Luanda. The other known records for *paludis* are due to B. de Mes-

TABLE 2

Malarian infection in Angolan anophelines

Species	Locality	Number dissected	Sporozoite rate	Author
funestus	Silva Porto (Bié District)	?	13%	Wellman & Fay, 1907
	Calai (Cuando-Cubango Distr.)	205	2.44%	Ribeiro 1966/67 (unpublished)
	Cubal (Benguela Distr.)	55	0	Ribeiro et al., 1970 (unpubl.)
	Cubal » »	91	3.3%	Ribeiro et al., 1971 (unpubl.)
austenii	Silva Porto (Bié District)	?	1%	Wellman & Fay, 1907
melas	Lobito (Benguela District)	1.007	0	Ribeiro et al., 1964
ziemanni	Lobito (Benguela District)	525	0	Ribeiro et al., 1964
	Calai (C.-Cubango District)	321	0	Ribeiro, 1965/66 (unpubl.)
gambiae	Calai (C.-Cubango District)	822	0.73%	Ribeiro, 1965/67 (unpubl.)
	Cubal (Benguela District)	90	6.67%	Ribeiro et al., 1970 (unpubl.)
	Cubal » »	100	8%	Ribeiro et al., 1971 (unpubl.)
	Moçâmedes	116	0	Ribeiro, 1969 (unpubl.)
pharoensis	Calai (C.-Cubango District)	65	0	Ribeiro, 1967 (unpubl.)
azevedoi	Mucuio (Moçâmedes District)	109	0	Ribeiro, 1969 (to be publ.)

quita (13): Maiombe (=Buco Zau), Santo António do Zaire, Maquela do Zombo, Bailundo and Alto Zambeze (Cazombo area).

No specimens of *paludis* were caught by the writers.

It seems probable that, in Angola, *A. paludis* be a relatively rare mosquito occurring in the zoogeographically West African Zones (maps 3 and 4).

8.1.1.4 — *Anopheles tenebrosus* Dönitz, 1902

Recorded by Gândara (1) from Mulondo, Cuchi and Nova Lisboa.

MATERIAL EXAMINED: Calai, 3-V-1965, 2 ♀; Dirico, IV-1965, 1 ♀; Ebanga, IX-1970, 1 ♂; Quimbango, 16-VI-1970, 1 pupa, all new locality records. Also Nova Lisboa, 2-IV-1970, 1 ♀ plus larvae.

DISTRIBUTION: See map 5.

TAXONOMIC NOTES: As for *caliginosus* sympatry of *tenebrosus* with *coustani s. str.* agree with the treatment of *tenebrosus* as a valid species.

Our pupa from Quimbango agree with the description of *tenebrosus,* though the pupa of *caliginosus* — also recorded from there — is unknown.

BIOECOLOGICAL NOTES: A relatively rare mosquito of the Rhodesian Highland Zone (map 3).

Adults were caught biting man outdoors between 18 h and 18 h 30 m.

Larvae were found in unshaded open pools and shallow earth-holes («cacimbas») with muddy bottom in clayey soils. The *pH* of one of the breeding-water was, in one instance, 6.2.

8.1.1.5 — *Anopheles ziemanni* Grünberg, 1902.

Recorded in Angola for the first time by Gândara (1) from Bom Jesus, Capelongo, Caconda, Cazengo, Lobito, Mulondo and Vila Gago Coutinho.

MATERIAL EXAMINED: Ambrizete 5-VIII-1970, 1 ♀; Cabinda, 22-VIII-1970, 2 ♂ and larvae;

7 km N of Cacuaco, IX-1967, 3 ♀; Calai, V-1965, IV-1966 and 5-VI-1967, 77 ♀ 4 ♂ plus many larvae; Camuele, 5-VI-1965 and 26-VI-1966, 7 ♀ 1 ♂ plus larvae; Carmona (=Uíge), IX-1969, 2 ♀ 1 ♂ and larvae; Cuangar, 12/14-IV-1965 and V-1965, 7 ♀; Cuango, 1/4-I-1970, 1 ♀; Dando, 15-VI-1970, 1 ♀; Dirico, IV-1965, 10 ♀; Ebanga, 18-IX-1970, 2 ♂ and larvae; Guilherme Capelo (=Lândana), 26-VIII-1970, 2 ♀; Lagoa Banda, V-1967, 1 ♀; Lifune, 22-IV-1970, 1 ♂ and larvae; Malanje, 29-I-1970, 1 ♀; Moçâmedes, VIII-1970, 5 ♀ 8 ♂ and larvae; Mumbondo, 8-V-1970, 2 ♀; Mutango, 25-IV-1966, 4 ♀ 1 ♂; Muxima, IV-1970, 24 ♀ plus larvae; Nangura, VI-1965 and IV/V-1966, 44 ♀ 1 ♂; Nova Lisboa, 25-IV-1970, 1 ♂ plus larvae; Panda, IV/V-1965, 15 ♀ plus larvae; Quimbango, 15 and 17-VI-1970, 4 ♀ plus larvae; Rio Lombe, 31-I-1970, 3 ♀; Xandel, 29 and 31-I-1970, 3 ♀. All these are new locality records. Also Lobito, all stages (32), and see table 2.

DISTRIBUTION: See map 5.

TAXONOMIC NOTES: Undoubtly a valid species as *ziemanni* group is sympatric with all the other members of the *coustani* group in Angola, without intergradation.

BIOECOLOGICAL NOTES: A quite common and generalized species in Angola, with the exception of SW Arid Zone (map 3).

Females were often taken biting man outdoors between 19 and 21 hours, though dissections for malaria parasites were always negative (see table 2). *A. ziemanni* was also seen to feed readily on cattle.

Larvae from wich both females and males were reared were found breeding in shallow grassy pools of somewhat turbid water with a salt-content up to 4,15 g/l, as it was the case of Moçâmedes (see plate I, fig. 2).

8.1.1.6 — *Anopheles obscurus* Grünberg, 1905

The only known record of *obscurus* in Angola was that of B. de Mesquita (12), from Bailundo.

MATERIAL EXAMINED: Mumbondo, 10-V-1970 1 ♂ plus larvae; Salazar (=Dala Tando), VIII-1969, 2 ♀ plus larvae; Tando Zinze (Cabinda), 1 ♀ plus larvae, all new locality records.

BIOECOLOGICAL NOTES: Not a much common species of the West African Zoogeographical Zones in Angola.

No adults were caught indoors or biting man, our adult specimens being reared from larvae.

Larvae bred in small shaded pools with decaying leaves, along the margins of forest *(Laurisilva)* streams (see plate II, fig. 1, and plate VI, fig. 1).

8.1.2 — Series *Anopheles*

8.1.2.1 — *Anopheles concolor* Edwards, 1938

New record for Angola.

MATERIAL EXAMINED: Henrique de Carvalho, 10-IV-1970, 1 ♀; Mona-Quimbundo, 10-IV-1970, 1 ♀.

DISTRIBUTION AND BIOECOLOGICAL NOTES: It seems that *concolor* is a rather rare mosquito of the West African biomes, our only two records concerning the Southern Congo Savana Zone (see maps 5 and 3).

One of the females were caught early night resting in a tent of our camp and the other was reared from larvae breeding in a slow-flowing irrigation drain.

8.1.3 — Series *Christya*

8.1.3.1 — *Anopheles implexus* (Theobald, 1903)

A. implexus was recorded for the first time in Angola by Barros Machado (17), from the Dundo-Portugália area.

MATERIAL EXAMINED: Cabuta, 11-IV-1970, 1 larva; Gungo, 23-XI-1969, 2 larvae; Salazar (=Dala Tando), 25-VIII-1969, 2 ♀ plus larvae, all new locality records.

DISTRIBUTION AND BIOECOLOGICAL NOTES: As most of the members of this «primitive» subgenus, *implexus* is closely associated with the West African forested biomes to wich refer all the known records from Angola (see maps 5 and 3).

The only two examined females were reared from pupae.

Larvae bred in small pools with decaying vegetable along forest *(Laurisilva)* streams, as larval *obscurus*. Neverthless, larvae were also found in unshaded pools, in areas in wich the forest was cleared (plate II, fig. 2).

8.2 — Subgenus *Cellia* Theobald, 1902

8.2.1 — Series *Neomyzomyia*

8.2.1.1 — *Anopheles ardensis* Theobald, 1905

Recorded by Gândara (1) from Caconda (1 larva).

MATERIAL EXAMINED: Ebanga, 17-IX-1970, 1 larva. New locality record.

DISTRIBUTION AND BIOECOLOGICAL NOTES: A rare highland species also in Angola, the only two known records being from the Mountain Zone (maps 6 and 3).

The only larva examined bred in the grassy margins of a slow-flowing stream (Halangalô River), which water had a *pH* of 5.4.

Plate III, fig. 1, shows the breeding place of *A. ardensis*.

8.2.1.2 — *Anopheles cinctus* Newstead & Carter, 1910

New record for Angola.

MATERIAL EXAMINED: Buco-Zau (about 20 km of), 20-VIII-1970, 1 ♂ reared from larvae plus 4 larvae.

DISTRIBUTION AND BIOECOLOGICAL NOTES: A species of the Guinean Forest Zone (see map 6 and 3).

Larvae from which our male was reared bred among the aquatic vegetation in the margins of the slow-flowing Inhuca River (plate III, fig. 2).

8.2.1.3 — *Anopheles dureni* Edwards, 1938

Recorded from Angola by B. Machado (17) in Chitato area (North-eastern Angola).

No specimens were caught by the writers. It seems to be a specie of the Southern Congo Savana Zone (map 3).

8.2.1.4 — *Anopheles natalensis* Hill & Haydon, 1907

Previously recorded by Gândara (1), from Caconda.

MATERIAL EXAMINED: Carmona (=Uíge), 25-IX-1969, 1 larva; Cuando (Barragem do), 26-V-1970, 1 larva; Ebo, 5-XI-1969, 1 larva; Luinga, 1-X-1969, 1 ♀ and larvae; Nova Lisboa, 27-V-1966, 1 larva; Quimbango, 19-VI-1970, 1 larva.

All new locality records.

DISTRIBUTION: See map 6.

TAXONOMIC NOTES: As it can be seen in the keys, the available Angolan series can be easily identified.

Neverthless, it seems probable that its known marked morphological variations together with the «complexity» of its zoogeographical distribution (see below) are pointing to the need of a taxonomic revision of all the available series.

BIOECOLOGICAL NOTES: In the whole range of its distribution in Africa, *A. natalensis* is a somewhat difficult species from the zoogeographical view-point. However, in Angola, it seems to be mainly a mosquito of the West African Subregion (map 3), as it is the rule in the series *Neomyzomyia*.

No adults were seen indoors nor biting. Larvae always bred in scarce numbers among emergent and flooting vegetation at the margins of slowflowing rivers with a varibaly developed galery forest. The *pH* of the breeding-water ranged from 5 to 7.

Plate IV, fig. 1, shows a breeding-place of *A. natalensis*.

8.2.1.5 — *Anopheles nili* Theobald, 1904

New record for Angola.

Wellman & Fay (8) recorded *A. umbrosus* Theo. 1903 — an Oriental species — from Bié, by mistake, and Gândara (1), probably by confusion with *A. umbrosus* Edw. 1911 — a sinonim of *A. nili* Theo. — atributed erroneously the record of *A. nili* to Wellman & Fay. This is the reason why, we think — and it is a quite valid one — Gillies & De Meillon did not included *nili* (nor *umbrosus*) in the Angolan list of species (22).

MATERIAL EXAMINED: Dando, banks of Cuanza River, 15-VI-1970, 1 ♀; Nangura (=Maiuvo), 6-V-1966, 1 larva.

TAXONOMIC NOTES: See below, under *A. nili* Congo form.

DISTRIBUTION AND BIOECOLOGICAL NOTES: According to its known distribution within the Ethiopian Region (22), *A. nili s. str.* seems to belong to the East and South African Subregion. Its association with the savanna biomes of Eastern and Southern Africa agree with the ecology of both localities now recorded for *A. nili s. str.* in Angola (see maps 6 and 3).

Our female was caught biting man at dusk (18 h 30 m), outdoors in the «miombo» wooded savanna, near Cuanza River. The larva bred in the shallow grassy margins of the Cuanza River, associated with *coustani* and *distinctus* larvae. The breeding-water had a *pH* 5.1.

8.2.1.6 — *Anopheles nili* Congo form

New record for Angola.

MATERIAL EXAMINED: Lucala, 27-VIII-1969, 1 larva; Novo Redondo, XI-1969, 1 ♀ 1 ♂ plus 5 larvae.

TAXONOMIC NOTES: Both our adults agree with the pale Congo form and are quite distinct of our *nili s. str.* female from Dando (see above). Unfortunately, no pupal pelts are available to us. As to the larvae, outer clypeals are about ½ to ⅗ inner in *nili* Congo form and somewhat longer (⅔ of inner) in Nangura larva *(nili s. s.)* and posterior clypeals are ½ to ⅗ outer in *nili* Congo form and minute, only ⅙ outer, in Nangura specimen *(A. nili s. str.)*.

BIOECOLOGICAL NOTES: According to the known distribution of *A. nili* Congo form within the Ethiopian Region, it seems that this pale-winged form belongs to the West African Subregion, which agree with our Angolan records (see maps 6 and 3).

Larvae were found in the margins of slow-flowing rivers (Lucala and N'Gunza), among emergent and floating vegetation.

8.2.1.7 — *Anopheles rhodesiensis rhodesiensis* Theobald, 1901

A. rhodesiensis sensu lato was recorded for the first time in Angola by Gândara (1), from Nova Lisboa.

MATERIAL EXAMINED: Brutuei, IV/V-1969, 8 larvae; Cabuta, VI-1970, 2 larvae; Cainde, IV-1969, 3 larvae; Caraculo, IV-1969, 1 ♀ 3 ♂ plus many larvae; Chão da Chela and Alto da Chela, VI-1969, 1 ♂ plus larvae; Chiquite 29-V-1970, 2 ♀ plus larvae; Cubal, IX-1970, 1 ♀ plus larvae; Duque de Bragança, 15-II-1969, 1 larva; Ebanga, 17/18-IX-1970, 2 ♀ plus 10 larvae; Ebo, 11-XI-1969, 6 larvae; Equimina, 31-V-1970, 2 ♀ plus larvae; Gungo, 23-XI-1969, 1 ♂ plus larvae; Iona, V-1969, 1 ♂ plus larvae; Iona, 40 m E of, 1 larva; Novo Redondo, 25-XI-1969, 1 larva; Rio Cunene, 60 km S of Espinheira, V-1969, 6 larvae; Rio Lucala, 24-VIII-1969, 2 larvae; Sousa Lara (=Bocoio), IX-1970, 1 ♀ plus 6 larvae; Tchivinguiro, IV-1969, 1 larva; Vila Arriaga, IV-1969, 1 ♀ plus larvae.

All are new locality records, those where only larvae were available referring to *rhodesiensis s. l.*

DISTRIBUTION: In map 6 are shown the localities from which *rhodesiensis* is now known, all of them atributed to the nominal subspecies (see below).

TAXONOMIC NOTES: Angolan adults agree with the nominate subspecies and, on the other hand, *rhodesiensis rupicolus* has its geographical distribution restricted to Northern Africa. It seems, so, that all Angolan records must be treated as *r. rhodesiensis*.

BIOECOLOGICAL NOTES: A widespread taxon in the Ethiopian region, though rare in the Guinean Forest biome. In Angola, it seems to be mainly associated with the Escarpement Zone, though quite tolerant to the semiarid SW Arid Zone (map 3).

A zoophilic mosquito, never caught indoors nor biting man standing near its breeding-places.

Larvae were found in rock-pools, sandy pools in river beds, rocky margins of streams, shallow earth holes and in a cement tank. Breeding-places were variably shaded, usually scarcely so, and the clean or slightly turbid breeding-water had a *pH*, measured in two instances, of 5.8 and 6.2.

Plate IV, fig. 2, plate V, fig. 1, plate XII, fig. 2, show three breeding-places of A. *rhodesiensis*.

8.2.1.8 — *Anopheles ruarinus* Edwards, 1940

Recorded for the first time in Angola by Gândara (1) from Mulondo.

MATERIAL EXAMINED: Gungo, 24-XI-1969, 3 ♀ 1 ♂ plus many larvae; Oncócua, 27-II-1970, 4 larvae, both new locality records.

DISTRIBUTION AND BIOECOLOGICAL NOTES: See map 6. Gungo is the northernmost locality for the species only recorded from Southern Africa, bordering the Kalahari basin.

Adults were never caught indoors nor biting and it is quite probably a zoophilic mosquito.

Larvae breed in large numbers in the shallow and unshaded rock-pools of the «inselbergen», clearly integrating the specialized ecosystem of the «inselberg». The *pH* of the breeding-water, measured in two breeding-places, was 5.8.

Plate V, fig. 2, shows a typical larval biotope of *ruarinus*.

8.2.2 — Series *Myzomyia*

8.2.2.1 — *Anopheles funestus* Giles, 1900

A. funestus was recorded for the first time in Angola by Wellman (6) from Bié (=Silva Porto) and Bailundo (=Vila Teixeira da Silva). Since then it was recorded by Gamble (29), 1914, from S. Salvador do Congo and Kimpese, by B. de Mesquita (12) from Cabinda, Santo António do Zaire, Dembos (= Quibaxe), Quissama, Libolo (= Calulo), Gabela and Cazombo area, by Gândara (1) from Bela Vista, Bom Jesus, Cachimo, Lobito, Nova Lisboa, Portugália, Cazengo and Cuchi and by B. Machado (17) from Dundo area.

MATERIAL EXAMINED: Cabuta, 12-VI-1970, 1 larva; Cacuaco, 10 km N of, XI-1967, 3 ♀; Calai, IV/V-1965, XII-1965, VI-1966 and VI-1967, 106 ♀ 16 ♂ plus many larvae; Camuele 5-VI-1965, 1 ♀; Carmona (=Uíge), IX-1969, ♂ plus 3 larvae; Cuangar, 25-V-1965, 1 ♂ plus 1 larva; Cuango, 1/4-I-1970, 9 ♀; Cubal, IX-1970, 20 ♀ plus larvae; Dundo, 19-VIII-1969, 10 larvae; Ebanga, IX-1970, 2 ♂ plus 4 larvae; Funda (Lagoa Banda), 28-XI-1967, 8 ♀ 3 ♂ plus larvae; Impulo, III-1970, 1 ♀; Lucala, 27-VIII-1969, 1 ♀ plus 6 larvae; Luinga, IX-1969, 1 larva; M'Pupa, 9-V-1966, 4 ♀; Mucusso, V-1965, 1 ♀; Nangura, 11-VI-1965, 2 ♀; Nova Lisboa, V-1970, 2 ♀ 1 ♂; Quimbango, VI-1970, 1 ♀ plus many larvae; Quissol, I-1970, 1 larva; Rio Lucala (Cassoalala), 7-XI-1967, 1 ♀; Salazar (= Dala Tando), VIII-1969, 1 ♀; Sousa Lara (= Bocoio), IX-1970, 5 larvae; Tchivinguiro, V-1969, 1 larva. Apart Dundo and Nova Lisboa all are new locality records. See also table 2.

DISTRIBUTION: See map 7.

TAXONOMIC NOTES: *A. funestus sensu stricto* was the only member of the *funestus* subgroup (see Gillies & De Meillon, *op. cit.*, p. 128) we identified when both larvae and adults were available from the same locality.

BIOECOLOGICAL NOTES: As in the whole Etiopian Region a widespread Anopheline, though absent from the SW Arid Zone (map 3). A well-known antropophilic and endophilic mosquito with major medical importance. Table 2 shows sporozoite rates found in *funestus* during dissections of salivary glands. It is to be noted that in the same place (Cubal) no parasited *funestus* were found in the dry season (September) and, in the rainy season (January) sporozoites were found in 3.3 % of the specimens.

Larvae bred in swampy margins of overflown rivers and among aquatic vegetation and vegetable debris in the rocky margins of streams.

Plate VI, fig. 1, shows a typical breeding-place of *funestus*.

8.2.2.2 — *Anopheles fuscivenosus* Leeson, 1930

Only recorded by Gândara (1), from Nova Lisboa. No adults were examined by the writers atributable to these species. It seems to be a quite rare Anopheline of the Rhodesian Highland Zone (maps 7 and 3).

8.2.2.3 — *Anopheles leesoni* Evans, 1931

New record for Angola.

MATERIAL EXAMINED: Only one larva from 12 km SW of Salazar (= Dala Tando), 28-VIII-1969 (map 7).

DISTRIBUTION AND BIOECOLOGICAL NOTES: It seems to be a rare and probably zoophilic mosquito in Angola.

The only larva we caught bred in the somewhat turbit water of a rock-pool in the margin of a forest *(Laurisilva)* stream (see plate VI, fig. 2).

8.2.2.4 — *Anopheles rivulorum* Leeson, 1935

New record for Angola.

MATERIAL EXAMINED: Carlaongo, 31-X-1969, 6 larvae; Mumbondo, 8-V-1970, 2 larvae (map 7).

DISTRIBUTION AND BIOECOLOGICAL NOTES: Also a widespread though a relatively rare mosquito of African savannas with the exception of the SW Arid biome.

In Angola, it seems to be also a zoophilic species. Larvae were found among filamentous algae in slow-flowing water (see plate VII, fig. 1), in the baobab *Hiemilignosa*.

8.2.2.5 — *Anopheles austeni* Theobald, 1905

A. austeni was described from specimens caught by Wellman in Bié (10). In 1907 it was recorded again from Bailundo (=Vila Teixeira da Silva) (7).

MATERIAL EXAMINED: Cangandala, 12-II-1970, 1 ♀; Ceilunga, 10-IX-1969, 4 larvae; Nova Lisboa, 30-XI-1969, 2 ♀ all new locality records.

TAXONOMIC NOTES: Adults are easily identified. Larvae vary significantly in the width of the main abdominal plate (see larval key).

DISTRIBUTION AND BIOECOLOGICAL NOTES: A relatively rare Anopheline of the Rhodesian Highland Zone (maps 8 and 3).

Our females were caught biting man indoors from 19 h to 20 h. It seems that *austeni* plays an appreciable role in malaria epidemiology in Angola, as Wellman & Fay (8) found a sporozoite rate of 1.1 % in specimens from Bié (Silva Porto).

Larvae were caught in the clean water of a shallow shaded earth-well with aquatic vegetation, at the edge of the *Humidiherbosa* in a «ochana» (see plate VII, fig. 2).

8.2.2.6 — *Anopheles harperi* Evans, 1936

The only previously known record was Caconda (Gândara, *op. cit.*).

MATERIAL EXAMINED: Nova Lisboa, V and IX-1966, 6 ♀ 3 ♂ plus 5 larvae; Tchivinguiro, V-1969, 1 ♂ plus 3 larvae, both new locality records.

TAXONOMIC NOTES: In all our eight larvae the median plate of the scoop has well-developed arms, Angolan larvae being, so, easily separable from the Kenyan type series (Gillies & De Meillon, *op. cit.*, p. 56 and plate 57-*c*). It seems probable, therefore, that Angolan *harperi* might be treated as a different subspecies.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. harperi* is a species of the Mountain Zone biome (maps 8 and 3), all three localities from which it is known in Angola lying at about 1,700 m in altitude. Though localized, it seems that *harperi* is not a much rare mosquito.

Our females were caught either biting man outdoors at dusk (18 h) or resting in cow-houses and poultry-yards. It seems, therefore, that *harperi*, though an exophagous mosquito, exhibits an appreciable degree of antropophily and may play a part in malaria epidemiology in high altitudes.

Larvae were found among vegetation in the edges of irrigation cannals, streams and drains, often associated with *A. cydippis* and *coustani* group larvae. The *pH* of the breeding-water varied from 4.5 to 6.4.

Plate VIII, fig. 1, shows a larval biotope of *A. harperi*.

8.2.2.7 — *Anopheles marshalli* Theobald, 1903

The first Angolan record was due to Theobald (10), from Bié (Wellman coll.). In 1914, recorded by Gamble (29) from S. Salvador do Congo. Portugália and Cachimo were new locality records added by Gândara (1).

MATERIAL EXAMINED: Carmona (=Uíge), 27-IX-1969, 1 larva; Ceilunga, 10-IX-1969, 2 larvae; Chicala, 17-VI-1970, 1 larva; Cossa, 21-VIII-1969, 2 larvae; Cuando (Barragem do), 26-V-1970, 1 larva; Ebanga, IX-1970, 3 larvae; Nova Lisboa, 8-V-1970, 1 ♂ plus larvae; Quimbango, 15-VI-1970, 1 larva; Sá da Bandeira, 20 km of, 6-VI-1969, 1 larva; Sousa Lara (=Bocoio), 9-IX-1970, 3 ♀ plus 1 larva. All the above localities are now recorded for the first time for *marshalli*.

DISTRIBUTION: See map 8.

TAXONOMIC NOTES: All the available adults have narrow scales on mesonotum and, in the wing, a pale interruption on the third dark area of first vein. In our 3 females from Sousa Lara the pale apical spots on the hind tarsi are confined to the apex of preceeding segments, while in our male from Nova Lisboa these spots noticeably overlap the joints into bases of succeeding

segments, as it seems to be the case in West African *marshalli*.

Some of our larvae have saddle hairs with only four branches (see larval key).

BIOECOLOGICAL NOTES: According to its known distribution in Angola, it would seem that we are dealing with both the West African form of uncertain *status* and the East-South African typical form of *marshalli* (see maps 8 and 3). Unfortunately, though the study of the Angolan populations of *marshalli* is liable to be of great taxonomic interest, our material is mainly in the larval stage (but see above).

As *marshalli* was never caught indoors nor biting man, it seems to be a zoophilic mosquito, also in Angola.

Larvae were always found in shaded breeding-places (including forest galery), among vegetation in the margins of slow-flowing rivers, streams and drains, in the little pools separated from the main current and in earth-wells in water lines. *A. marshalli* often occurs in the same larval biotope as *A. austeni* (sse plate VII, fig. 2).

8.2.2.8 — *Anopheles njombiensis* Peters, 1955

The only known record of *njombiensis* from Angola is that of Gândara (1) from Nova Lisboa.

No Angolan material was caught by the writers.

A rare zoophilic species of the Rhodesian Highland District of Chapin (19) (Rhodesian Highland Zone, map 3).

8.2.2.9 — *Anopheles distinctus* Newstead & Carter, 1911

New record for Angola.

MATERIAL EXAMINED: Calai, IV/V-1965, 10 ♀ plus many larvae; Cuito River, 15 km NW of Dirico, 8-V-1965, 4 larvae; Dando, 15-VI-1970, 10 ♀; Dirico, 5/8-V-1966, 6 larvae; Lomba, IV-1965, 1 ♀ (Dr. Fontes e Sousa coll.); M'Pupa, 9-V-1966, 3 ♀ plus 3 larvae; Nangura, IV/VI-1966, 22 ♀ plus many larvae; Panda, 21-V-1967, 2 ♀ plus 1 larva; Rio Chissombe, 24-IV-1965, 5 ♀; Santa Cruz do Cuando, 2-XI-1963, 2 ♀; Vila Gago Coutinho, no date, 1 ♀ (Dr. A. F. Gândara coll.).

DISTRIBUTION: see map 9.

TAXONOMIC NOTES: Though many of our specimens have three pale bands on palps, the width of the outer bands is a good character for distinction between *distinctus* and the sympatric *wellcomei ugandae*. Larvae are indistinguishable, the above cited records from Dirico and Ueca being only tentative.

BIOECOLOGICAL NOTES: A species of the Rhodesian Highland Zone (map 3) occurring from 900 m to 1,800 m (Gillies & De Meillon, *op. cit.*).

Females were often caught biting man outdoors (plate VIII, fig. 2). Larvae breed among vegetation at the shallow margins of rivers and their backwaters, often associated with *A. squamosus* and *A. coustani s. l.*

Plate XIV, fig. 2, shows a breeding-place where *A. distinctus* was associated with *A. squamosus*.

8.2.2.10 — *Anopheles theileri* Edwards, 1912

New record for Angola.

MATERIAL EXAMINED: Calai, 12-VI-1967, 1 ♀ plus larvae; Rio Chissombe, 24-IV-1965, 1 ♀ and 21-IV-1965, 2 larvae.

TAXONOMIC NOTES: Adults are easily identifield, though, according to our experience, the distinction of *theileri* larvae from that of *distinctus/wellcomei* is a delicate one.

DISTRIBUTION AND BIOECOLOGICAL NOTES: As the other species of the *wellcomei* section, *theileri* is a Rhodesian Highland species (maps 9 and 3).

One of our two females was caught landing on man in the early afternoon.

Larvae bred in association with *squamosus* in the grassy flooded margins of slow-flowing Chissombe and Cubango Rivers. The breeding-water in one of the larval biotopes had a *pH* 5.1.

8.2.2.11 — *Anopheles wellcomei ugandae* Evans, 1934

A. wellcomei sensu lato was recorded in Angola by Wellman (6, 7), and Wellman & Fay (8) from Bié (= Silva Porto) and Bailundo (= Vila Teixeira da Silva). Later, these records were atributed by De Meillon (16) and Gillies & De Meillon (22) to subsp. *ugandae*.

MATERIAL EXAMINED: Cuito Cuanavale, XI-1963, 2 ♀; Dando, 15-VI-1970, 1 ♀; Quimbango, 16-VI-1970, 1 ♀ and 19-VI-1970, 4 larvae; Luando River, near Quimbango, 16-VI-1970, 3 ♀; Vila Gago Coutinho, no date, 6 ♀ (Dr. A. F. Gândara coll.). Also 3 larvae from Cangandala (12-II-1970) and 4 larvae from Muquixe (30-VI-1970) seem to be attributable to this subspecies on purely zoogeographical grounds.

TAXONOMIC NOTES: All our specimens have brown proboscis, without pale scales. A few scattered pale scales may be present on palps.

DISTRIBUTION AND BIOECOLOGICAL NOTES: A species of the Rhodesian Highland Zone (maps 9 and 3).

All our females were caught biting man at dusk.

Larvae were found in the grassy edges of a open pool in the «miombo» woodland.

8.2.2.12 — *Anopheles yellcomei wellcomei* Theobald, 1904

New record for Angola.

MATERIAL EXAMINED: Muxima, 29/30-IV-1970, 24 ♀. Two larvae from Cariango (18-X-1969) are also tentatively attributed to the nominate subspecies.

TAXONOMIC NOTES: All our females exhibit marked flavescence both of the palps and distal half of proboscis.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. w. wellcomei* is a widespread mosquito of the African savanna. In Angola, it seems probable that *w. wellcomei* will be found throughout the savannas of the West African zoogeographical portion of the territory while the allopatric *w. ugandae* is an Oriental form (see maps 9 and 3).

Our females were caught either resting indoors or biting man both indoors and outdoors, at dusk and early night, near Cuanza River (plate IX, fig. 1).

8.2.2.13 — *Anopheles demeilloni* Evans, 1933

New record for Angola.

MATERIAL EXAMINED: Cabuta, 12-VI-1970, 3 larvae; Chão da Chela and Alto da Chela, V/VI-1969, 1 ♀ 4 ♂ many larvae; Chiquite, V-1970, 6 larvae; Cossa, VIII-1969, 20 larvae; Cuando (Barragem do), 18-V-1970, 4 larvae; Ebanga, 17/21-IX-1970, 5 ♀ 2♂ plus many larvae; Salazar (Dala Tando), VII-1969, 3 larvae; Sanza Pombo, 24-IX-1969, 2 larvae; Sousa Lara (= Bocoio), IX-1970, 3 larvae; Tchivinguiro, VI-1969, 5 larvae; Vila Nova do Seles, 19-XI-1969, 7 larvae.

DISTRIBUTION: See map 9.

TAXONOMIC NOTES: Our larvae have almost constantly simple saddle hairs, though in a few of them this hair is bifid. Also as in Tanzania specimens, Angolan larvae may show some lateral branching of the posterior clypeals.

BIOECOLOGICAL NOTES: The finding of *demeilloni* in the Humid Mountain Zone and the Escarpment Zone agree with its known distribution through highland areas of West and East Africa.

Adults were never caught indoors nor biting man, which agree with the generally accepted zoophily of this species.

Larvae bred among vegetation at the edges of streams and drains the breeding-water having a *pH* 5.4-6.

Plate IX, fig. 2, shows a breeding-place of *demeilloni*.

8.2.2.14 — *Anopheles barberellus* Evans, 1932

The only known record of *barberellus* in Angola is due to Gândara (1), from Vila Gago Coutinho.

A. barberellus is a species of the Guinean Forest biome and it seems quite probable that it will be also found as a rare mosquito of this biome in Angola. Vila Gago Coutinho, however, seems to be clearly outside its expected distribution area (see also Gillies & De Meillon, *op. cit.*, p. 281).

No specimens of *barberellus* were caught by the writers.

8.2.2.15 — *Anopheles brunnipes* Theobald, 1910

A. brunnipes was described by Theobald (5) from Bié (= Silva Porto) (Wellman coll.).

MATERIAL EXAMINED: Ceilunga, 10-IX-1969, 4 larvae; Chicala, 17-VI-1970, 2 larvae; both new locality records.

DISTRIBUTION AND BIOECOLOGICAL NOTES: A widespread though scarce species occurring in both West and East African savannas. In Angola, *brunnipes* is undoubtly a scarce and rather local mosquito in occurrence (map 7).

Adults were never seen biting man placed near its breeding-places, nor were never caught indoors. Neverthless, *brunnipes* has been found infected with malaria parasites and it may, possibly, play a minor part in the transmission of malaria in certain localized areas. Larvae bred among *Humidiherbosa* vegetation in the margins of slow-flowing rivers and drains, associated with *cydippis* and *coustani s. str.*

Plate I, fig. 1, and plate X, fig. 1, show breeding-places of *A. brunnipes*.

8.2.2.16 — *Anopheles flavicosta* Edwards, 1911

New record for Angola.

MATERIAL EXAMINED: Capunda, VI-1970, 2 pupae; Quimbango, VI-1970, 6 larvae.

TAXONOMIC NOTES: Both Angola larvae and pupae seem to be quite typical. Larval saddle hair is 3-5 branched.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. flavicosta* is a species of the Northern Savanna of Moreau (Sudanese Province of Chapin). Its presence in Malagasy, on the other hand, shows that in the past the distribution area of *flavicosta* included also the Southern Savanna of Moreau (map 2).

The finding of an isolated population of *flavicosta* in the upper basin of the Cuanza River (map 7) reinforces this view and points to the somewhat peculiar ecological characteristics of that area.

Larvae and pupae were found in the grassy edges of a shallow earth-well and among emergent vegetation in the flooded margins of a slow-flowing stream. *A. funestus* and *A. tenebrosus* were found in the same larval biotopes.

8.2.2.17 — *Anopheles longipalpis* Theobald, 1903

New record for Angola.

MATERIAL EXAMINED: Cabuta, 11-VI-1970, 1 larva; Carlaongo, 5-XI-1969, 1 larva; Chão da Chela, 27-V-1969, 2 larvae; Chiquite, 29-V-1970, 2 larvae; Ebanga, IX-1970, 6 larvae; Salazar (= Dala Tando) 12 km SW of, 28-VIII-1969, 1 larva; Sousa Lara (=Bocoio), IX-1970, 1 larva.

TAXONOMIC NOTES: Angolan larvae seem to be easily identifiable though the width of the main abdominal plate is somewhat variable and saddle hair may have 5 branches.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. longipalpis* is a Southern Savanna species of Southern Africa. In Angola, as far as we know, it would seem that *longipalpis* is mainly associated with the savanna belt with baobab of the SW Arid Zone extending along the base of the Angolan Escarpment (see maps 7 and 3).

It seems to be a zoophilic mosquito, as no adults were taken indoors nor biting man.

Larvae bred among aquatic vegetation in the margins of streams.

Plate X, fig. 2, shows a breeding-place of *A. longipalpis*.

8.2.2.18 — *Anopheles schwetzi* Evans, 1934

New record for Angola.

MATERIAL EXAMINED: Cuelei, no date, 2 ♀ (Dr. A. F. Gândara coll.); Nova Lisboa, 30-XI-1967, 4 ♀ plus 2 larvae, 27-V-1966; Vila Gago Coutinho, no date, 10 ♀ (Dr. A. F. Gândara coll).

TAXONOMIC NOTES: Angolan females were never seen with a sector pale spot on costa, the only available larvae both have saddle hairs 4-branched on one side and 5-branched on the other side (see larval key).

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. schwetzi* is clearly a species of the Rhodesian Highland Zone (see maps 7 and 3).

Adult *schwetzi* was caught either resting (fed females) in human habitation or (also fed females) in cow-houses and poultry-yards, in the early morning (6 h-6 h 30 m).

Larvae were found in the shallow unshadded margins of a stream, associated with *A. natalensis*. The clear breeding-water had a *pH* 5.

8.2.2.19 — *Anopheles tchekedi* De Meillon & Leeson, 1940

The only known record of *tchekedi* in Angola is due to Gândara (1), from Cuito-Cuanavale.

A localized zoophilic species described from Botswana. No *tchekedi* specimens were seen by the writers.

8.2.2.20 — *Anopheles walravensi* Edwards, 1930

As for the preceeding species *walravensi* was only recorded in Angola by Gândara (1), from Vila Gago Coutinho.

A. walravensi is clearly a species of the Rhodesian Highland District of Chapin and it probably occurs in this biome in the Eastern Angola.

No *walravensi* specimens were caught by the writers.

8.2.3 — Series *Pyretophorus*

8.2.3.1 — *Anopheles gambiae* Giles, 1902

So far as we know, the first published record of *A. gambiae* in Angola is that of Wellman & Fay (8), from Bailundo (=Vila Teixeira da Silva). Recorded by Gamble (29), in 1914, from S. Salvador do Congo. In 1942, F. Colaço (28) adds Sambo as a new locality for *gambiae* and later Gândara (1) records this species from Capelongo, Lobito, Luanda, Nova Lisboa, Mulondo and Caconda. Lastly, in 1960, *gambiae,* is recorded from the Chitato area, in North eastern Angola, by B. Machado (17).

As for the above mentioned records, all the material cited below refers to the three freshwater species as a whole.

MATERIAL EXAMINED: Ambrizete, VIII-1970, 7 ♀ 6 ♂; Barra do Cuanza, XI-1967, 2 ♀; Barra do Dande, 2 ♀ 1 ♂, plus 2 larvae; Cabinda, 8 and 26-VIII-1970, 1 ♀ 2 ♂; Cainde, V-1969, 6 larvae; Cacuaco, 22-V-1967 and 7-IX-1967, 17 ♀ 32 ♂, plus larvae; 15 km N of Cacuaco, road to Caxito, XI-1967, 3 ♀ 2 ♂, plus larvae; Calai, 25-V-1965, 1 ♂, 4-VI-1965 1 ♂ plus larvae; 15-XI-1965, 1 ♀, VI/V-1966, 8 ♀ plus larvae and V/VI-1967, 8 ♀ 4 ♂; Camuele, 15 km W of Calai, 4-VI-1965, 2 ♀, 3 and 9-XII-1965, 2 ♀ plus 2 larvae and IV/V-1966, 6 ♀ plus 3 larvae; Cangandala, 12-II-1970, 1 ♀; Capunda, I-1970, 2 larvae; Caraculo, 24-IV-1969 and 14-V-1969, 22 ♀ 21 ♂, plus many larvae; Carmona (=Uíge), 26-IX-1969, 1 ♀ plus larvae; Chiquite, 27-V-1970, 1 ♀; Chitado, 21-II-1970, 2 ♀ plus 1 larva; Cuando (Barragem do), 19-V-1970, 1 larva; Cuangar, 10/27-IV-1965, 4-V-1965 and IV/V-1966, 12 ♀ 2 ♂, plus many larvae; Cuango, 1/I-1970, 1 ♀; Cubal, 16-IX-1970, 1 ♀; Cui, 7/11-III-1970, 8 ♀ plus 7 larvae; Ebo, 17-XI-1969, 2 larvae; Equimina, 31-V-1970, 1 ♀ plus 4 larvae; Impulo, 22 and 13-III-1970, 2 ♀ plus 15 larvae, and 29-V-1971, 1 ♀; Lagoa Banda, 8-VI-1967, 1 larva; Lagoa do Carvalhão, 9-V-1969, 1 larva; Lândana, 26-VIII-1970, 16 ♀; Lucira, 30-IV-1969, 9 larvae; Luso, 18-IV-1970, 3 larvae; Malanje, 21-I-1970, 2 ♀ plus 6 larvae; Mazozo, 10-IV-1970, 1 larva; Moçâmedes, X-1967, 24-IV-1969 and 1-V-1969, 33 ♀ 1 ♂ plus 7 larvae; 18 km E of Moçâmedes, 26-V-1969, 3 ♀ 2 ♂ plus 1 larva; Morro dos Veados, 29-IV-1970, 2 ♀; M'Pupa, IV/V-1966, 1 ♀; Mutango, IV/V-1966, 7 ♀ 6 ♂ plus many larvae; Muxima, 27-IV-1970, 1 ♀; Munhino, V-1969, 1 ♀ 4 ♂, plus 12 larvae; 25 km W of Munhino, 14-V-1969, 1 ♀ 1 ♂ plus 1 larva; Nangura, IV/V-1966, 10 ♀ and V/VI-1967, 1 ♀; Naulila, 6-III-1970, 4 larvae; Oncócua, 27-II-1970, 3 ♀ 1 ♂ plus 12 larvae; Pereira d'Eça, 18-II-1970, 1 ♀ 2 ♂ plus many larvae; Quela, 16 km W of, 29-I-1970, 2 larvae; Quilengues, 27/28-V-1971, 2 ♀; Rio Bero (N of Virei), 8, 12 and 26-V-1969, 29 ♀ 2 ♂ plus 11 larvae; Rio Giraul, 24-VI-1969, 10 ♀ 5 ♂ plus 2 larvae; Rio Cunene, V-1969, 1 ♂ plus 1 larva; Salazar (=Dala Tando), 12 km SW of, VIII-1969, 1 larva; Salinas, 5-XI-1969, 8 ♀ 3 ♂ plus 7 larvae; Santa Clara (=Otchicango), II-1970, 1 larva; S. Nicolau, 28-IV-1969, 5 larvae; Sousa Lara (=Bocoio), 10-IX-1970, 15 ♀ 16 ♂; Vila Arriaga, V-1969, 4 ♂ plus 1 larva; Virei, 7-V-1969, 2 ♀, all new locality records. Also Nova Lisboa, 21-V-1970 and 8-V-1970, 10 ♀ 11 ♂.

DISTRIBUTION: See map 10.

BIOECOLOGICAL NOTES: A widespread and common mosquito in Angola, though less so in Guinean Forest and rare and even absent in the driest parts of the SW Arid biome (see maps 10 and 3).

A. gambiae s. l. is a highly antropophilic and endophilic Anopheline, the most important malaria vector, in Angola as in the rest of the Ethiopian Region (see under 9 and tables 2 and 3). It is to be noted however, that these characteristics seem to be less marked in species B than in A, and that species C is an exophilic and zoophilic mosquito (22, 30, 31).

Adults of freshwater *gambiae,* in Angola (species A and, quite probably, also B), were almost exclusively seen resting or biting man

indoors. Neverthless, *gambiae* females were also caught on human baits outdoors, as in Moçâmedes and in the Calai area, though here, *pharoensis, ziemanni, squamosus, distinctus* and *caliginosus* were much more commonly caught under such conditions. No *gambiae* specimens were ever seen by the writers on animals, though in one instance, in Sousa Lara, a few unfed specimens rested in a cow-house.

The breeding-places of the freshwater *gambiae* are usually quite characteristic: shallow open pools often without any vegetation, and with muddy botton.

Plate XI, fig. 1, shows one of these so commonly found *gambiae* larval biotopes in Angola.

Neverthless, other «atypical» breeding-places were recorded by the writers, such as a little cement tank with water for poultry.

8.2.3.2— Species A (*gambiae* complex)

New record for Angola, from 15 km N of Cacuaco (map 10), due to Dr. G. Davidson, Ross Institute, London (Davidson, 1-I-1968, *in litt.*).

Species A is the main malaria vector within the *gambiae* complex (22, 30, 31). It seems possible that species A will prove to be more common in the West African biomes in Angola, while species B — the other important vector — is expected to be more associated with the Rhodesian Highland and SW Arid Zones (map 3).

8.2.3.3 — *Anopheles melas* Theobald, 1903

A. melas, the West African salt-water member of the *gambiae* complex, was recorded for the first time in Angola by Gândara (1), from Lobito. Later, this was in a way confirmed by Ribeiro *et al.* (32) by the finding of larvae breeding in water with a salinity as high as 40 g/l *(Cl Na)*. In fact, as it is shown in plate XI, fig. 2, it seems that there is a clear discriminating zone of salinity between the breeding-places of freshwater *A. gambiae* and *A. melas*.

Crossing experiments, however, are in course in the Ross Institute at London with material sent from Lobito and, if the identification is confirmed, it would be the southernmost locality for *melas* (Davidson, 23-IX-1970, *in litt.*).

Other new localities for *melas* (map 10) are 13 km N of Cacuaco and Barra do Cuanza (Davidson, *in litt.*).

A. melas is a poor malaria vector — usually occurring with the potent vector species A — though it bites man readily both indoors and outdoors (see also under 9 and tables 2 and 3).

8.2.4 — Series *Paramyzomyia*

8.2.4.1 — *Anopheles azevedoi* Ribeiro, 1969

A. azevedoi was described by one of us (18) from Moçâmedes.

MATERIAL EXAMINED: Benguela, 31-V-1970, 16 ♀ 9 ♂, plus 3 larvae; Cherugema (Rio Curoca), IX-1972, 6 larvae, Prof. F. J. C. Cambournac coll.; Moçâmedes, 18/27-X-1967, 119 ♀ 81 ♂, plus many larvae; and 23-IV-1969 to 30-V-1969, 148 ♀ 150 ♂, plus many larvae; Mucuio, 27/30-V-1969, 24 ♀ 16 ♂, plus many larvae; Novo Redondo, 5-XII-1969, 1 ♀ and 24-XI-1969, 4 larvae; Porto Alexandre, 9/24-V-1969, 37 ♀ 32 ♂, plus many larvae; Saco do Giraul, 9-V-1969, 2 ♀ 2 ♂, plus 1 larva; S. Nicolau, 28-IV-1969 to 12-V-1969, 11 ♀ 6 ♂ plus 7 larvae; Rocha do Magalhães, 9-V-1969, 3 ♀ 1 ♂, plus 4 larvae.

TAXONOMIC NOTES: *A. azevedoi* exhibits a marked morphological uniformity through all its range. In the wing, the inner prehumeral dark spot is usually reduced and often completely absent. Larvae are quite distinctive.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. azevedoi* is a coastal halophilic species of the SW Arid Zone (maps 11 and 3). It seems probable, however, that this species extends southwards along the coast of SW Africa. From 11° S lat. northwards, the larval salt-water niche is occupied by *A. melas*.

Females bite man readily outdoors at sunset and early night and even by day, though attempts to feed *azevedoi* on arm in captivity were unsuccessfull. Both fed and unfed females were also caught in houses.

Though *azevedoi* exhibits an appreciable antropophily, dissections for malaria parasites were negative (table 2), and it probably plays only a minor part in the transmission of the disease.

Larvae bred in sea-water pools subjected to tidal influence, water holes along the coast and salt-pans. The salt-content of the breeding-water is always high and it may be as high as 130 g/l,

TABLE 3

Malaria vectores in Angola (*a*)

MAIN BIOTIC ZONES			MAIN VECTORS	SECUNDARY VECTORS
	GUINEAN FOREST		gambiae	paludis
	ESCARPMENT		gambiae funestus	coustani ziemanni rufipes pretoriensis
	SOWTHERN CONGO SAVANNA		gambiae funestus *nili Congo form	coustani paludis ziemanni w.wellcomei
	HUMID MONTANE		gambiae funestus *austeni	pharoensis coustani ziemanni *brunnipes squamosus
	RHODESIAN HIGHLAND		gambiae funestus *nili s.s.	coustani ziemanni w.ugandae pharoensis squamosus distinctus
	SOWTHWEST ARID	NORTHERN STRIP	gambiae	*melas ziemanni pharoensis squamosus
		SOUTHERN AREA	gambiae	squamosus *azevedoi listeri pharoensis

(*a*) Anophelines marked with an asterisk are localized forms.

or even more, which seems to be one of the highest known chloride-content, at least for Ethiopian saltwater-breeding Anophelines.

Plate XII, fig. 1, shows a characteristic breeding-place of *azevedoi,* the salt-content of the breeding-water being 36 g/l *(Cl Na),* slightly more than 100 % sea-wter.

Further information on the biology of *A. azevedoi* may be found in Ribeiro, 1974 (33).

8.2.4.2 — *Anopheles listeri* De Meillon, 1931

A. listeri was recorded for the first time in Angola by Gândara (1), from Lobito.

MATERIAL EXAMINED: Cainde, 13-V-1969, 1 ♂, plus 4 larvae; Capolopopo, 25 km S of Virei, 11/12-V-1969, 15 ♀ 6 ♂; Caraculo, 16-V-1969, 19 ♀ 19 ♂ plus 66 larvae; Chiquite, 27-V-1970, 1 ♀; Equimina, 22-V-1970, 1 ♂, plus 3 larvae; Foz do Cunene, 23-V-1969, 7 ♀ e 8 ♂, plus 106 larvae; Iona, V-1969, 1 ♀ 1 ♂ plus many larvae; 40 km E of Iona, in the road to Oncócua, 21-V-1969, 23 ♀ 22 ♂ plus 69 larvae; Lagoa do Carvalhão, 13-V-1969, 2 ♂ plus 3 larvae; Lucira, IV/V-1969, 2 ♂ plus 42 larvae; Moçâmedes, 18/26-X-1967, 7 ♀ 6 ♂ plus 15 larvae and IV/V-1969, 103 ♀ 87 ♂ plus many larvae; Munhino, V-1969, 1 larva; Novo Redondo, 24-XI-1969, 1 larva; Pico Azevedo, 6/9-V-1965, 3 ♀ 1 ♂ plus 36 larvae; Ponte do Curoca, V/VI-1969, 3 ♂ plus 52 larvae; Porto Alexandre, V-1969, 4 ♀ 13 ♂ plus many larvae; Rio Bero, 17 km N of Virei, 9/12-V-1969, 11 ♀ 6 ♂ plus 57 larvae; Rio Cunene, 60 km S of Espinheira, V-1969, 11 larvae; Rio Curoca, 70 km N of Espinheira, 18-V-1969, 5 ♀ 7 ♂ plus 28 larvae; Rio Giraul, 26-V-1969, 8 ♀ 4 ♂ plus 9 larvae; São Nicolau, 30-IV-1969, 1 ♀ 1 ♂; Tchivinguiro, V-1969, 1 larva; Virei, 10/12-V-1969, 8 ♀ 5 ♂. All these are new locality records. Also Lobito, all stages (32).

TAXONOMIC NOTES: Adults of *A. listeri* are very easily confused with *A. azevedoi* on the only grounds of the external morphology (see key). Larvae (and pupae) on the contrary, are readily distinguished (see larval key).

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. listeri* is the most abundant Anopheline, at least, in the driest areas of the SW Arid Zone and it was not seen outside this biome. As it is shown in map 11, the range of *listeri* within the SW Arid Zone will not probably include the area East of Cunene River, though it extends northwards, through the semi-arid coastal belt, as far as Novo Redondo. It seems, however, quite probable that *listeri* will not be found at latitudes lower than 11° S.

A. listeri was never seen biting man, even in areas where it is a fairly common mosquito, as in the Moçâmedes District. A few fed and gravid females, however, were caught indoors, at Pico Azevedo, near prolific breeding-places (rock-pools). See also Ribeiro, 1964 (32).

Larvae breed in rock-pools, open shallow pools in river beds, shallow margins of pounds and cement water-tanks, in unshadded, or scarcely so, places. Larval *listeri* shows a high tolerance to the salt-content of the breeding-water, our figures varying from 0.1 to 53.8 g/l *(Cl Na),* in 59 samples examined (33).

A. gambiae and *A. pretoriensis* were the other Anophelines more commonly found in the same larval biotopes with *listeri,* though, in the breeding-places with higher salinity, *A. azevedoi* was often the associated species (33).

Plate XII, fig. 2, shows a breeding-place of *A. listeri.*

8.2.5 — Series *Neocellia*

8.2.5.1 — *Anopheles maculipalpis* Giles, 1902

A. maculipalpis was recorded for the first time in Angola by Wellman & Fay (8), from Bailundo (=Vila Teixeira da Silva). Later, F. Colaço (28), added Sambo as a new locality record for *maculipalpis* and Gândara (1) recorded this species from Nova Lisboa.

MATERIAL EXAMINED: Ambrizete, 2-VIII-1970, 1 ♀; Capunda, VI-1970, 2 larvae; Chicala, 17-VI-1970, 1 larva; Chitembo, 18-VI-1970, 1 ♂; Cuango, 5-II-1970, 1 ♀; Cubal, 12-IX-1970, 1 ♀ 1 ♂ plus 9 larvae; Mumbué, 19-VI-1970, 4 larvae; Nova Lisboa, 8/14-IV-1970, 5 ♀ 3 ♂ plus 10 larvae; Sousa Lara (=Bocoio), 8/9-IX-1970, 5 ♀ 1 ♂ plus 6 larvae; Tchinvinguiro, 1-V-1969, 1 ♀ plus 3 larvae. All these are new locality records with the exception of Nova Lisboa.

DISTRIBUTION AND BIOECOLOGICAL NOTES: As the other two *Neocellia* members, *maculipalpis* is a widespread species occurring both in West as

East-South African savannas. This seems to be also the case in Angola (maps 11 and 3).

It seems to be a zoophilic mosquito, as no females were taken indoors nor biting man, though a few were caught in outdoor shelters at sunset.

Larvae were found in small rock-pools in little temporary streams and among aquatic vegetation in the margins of slow-flowing rivers and little drains with muddy botton and iron precipitates which adhere to larval cuticle and hairs.

Plate XIII, fig. 1, shows a breeding-place of *A. maculipalpis*.

8.2.5.2 — *Anopheles pretoriensis* Theobald, 1903

The only known record of *pretoriensis* in Angola was that of B. de Mesquita (13), from Sanza Pombo.

MATERIAL EXAMINED: Cainde, IV/V-1969, 11 ♀ 9 ♂ plus 51 larvae; 16 km NNE of Cainde, in the road to Chibia, 46 larvae; Calulo, VI-1970, 1 larva; Camucuio, 29-V-1971, 7 ♀; Chão da Chela, V-1969, 1 larva; Chitado, II-1970, 2 ♀ 5 ♂ plus 1 larva; Cubal, IX-1970, 4 ♀ 1 ♂ plus 10 larvae; Impulo, 24-III-1970, 5 larvae and 29-V-1971, 3 ♂ 1 ♀; Iona, V-1969, 1 ♀ 1 ♂ plus 37 larvae; Lucira, IV-1969, 1 larva; Munhino, IV/V-1969, 6 ♀ 7 ♂ plus many larvae; 25 km W of Munhino, V-1969, 4 larvae; Oncócua, about 40 km W of, V-1969, 4 ♀ 7 ♂ plus 14 larvae; Quilengues, 28-V-1971, 4 ♀ 2 ♂; Rio Bero, 17 km N of Virei, IV-1969, 3 ♀ 5 ♂ plus 31 larvae; Rio Cunene, 60 km S of Espinheira, V-1969, 1 ♀ plus 1 larva; Rio Giraul, VI-1969, 1 ♂ plus 1 larva; Sousa Lara (= Bocoio) 10-IX-1970, 1 ♀; Virei, V-1969, 1 larva; about 20 km W of Virei, in the road to Cainde, V-1969, 1 larva. All these are new locality records for *pretoriensis*.

TAXONOMIC NOTES: The identification of *pretoriensis* in Angola offers no difficulties, both in the adult and larval stages (see keys).

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. pretoriensis* is a widespread African savanna species. In Angola, however, it seems to be mainly associated with the South West Arid biome (maps 11 and 3).

As in the other areas of its range, in Angola, *pretoriensis* is also a zoophilic mosquito never caught indoors nor biting man.

Larvae were usually found in pools left by receeding rivers with sandy beds (including elephant foot-prints) rock-pools, drains and edges of small streams, often with filamentous green algae. *A. listeri* larvae were quite often associated with *pretoriensis* and so were *rufipes*, *rhodesiensis* and, at times, *gambiae*.

Plate XII, fig. 2, shows a breeding-place of *pretoriensis*.

8.2.5.3 — *Anopheles rufipes rufipes* Gough, 1910

A. rufipes sensu lato was recorded for the first time in Angola by Gamble (29) from Vatem (São Salvador do Congo), in 1914. Recorded by Gândara (1), from Vila Mariano Machado, Capelongo, Caconda and Cuchi. Gândara's material almost certainly also belonged to the subspecies *r. rufipes* now recorded.

MATERIAL EXAMINED: Cainde, 12-V-1969, 1 ♀ 1 ♂ plus 12 larvae; Caraculo, 14-V-1969, 6 larvae; Carlaongo, 31-X-1969, 2 larvae; Chão da Chela, 29-V-1969, 1 larva; Chiquite, 28-V-1970, 2 larvae; Cubal, 14/15-IX-1970, 4 ♀ 2 ♂ plus 4 larvae; Ebanga, IX-1970, 1 ♀ plus 2 larvae; Lucala, 27-VIII-1969, 1 larva; Sá da Bandeira, about 20 km W of, 6-VI-1969, 1 ♀; 30 km SW of Salazar (=Dada Tando), bed of Dange-ia-Menha River, 28-VIII-1969, 1 larva; Sousa Lara (=Bocoio), 8/12-IX-1970, 6 ♀ plus 22 larvae; Tchivinguiro, 29-VI-1969, 27 larvae; Vila Arriaga, V-1969, 1 larva. All these are new locality records for the species. Adult records reffers surely — and larval records almost certainly — to the nominate subspecies.

TAXONOMIC NOTES: Identification of adults offers no difficulties. In the larvae, however, there is marked variation of the inner clypeal hairs (see larval key).

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. rufipes rufipes* is a widespread subspecies of African savannas, while *A. rufipes broussesi* is restricted to the western portion of the Northern Savanna of Moreau. Its zoogeographical affinities are difficult to understand, though in Angola it seems to be mainly associated with the SW Arid biome (maps 11 and 3).

Adults were never caught indoor nor biting man, which agree with the general zoophily of *r. rufipes* through its range. Larvae were usually found in open pools in the beds of temporary

rivers, often in association with *listeri* and *pretoriensis,* and in rock-pools.

Plate XIII, fig. 2, shows a breeding-place of *A. rufipes.*

8.2.6 — Series *Cellia*

8.2.6.1 — *Anopheles argenteolobatus* Gough, 1910

The first record of *A. argenteolobatus* in Angola is due to De Meillon (16). In 1956, A. F. Gândara *(op. cit.)* recorded *argenteolobatus* from Bailundo (=Vila Teixeira da Silva), Mavinga and Cuchi. Gillies & De Meillon (22) also plotted this species in the Luso area (Gillies & De Meillon, *op. cit.,* fig. 63), this record being, possibly, that of De Meillon.

MATERIAL EXAMINED: Calai, 6/12-IV-1966, 9 ♀ plus 15 larvae; Camuele, 15 km W of Calai, IV-1966, 3 larvae; Carmona (= Uíge), about 15 km S of, in the road to Quitexe, 27-IX-1969, 2 larvae; Ceilunga, 11-IX-1970, 1 larva; Chitembo, 18-VI-1970, 5 larvae; Dando, 15-VI-1970, 1 ♀; Dirico, IV-1966, 1 larva; M'Pupa, IV-1966, 6 larvae; Mumbué, 19-VI-1970, 2 larvae; Mutango, 25-IV-1970, 3 ♀; Nangura, 18-IV-1966, 1 ♀, 26-IV-1966, 1 ♀ and 10-V-1966, 1 ♀; Nova Lisboa, IV/V-1970, 2 ♀ plus 5 larvae; Silva Porto, 16-VI-1970, 1 larva. All these are new locality records for *argenteolobatus.*

TAXONOMIC NOTES: Adults are easily identified. Larval outer clypeal hairs, however, vary in our series from 5 to 10 branches (see larval key). Both log mesopleural hairs are constantly simple in our series.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. argenteolobatus* is a highland species of Central and South Africa. In Angola, it occurs through the Rhodesian Highland Zone (maps 12 and 3), at altitudes ranging from 950 m to 1,700 m (see gazetteer of localities).

A few of our females were caught biting man outdoors at dusk and it seems that *argenteolobatus* in Angola, though being a scarce Anopheline, exhibits an appreciable degree of antrophphily.

Larvae were found among vegetation at the edges of ground pools, along irrigation drains and of margins of slow-flowing rivers.

Plate XIV, fig. 1, shows a breeding-place of *A. argenteolobatus.*

8.2.6.2 — *Anopheles cydippis* De Meillon, 1931

New record for Angola.

MATERIAL EXAMINED: Cachingues, VI-1970, 2 larvae; Cariango, 14-X-1969, 1 larvae; Carmona (=Uíge), 15 km of, in the road to Quitexe, IX-1969, 2 larvae; Ceilunga, 10-IX-1969, 1 ♀ plus 2 larvae; Chicala, VI-1970, 4 larvae; Chitembo, VI-1970, 5 ♀ 4 ♂ plus 5 larvae; Cuando (Barragem do) 19-V-1970, 3 larvae; Cubal, 15-IX-1970, 1 ♀ 1 ♂ plus 4 larvae; Luinga, IX-1969, 2 larvae; Nova Lisboa, IV/V-1970, 2 ♀ 1 ♂ plus 32 larvae and IX-1969, 4 ♂ plus 3 larvae; Quimbango, 16-VI-1970, 1 ♀ 1 ♂ plus 7 larvae.

TAXONOMIC NOTES: Adults are indistinguishable from *squamosus* and some of the records referring to *squamosus s. l.* may be in fact *cydippis* (see under 8. 2. 6. 4). The above records are based on the examination of the larvae, adults being identified as *cydippis* when emerged from larval breeding-places of this species.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. cydippis* is also a highland species of Central and Southern Africa. In Angola, also as *argenteolobatus,* it is a species of the Rhodesian Highland Zone and occurs within the same range of altitudes (950 m-1,700 m), though apparently absent from the Southernmost Angola (maps 12 and 3).

Adults were never seen biting man near its breeding-places, and it seems that *cydippis* is a zoophilic species.

Larvae bred among *Humidiherbosa* grass in pools and drains in «ochanas».

Plate X, fig. 1, shows a larval biotope of *A. cydippis* breeding in association with *A. brunnipes.*

8.2.6.3 — *Anopheles pharoensis* Theobald, 1901

A. pharoensis was recorded for the first time in Angola by Giles (4), in 1904, among material caught by Y. Massey at Benguela. The following year, recorded by Wellman (6), from Bié (=Silva Porto) and Bailundo (=Vila Teixeira da Silva). B. de Mesquita (12, 13) added Cacongo, Maiombe (=Buco-Zau) and Cabinda as new localities for *pharoensis,* and Gandara (1) recorded also this species from Luanda and Lobito.

MATERIAL EXAMINED: Calai, IV/V and VI-1965, 82 ♀ 4 ♂ plus 38 larvae; Camuele, 15 km W of Calai, VI-1965, 4 ♀ plus 44 larvae and IV/V-1966, 1 ♂ plus 4 larvae; Cariango, 18-X-1969, 1 larva; Cuangar, 22-IV-1965, 1 ♀, and 25-V-1965, 5 ♀; Cuito River, 15 km W of Dirico, 8-V-1965, 1 larva; Dirico, IV-1965, 3 ♀, and 5/9-VI-1965, 1 ♀ plus 4 larvae; Lomba, IV-1965, 1 ♀ (Dr. Fontes e Sousa coll.); 19 km N of Luanda, in the road to Caxito, 24-V-1967, 2 ♀; Mazozo, 13-IV-1970, 1 ♂ plus 1 larva; Mutango, 12/14-VI-1965, 1 ♀ plus 15 larvae and IV/V-1966, 2 ♀ 2 ♂ plus 62 larvae; Muxima, 29-IV-1970, 2 ♀; Nangura, VI-1965, IV/V-1966 and 12-VI-1967, 52 ♀ plus 45 larvae; Panda, 13-IV-1965, 1 larva, and 21-V-1967, 4 larvae.

All these are new locality records for *pharoensis*.

DISTRIBUTION AND BIOECOLOGICAL NOTES: *A. pharoensis* is a widespread and common species in Africa, with the exception of the canopy forest and deserts and subdeserts. In Angola it seems to be rare in the West African areas and absent from the driest areas of the SW Arid Zone (maps 12 and 3).

Adults were often caught indoors and biting man or calf outdoors. Though *pharoensis* may undoubtly play a part in the maintenance of malaria, it seems to be of minor importance. All the 65 females we investigated for malaria parasites in Calai were negative (see also under 9 and tables 2 and 3).

Larvae were found among aquatic vegetation at the edges of pounds and shallow margins of slow-flowing rivers.

8.2.6.4 — *Anopheles squamosus* Theobald, 1901

A. squamosus was recorded for the first time in Angola by Wellman (6), from Bié (= Silva Porto) and Bailundo (= Vila Teixeira da Silva). Later, F. Colaço (28) recorded *squamosus* from Sambo and A. F. Gândara (1) added Capelongo, Cuangar, Lomba, Longa, Luanda, Luiana, Barragem do Cuando, Luso and Mulondo to the list of localities for this species in Angola.

MATERIAL EXAMINED: Cainde, 9 km NW of, in the road to Chibia, 12-V-1969, 1 ♀ plus 6 larvae; Calai, VI-1965, 29 larvae, XI-1965, 6 larvae, IV-V-1966, 30 ♀ 5 ♂, V/VI-1967, 67 ♀ 31 ♂ plus many larvae; Calulo, VI-1970, 1 ♀; Camuele, 9-VI-1965, 5 ♀ and 6-XII-1965, 5 larvae, V/VI-1966, 2 ♂ plus 44 larvae, and 11-VI-1967, 16 larvae; Cangandala, II-1970, 1 larva; 24 km E of Cangandala, II-1970, 1 larva; Capunda, VI-1970, 2 larvae; Cariango, 19-X-1969, 1 ♂ plus 1 larva; Cuango, 1-I-1970, 1 ♀; Cubal, 14-IX-1970, 10 ♀ 5 ♂ plus 17 larvae; Cuito River, 15 km W of Dirico, 8-V-1965, 3 larvae; Dirico, 5/8-V-1965, 36 larvae; Ebanga, 18/21-IX-1970, 4 ♀ 3 ♂ plus larvae; Litu, 22-X-1963, 1 ♀; Malanje, II-1970, 4 larvae; Mazozo, 10-IV-1970, 2 larvae; Moçâmedes, V-1969, 1 larva; M'Pupa, 27-V-1965, 16 larvae; Mutango, IV/V-1966, 18 ♀ plus 62 larvae; Muxima, 30-IV-1970, 1 ♀; Nangura, VI and XII-1965, IV-V-1966 and V/VI-1967, 30 ♀ plus 42 larvae; Naulila, 6-III-1970, 8 ♀; Nova Lisboa, 16-VIII-1965, XI/XII-1966, 28-I-1969 and V and IX-1970, 20 ♀ 9 ♂ plus 4 larvae; Panda, 20-IV-1965, V-1966 and V-1967, 29 larvae; Quimbango, VI-1970, 10 larvae; Rio Chissombe, 21-IV-1965, 4 larvae; Santa Clara (= Otchicango), 18-II-1970, 1 larva; Sousa Lara (= Bocoio), 8-IX-1970, 1 ♀ 1 ♂ plus 2 larvae; Tchinvinguiro, 29-V-1969, 1 ♂ plus 11 larvae; Ueca, 6-V-1966, 6 larvae; Virei (Lagoa dos Paralelos), 10-V-1969, 1 ♂ plus 11 larvae, all new locality records. Also Cuangar, 22-IV-1965, 25-V-1965, 4-V-1966, and 21-V-1967, 4 ♀ 1 ♂ plus 7 larvae.

TAXONOMIC NOTES: Adults are indistinguishable from *cydippis*. Larvae are liable to be confused with *pharoensis*. Neverthless, though it is desirable to obtain both adult and larval material from each breeding-place, the characters given in the key will separate, at least, the great majority of the Angolan larval series.

DISTRIBUTION: In map 12, localities from which only adults are available are recorded as *A. squamosus s. l.* and some of them may refer, in fact, to *A. cydippis*.

BIOECOLOGICAL NOTES: *A. squamosus* is also a widespread and abundant mosquito in Africa. In Angola, it seems that *squamosus* is relatively rare in the West African zoogeographical portion of the territory and practically absent from the driest parts of the SW Arid Zone (maps 12 and 3).

Females were very often caught biting man outdoors early night, as well biting calf. It is to be noted, however, that only a low proportion of females attacked members of our team when capturing females landing on bovids. As it was the case for *pharoensis* and generally speaking,

squamosus clearly plays, if so, a minor part in the transmission of human malaria.

Larvae bred often in association with *distinctus* and *coustani* group larvae (plate XIV, fig. 2).

9 — *RELATION TO DISEASE*

The major importance of Anophelines, in Angola as in the rest of Africa, still stems in the transmission of malaria.

The widespread-though not omnipresent-highly antropophilic and long-lived *gambiae* (species A and B) and *funestus (sensu stricto)* are, of course and generally speaking, the key species in the epidemiology of malaria in Angola. Neverthless, even in the case of these most potent vectors, the percentage of parasitized specimens varies greatly from one to another ecologically different areas and, even in the same place, from one season to another (see table 2). That is to say that if the vector capacity of an Anopheline is fundamentally dependent on physiological characteristics of that species, it is also the result of the interaction of many other factors concerning the ecosystem to which the vector population belongs.

Plate XV, fig. 1, shows infected salivary glands of *A. gambiae* from Calai, many of the specimens being caught in the house of plate XV, fig. 2. Many *A. funestus* with sporozoites in salivary glands were also caught in the houses of plate XVI, fig. 1, in Cubal.

In Angola, besides *gambiae* and *funestus,* it is admitted that both forms of *A. nili* and *A. austeni* — as it is indicated in table 3 — may play an important role in the epidemiology of malaria in certain areas and, at least under certain conditions.

The importance of the secondary vectors, also generally speaking, seems to be negligible in the presence of the highly antropophilic and endophilic species. Neverthless, as it is judiciously stated by Gillies & De Meillon (22), in spite of the control measures directed against the main vectors, a low-level-transmission may still be exclusively maintained by those species now treated as «secondary» vectors.

Plate XVI, fig. 2, and plate XVII, fig. 1, show feeding and resting-places of *A. squamosus, A. constani* and *A. pharoensis* at Camuele (Calai area).

In connection with our theme, we must also refer to animal malaria. Besides the occurrence in Angola of *A. dureni,* the vector of the interesting Rodent malaria parasites *P. berghei* and *P. vinckei,* it is to be remembered the possibility of transmission of Primate malaria to man by mainly zoophilic or/and indifferent Anophelines. Though the epidemiological significance of such a sylvan malaria is negligible at present, it seems quite probable that its importance will be greater in the future.

A. funestus and *A. gambiae* are also the main vectors of bancroftial filariasis in Africa, though we never saw microfilariae during the dissections of these species in Angola. The only filarian infection we found was that of a lot of cattle-fed *A. ziemanni* from Calai, where a few specimens showed very active microfilariae of animal (bovine ?) origin in thoracic muscles.

Among the arthropod borne viruses, O'nyongnyong, Nyando, Tataguine, Sindbis and Bwamba — these two at least, being active in Angola (34) — are already known to be transmitted to man by Anophelines (35), though it seems that the importance of the Arbor-virus diseases in Africa has not yet been fully recognized.

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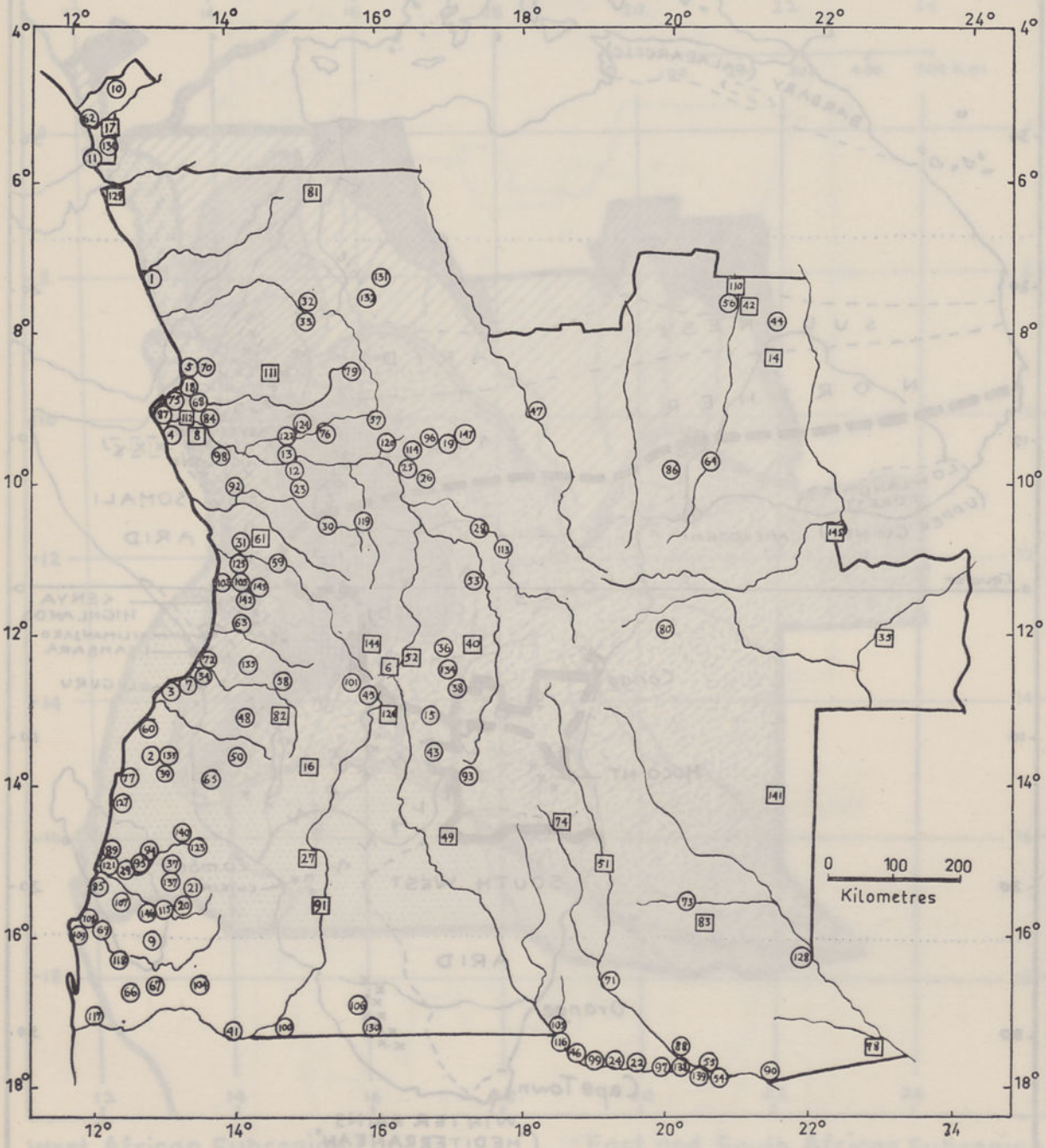
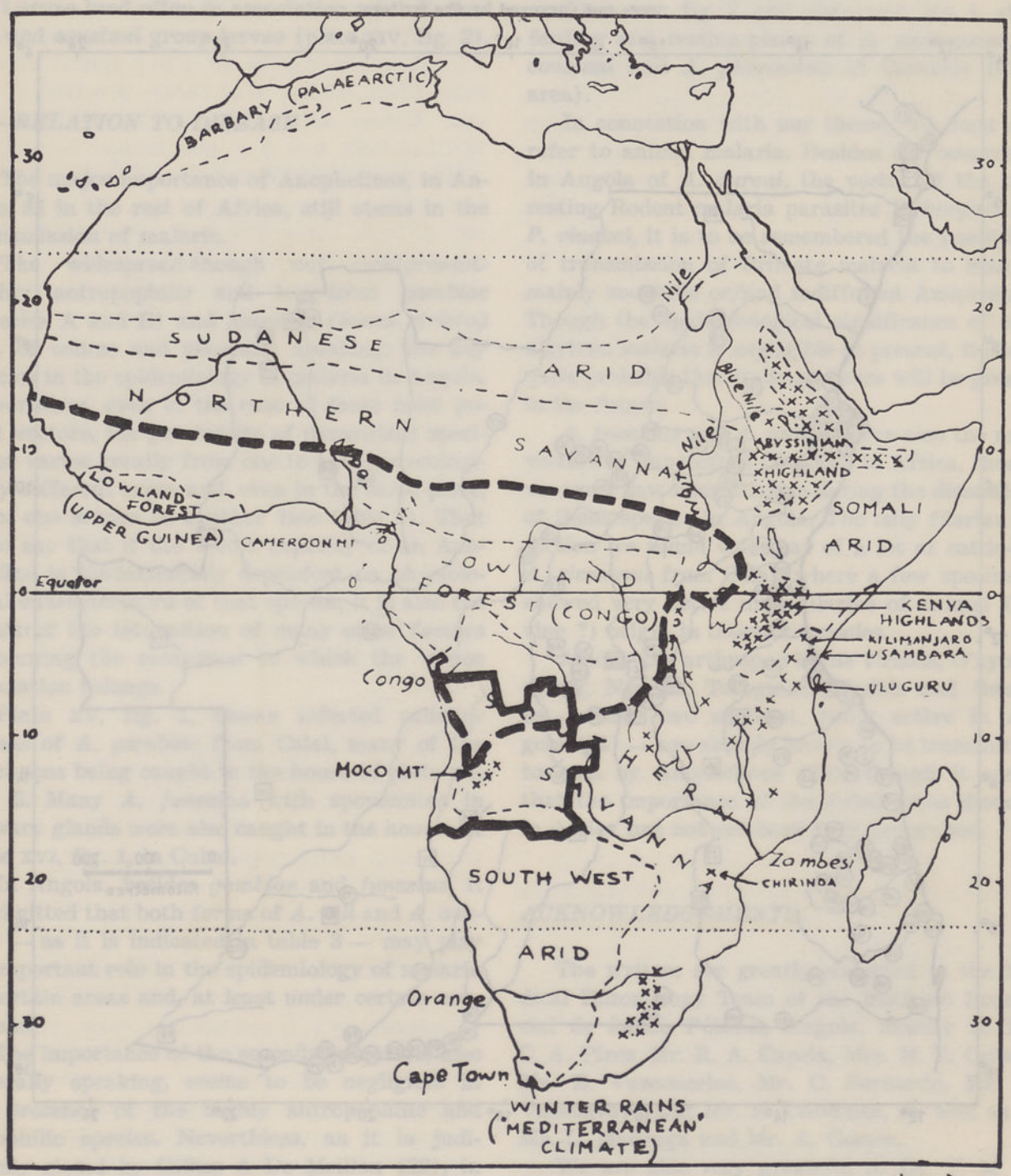
MAP 1

Map showing main collecting localities. Localities marked with squares were not surveyed by the writers



MAP 2

Main biotic zones in Africa



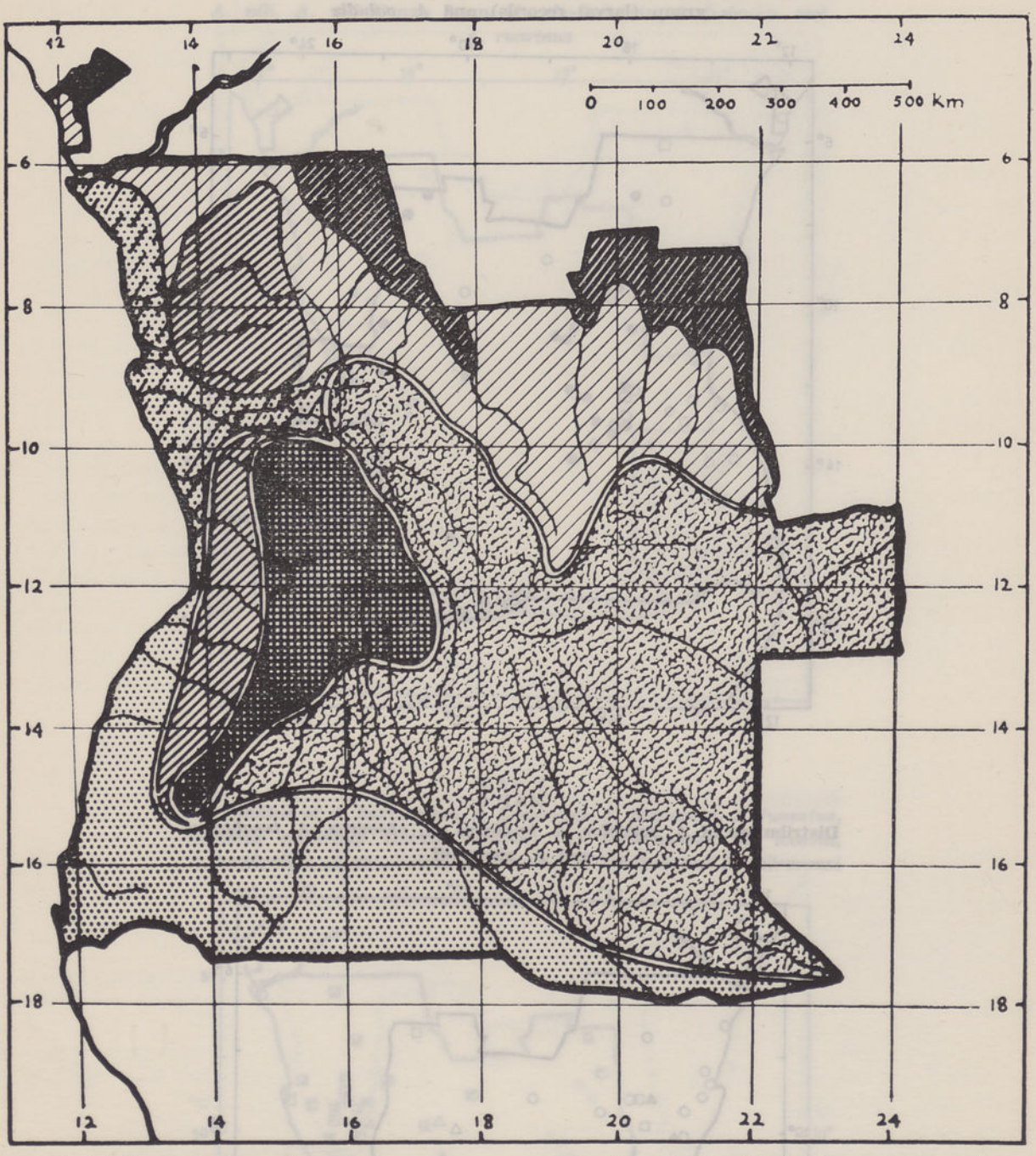
(Moreau, modif.)

x·x·x — Mountain biomes.

▬ ▬ ▬ — Limit of the West African subregion.

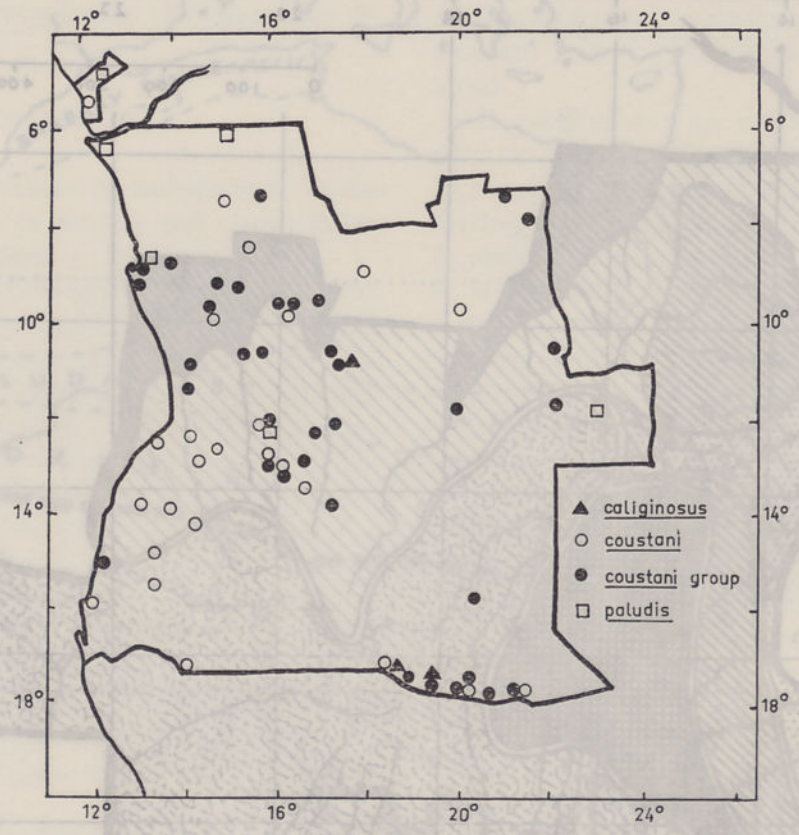
MAP 3

Tentative zoogeographical division of Angola



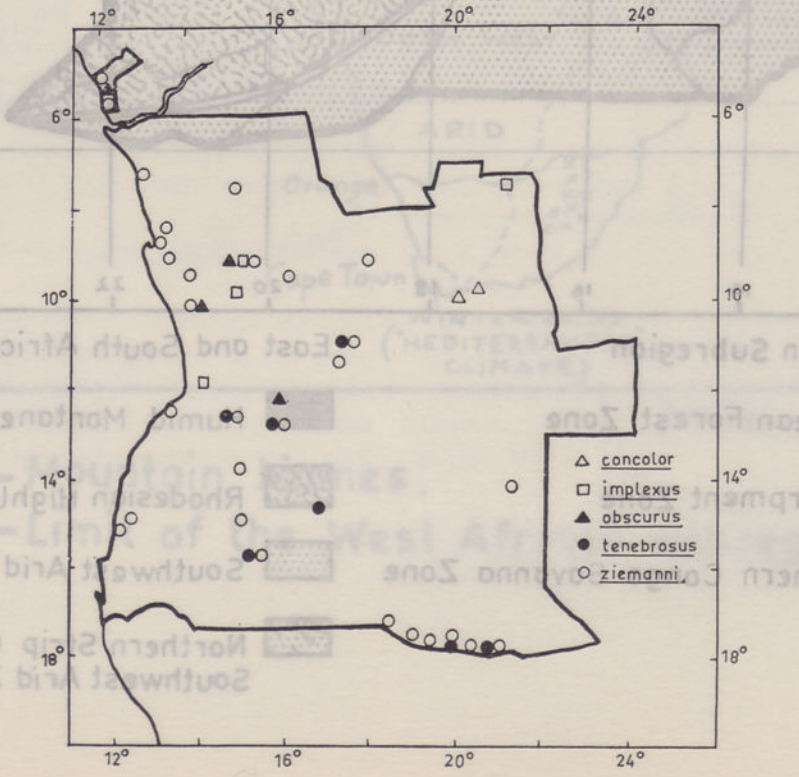
MAP 4

Distribution of *A. caliginosus, A. coustani, coustani* group (larval records) and *A. paludis*



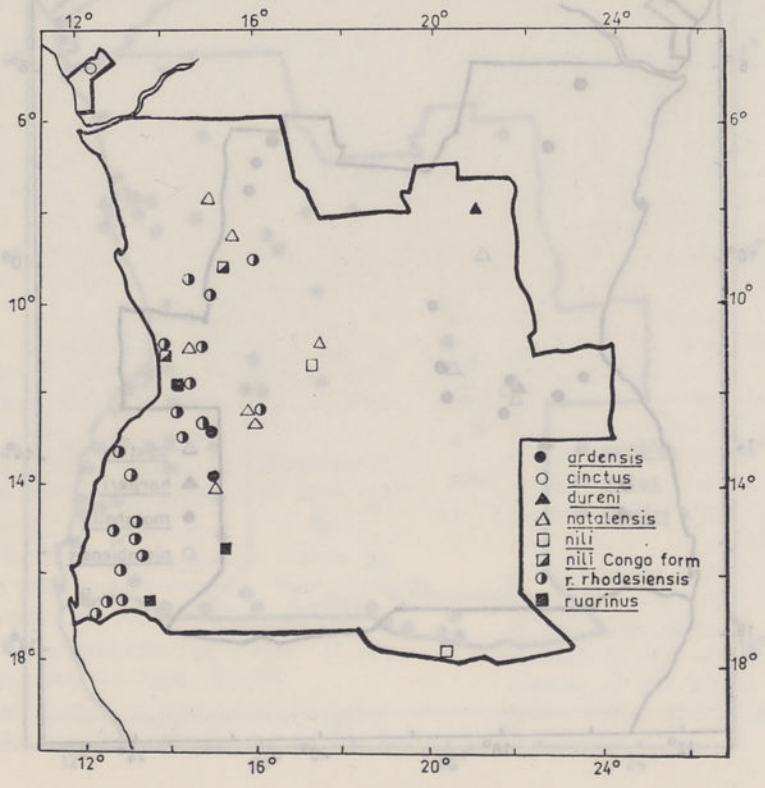
MAP 5

Distribution of *A. concolor, A. implexus, A. obscurus, A. tenebrosus* and *A. ziemanni*



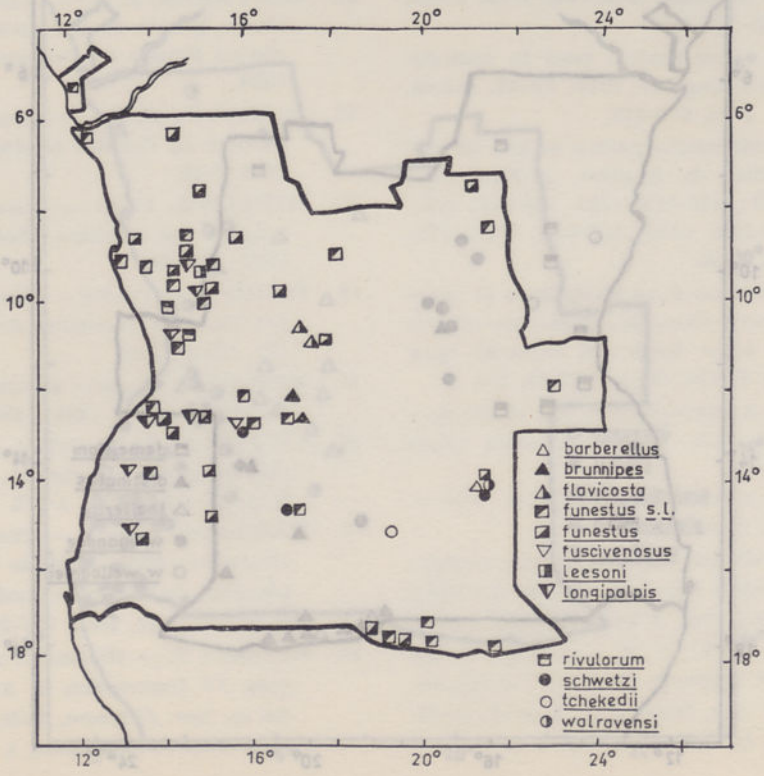
MAP 6

Distribution of *A. ardensis, A. cinctus, A. dureni, A. natalensis, A. nili, A. nili* Congo form, *A. rhodesiensis rhodesiensis* and *A. ruarinus*



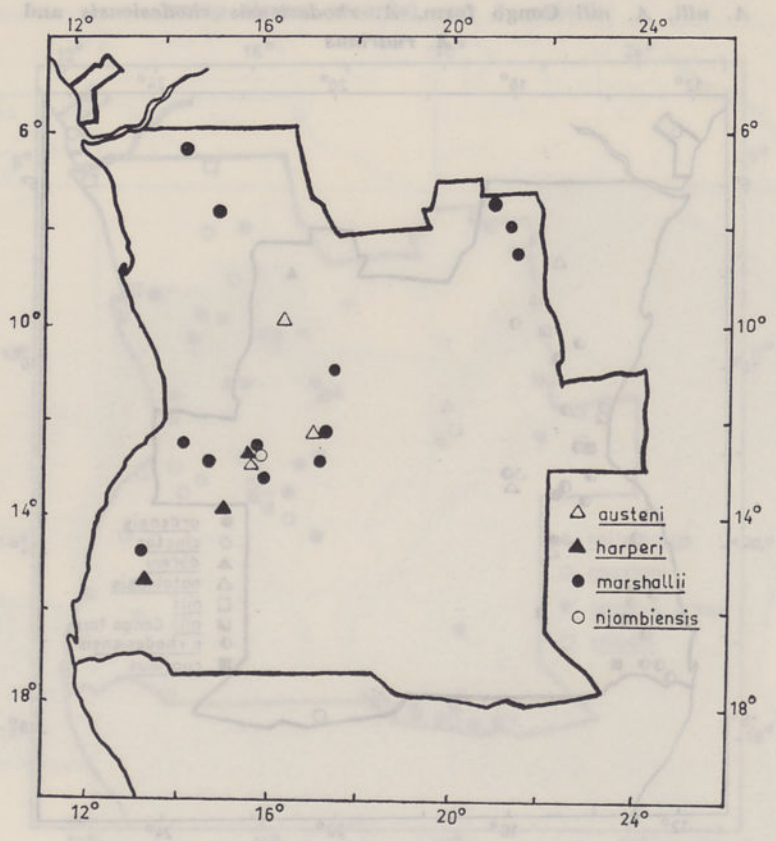
MAP 7

Distribution of *A. barberellus, A. brunnipes, A. flavicosta, A. funestus, funestus subgroup* (larval records), *A. fuscivenosus, A. leesoni, A. longipalpis, A. rivulorum, A. schwetzi, A. tchekedi* and *A. walravensi*



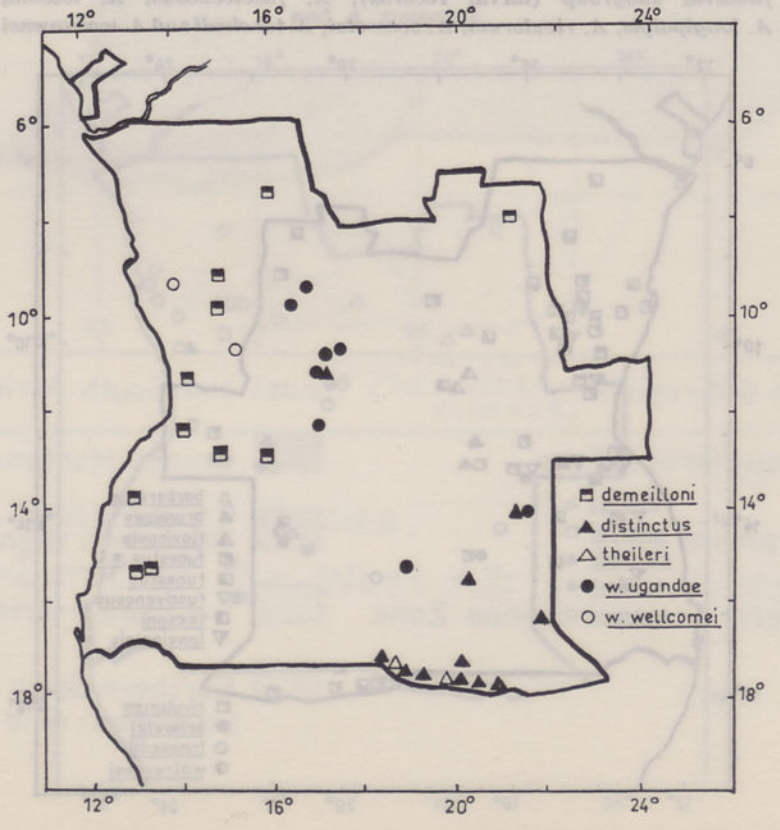
MAP 8

Distribution of *A. austeni, A. harperi, A. marshalli* and *A. njombiensis*



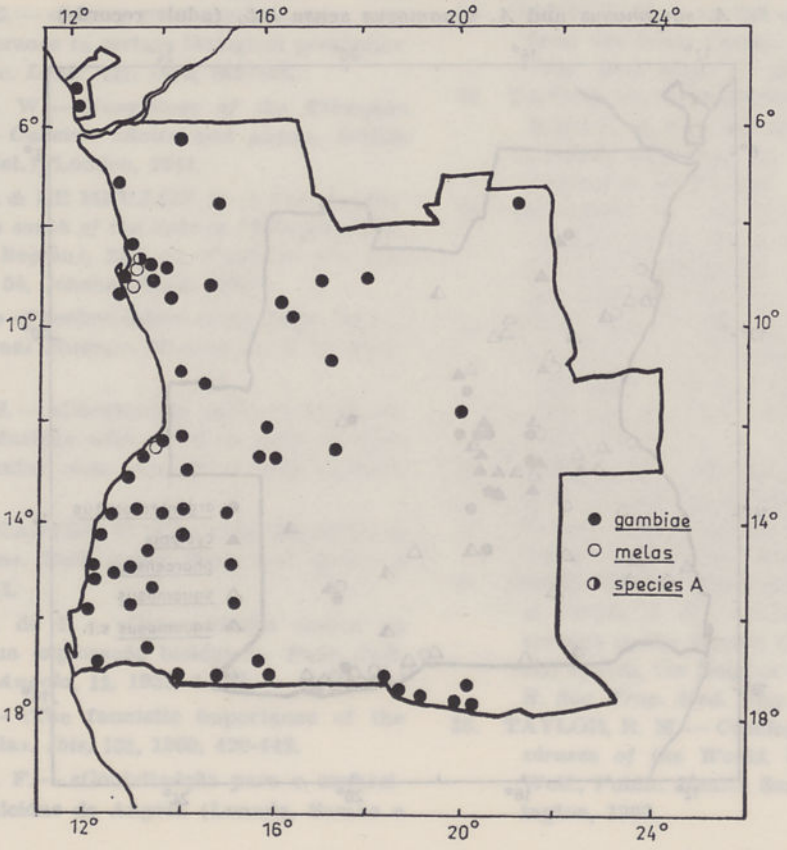
MAP 9

Distribution of *A. demeilloni, A. distinctus, A. theileri, A. wellcomei ugandae* and *wellcomei wellcomei*



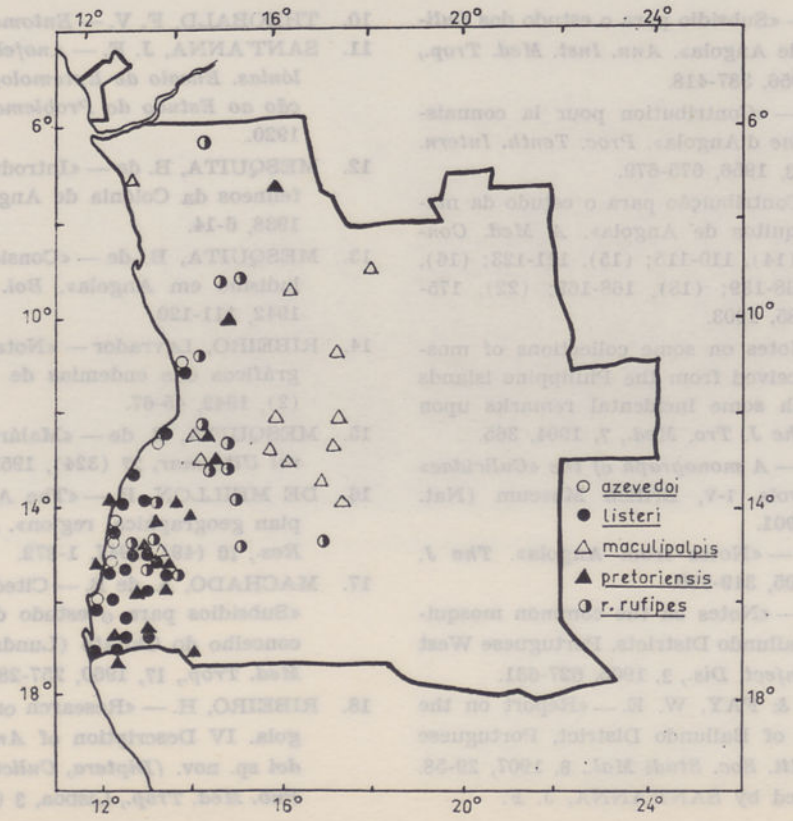
MAP 10

Distribution of *A. gambiae, A. melas* and species A (*gambiae* complex)



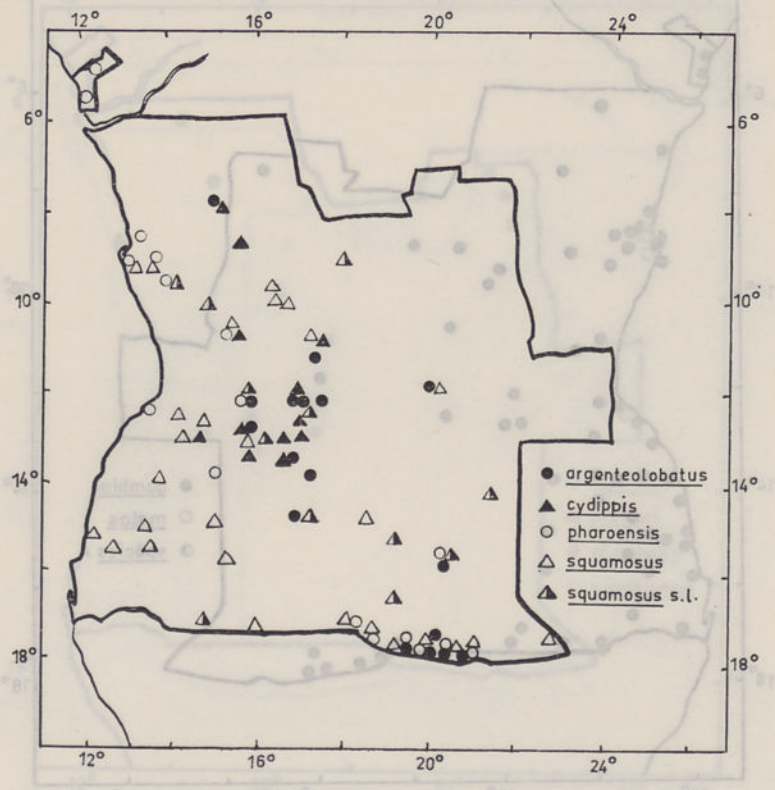
MAP 11

Distribution of *A. azevedoi, A. listeri, A. maculipalpis, A. pretoriensis,* and *A. rufipes rufipes*



MAP 12

Distribution of *A. argenteolobatus, A. cydippis, A. pharoensis, A. squamosus* and *A. squamosus sensu lato* (adult records)



REFERENCES

1. GANDARA, A. F. — «Subsídio para o estudo dos *Culicidae (Diptera)* de Angola». *Ann. Inst. Med. Trop.*, Lisboa, 13 (3), 1956, 387-418.
2. GANDARA, A. F. — «Contribution pour la connaissance des *Culicidae* d'Angola». *Proc. Tenth. Intern. Cong. Entomol.*, 3, 1956, 675-679.
3. ROQUE, A. B. — «Contribuição para o estudo da malária e dos mosquitos de Angola». *A Med. Contemp.*, Lisboa, 6 (14), 110-115; (15), 121-123; (16), 127-130; (17), 138-139; (18), 168-169; (22), 175-177; (23), 183-185, 1903.
4. GILES, G. M. — «Notes on some collections of mosquitoes, & C., received from the Philippine islands and Angola; with some incidental remarks upon classification». *The J. Tro. Med.*, 7, 1904, 365.
5. THEOBALD, F. V. — *A monograph of the «Culicidae» of the World*, vols. I-V, British Museum (Nat. Hist.), London, 1901.
6. WELLMAN, F. C. — «Notes from Angola». *The J. Trop. Med.*, 8, 1905, 319-320.
7. WELLMAN, F. C. — «Notes on the common mosquitoes of Bié and Bailundo Districts, Portuguese West Africa». *The J. Infect. Dis.*, 2, 1905, 627-631.
8. WELLMAN, F. C. & FAY, W. E. — «Report on the endemic malaria of Bailundo District, Portuguese West Africa». *Atti. Soc. Studi Mal.*, 8, 1907, 29-58.
9. MENDES, C. — Cited by SANT'ANNA, J. F.
10. THEOBALD, F. V. — *Entomologist*, 38, 1905, 102.
11. SANT'ANNA, J. F. — *Anofelíneos de Portugal e Colónias. Ensaio de Entomologia Médica com Aplicação ao Estudo do Problema do Sezonismo*, Lisboa, 1920.
12. MESQUITA, B. de — «Introdução ao estudo dos Anofelíneos da Colónia de Angola». *Bol. Sanit.*, 5 (2), 1938, 6-14.
13. MESQUITA, B. de — «Considerações sobre o impaludismo em Angola». *Bol. Geral Med.*, 24 (7/9), 1942, 111-120.
14. RIBEIRO, Lavrador — «Notas sobre aspectos nosográficos das endemias de Angola». *Bol. Sanit.*, 5 (2), 1942, 45-67.
15. MESQUITA, B. de — «Malária in Angola». *Bol. Geral Ultramar*, 27 (324), 1952, 3-39.
16. DE MEILLON, B. — «The Anophelini of the Ethiopian geographical region». *Publ. S. Afr. Inst. Med. Res.*, 10 (49), 1947, 1-272.
17. MACHADO, A. de B. — Cited by DAVID, J. H. S. — «Subsídios para o estudo da endemia palúdica no concelho do Chitato (Lunda — Angola)». *An. Inst. Med. Trop.*, 17, 1960, 257-281.
18. RIBEIRO, H. — «Research on the mosquitoes of Angola. IV Description of *Anopheles (Cellia) azevedoi* sp. nov. *(Diptera, Culicidae)*». *An. Esc. Nac. S. Pub. Med. Trop.*, Lisboa, 3 (1/4), 1969, 113-123.

19. CHAPIN, J. P. — «The birds of the Belgian Congo». *Bull. Amer. Mus. Nat. Hist.*, 65, 1932.

20. MOREAU, R. E. — «Africa since the Mesozoic: with particular reference to certain biological problems». *Proc. Zool. Soc. Lond.*, 121, 1952, 869-893.

21. EDWARDS, F. W. — *Mosquitoes of the Ethiopian Region. III — Culicine adults and pupae*, British Mus. (Nat. Hist.), London, 1941.

22. GILLIES, M. T. & DE MEILLON, B. — *The Anophelinae of Africa south of the Sahara (Ethiopian Zoogeographical Region)*, 2nd ed. Publ. S. Afr. Int. Med. Res., n.º 54, Johannesburg, 1968.

23. KOCH, C. — *The «Tenebrionidae» of Southern Africa*, vol. 1, Transvaal Museum Memoir n.º 7. Pretoria, 1955.

24. DAVIS, D. H. S. — «Distribution patterns of Southern African Muridae with notes on some of their fossil antecedents». *Ann. Cape Prov. Mus.*, 2, 1962, 56-76.

25. HILL, G. E. & CARTER, T. D. — «The Mammals of Angola, Africa». *Bull. Amer. Mus. Nat. Hist.*, 78 (1), 1941, 1-211.

26. MACHADO, A. de B. — «Generalidades acerca da Lunda e da sua exploração biológica». *Publ. Cult. Comp. Diam. Angola*, 12, 1952, 1-107.

27. HALL, B. P. — «The faunistic importance of the scarp of Angola». *Ibis*, 102, 1960, 420-442.

28. COLAÇO, A. T. F. — «Contribuição para o conhecimento dos Culicidae de Angola (Luanda, Sambo e Nova Lisboa)». *Ann. Inst. Med. Trop.*, Lisboa, 9 (2), 1952, 511-516.

29. GAMBLE, M. — «A list of blood-sucking Arthropods from the lower Congo, with a vocabulary». *The J. Trop. Med. Hyg.*, 17, 1914, 148-150.

30. DAVIDSON, G.; PATTERSON, H. E.; COLUZZI, M.; MASON, G. F. & MICKS, D. W. — «The Anopheles *gambiae* Complex». In *Genetics of Insect vectors of Disease*. WHO, 1967.

31. CHAUVET, G.; DAVIDSON, G. & COZ, J. — «Le complex *Anopheles gambiae* en Afrique Continentale et à Madagascar». *Cah. O. R. S. T. O. M.*, sér. Ent. Méd. et Parasitol., 7 (1), 1969, 9-12.

32. RIBEIRO, H.; CASACA, V. M. R. & COCHOFEL, J. A. L. P. — «A malaria survey in the Lobito — Catumbela region, Angola (Portuguese West Africa)». *An. Inst. Med. Trop. Lisboa*, 21 (3/4), 1964, 337-351.

33. RIBEIRO, H. — «Research on the mosquitoes of Angola. V — On the bioecology of *Anopheles azevedoi* Ribeiro, 1969 (*Diptera, Culicidae*). *Garcia de Orta*, sér. Zool., 3, 2, 1974, 31-38.

34. BEEWKES, H.; MAHAFFY, A. F.; BURKE, A. W. & PAUL, J. H. — «Yellow Fever protection test surveys in the French Cameroons, French Equatorial Africa, the Belgian Congo and Angola». *Trans. R. Soc. Trop. Med. Hyg.*, 28 (3), 1934, 233.

35. TAYLOR, R. M. — *Catalogue of the Arthropod-borne viruses of the World*. U. S. Depart. Health, Ed. Welf., Public. Health Service, Publ. n.º 1760, Washington, 1967.

REFERENCES

12. CHAPIN, J. P. — «The birds of the Belgian Congo».

20. MONTEIRO, R. E. — «Africa since the Mesozoic: with particular reference to certain biological problems».

21. EDWARDS, F. W. — «Mosquitoes of the Ethiopian Region. III — Culicine adults and pupae, British Mus. (Nat. Hist.), London, 1941.

22. GILLIES, M. T. & DE MEILLON, B. — The Anophelinae of South of the Sahara (Ethiopian Zoogeographical Region), 2nd ed. Publ. S. Afr. Inst. Med. Res. n.° 54, Johannesburg, 1968.

23. HOCH, C. — The «Tendrivelles» of Boutiva Algiers, vol. I. Transvaal Museum Memoir n.° 1. Pretoria, 1955.

24. DAVIS, D. H. S. — «Distribution patterns of South-ern African Muridae with notes on some of their fossil antecedents». Ann. Cape Prov. Mus., 3, 1963, 56-76.

25. HILL, G. E. & CARTER, T. D. — «The Mammals of Angola, Africa». Bull. Amer. Mus. Nat. Hist., 78 (1), 1941, 1-211.

26. MACHADO, A. de B. — «Contribuição para o conhecimento da Fauna de Angola». Publ. Cult. Comp. Diam. Angola, 12, 1952, 1-107.

27. HALL, R. P. — «The faunistic importance of the Congo of Angola». Ibis, 102, 1960, 430-442.

28. CORREIA, A. T. P. — «Contribuição para o conhecimento dos Culicídeos de Angola (Luanda, Bambo e

29. DAMICK, M. — «A list of blood-sucking Arthropods from the lower Congo, with a vocabulary». Ann. Trop. Med. Par., 17, 1914, 148-180.

30. DAVIDSON, G.; PATTERSON, H. E.; COLUZZI, M.; MASON, G. F. & MICKS, D. W. — «The Anopheles gambiae Complex». In: Genetics of Insect vectors of Disease. WHO, 1967.

31. CHAUVET, G.; DAVIDSON, G. & COZ, J. — «Le complex Anopheles gambiae en Afrique Continentale et à Madagascar». Cah. O. R. S. T. O. M., sér. Méd. Par., 7 (1), 1969, 9-12.

32. RIBEIRO, H.; GARCIA, V. M. R. & COCHOFEL, J. A. I. P. — «A malaria survey in the Lobito — Catumbela region, Angola (Portuguese West Africa)». An. Inst. Med. Trop. Lisboa, 21 (3-4), 1964, 333-351.

33. RIBEIRO, H. — «Research on the mosquitoes of Angola. V — On the bionomics of Anopheles ranceloi Ribeiro, 1959 (Diptera, Culicidae). Garcia de Orta, Méd. Geral, 3, 2, 1971, 21-28.

34. BERKWKEN, H.; MAHAFFY, A. F.; BURKE, A. W. & PAUL, J. H. — «Yellow Fever protection test survays in the French Cameroons, French Equatorial Africa, the Belgian Congo and Angola». Trans. R. Soc. Trop. Med. Hyg., 32 (3), 1938, 333.

35. TAYLOR, R. M. — Catalogue of the Arthropod-borne viruses of the World. U. S. Depart. Health, Ed. Well., Public Health Service, Publ. n.° 1760, Washington, 1967.

Fig. 1 — Swampy margins of Etala River at Ebanga, a breeding-place of *A. coustani s. s.* and *A. brunnipes*

Fig. 2 — Shallow grassy pool, a larval biotope of *A. ziemanni* at Moçâmedes

Fig 1 — Small shadded pool in the margin of a forest stream, a breeding-place of *A. obscurus* at Salazar (= Dala Tando)

Fig. 2 — *A. implexus* bred in the margins of this forest stream, at Salazar (= Dala Tando)

Fig. 1 — Grassy margins of the Halangalô River, at Ebanga, a larval biotope of *A. ardensis*

Fig. 2 — Inhuca River, near Buco-Zau, breeding-place of *A. cinctus*. Note the cleared Guinean Forest

Fig. 1 — Aquatic vegetation in the margins of the slow-flowing Cassissa River near Ebo, breeding-place of *A. natalensis*

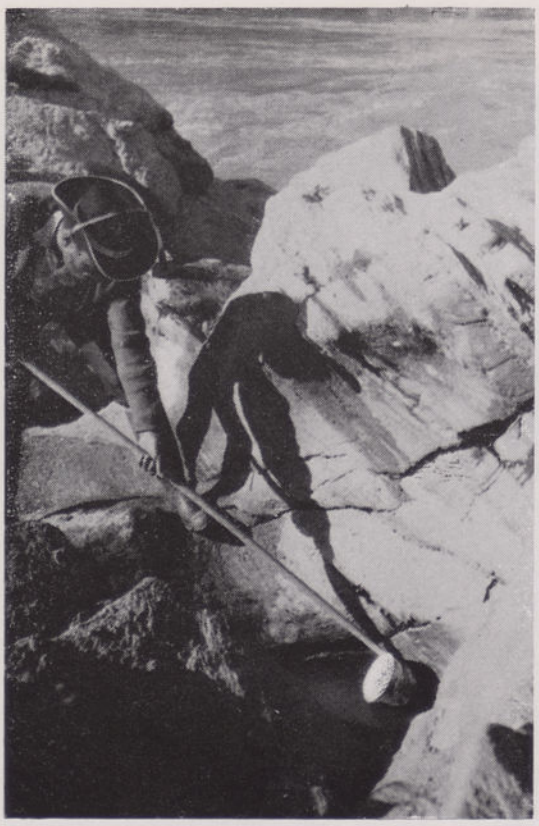


Fig. 2 — Rock-pool in the Cunene River margins, Angola-SW Africa border, larval biotope of *A. rhodesiensis rhodesiensis*

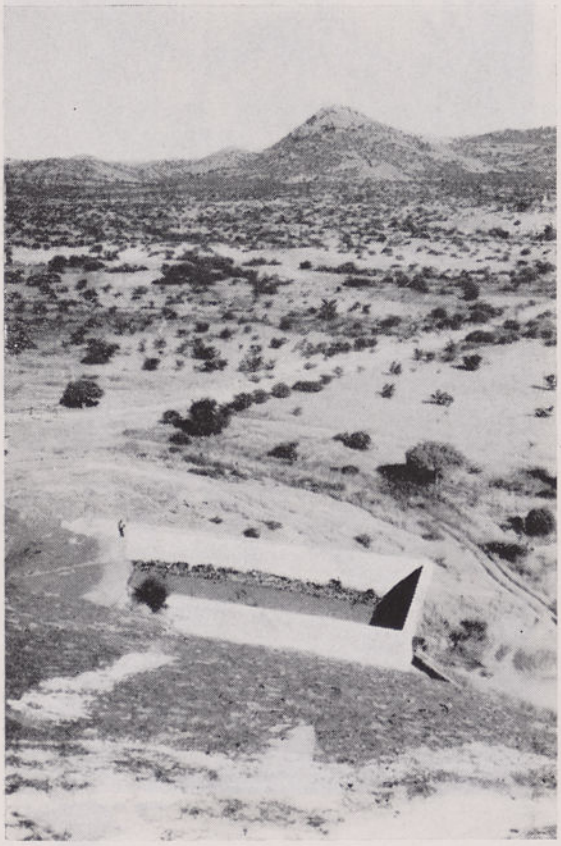


Fig. 1 — Cement water-tank with *Pistia stratiotes*, larval biotope of *A. rhodesiensis rhodesiensis* at Caraculo. Note the arid country with *Acacia* spp., *Terminalia* spp. and *Rigozum virgatum*

Fig. 2 — Rock-pools in an «inselberg» at Gungo, prolific breeding-places of *A. ruarinus*. Note the road at the base between both «inselbergen»

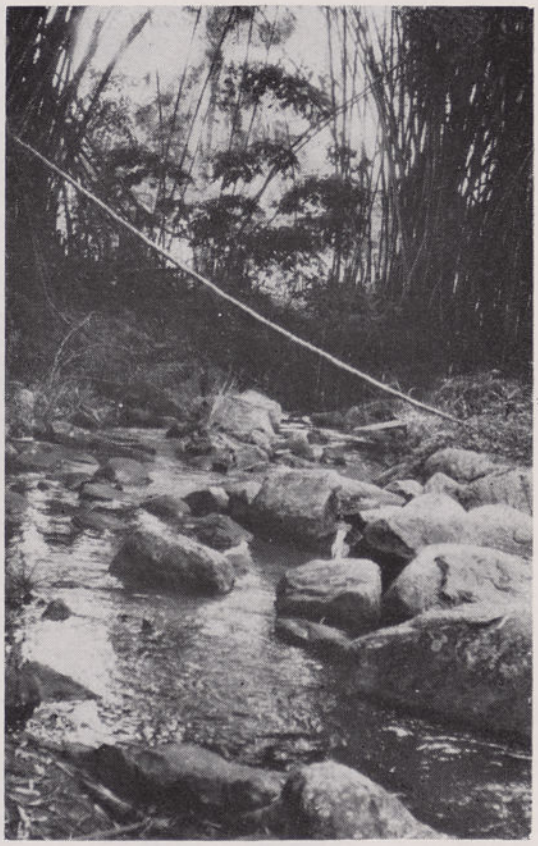


Fig. 1 — Forest stream at Salazar (=Dala Tando) in which margins bred *A. funestus* and *A. obscurus*

Fig. 2 — Pippeting larvae of *A. leesoni* in another forest stream. near Salazar (=Dala Tando)

Fig. 1 — A larval biotope of *A. rivulorum*, with filamentous algae, in the Carlaongo River, near Carlaongo

Fig. 2 — Shallow earth-well at the edge of an «ochana» at Ceilunga, a breeding-place of *A. austeni* and *A. marshalli*. Note the «miombo» wooded savanna in the background

Fig. 1 — Mountain spring at Tchivinguiro, a larval biotope of *A. harperi*

Fig. 2 — Margins of the Cuanza River at Dando, feeding-area of *A. distinctus* and *A. wellcomei ugandae*

Fig. 1 — Margins of Cuanza River, at Muxima, biotope of *A. wellcomei wellcomei*

Fig. 2 — Grassy margin of the Etala River, a breeding-place of *A. demeilloni*

Fig. 1 — Little drain in the *Humidiherbbosa* of an «ochana» at Ceilunga, a larval biotope of *A. brunnipes* and *A. cydippis*

Fig. 2 — Margins of a stream with aquatic vegetation, a typical breeding-place of *A. longipalpis*

Fig. 1 — Shallow unshadded rain pool, at Pereira d'Eça, a typical breeding-place of freshwater *A. gambiae*. In the background note *Acacia* spp., *Combretum* spp. and *Colophospermum mopane*

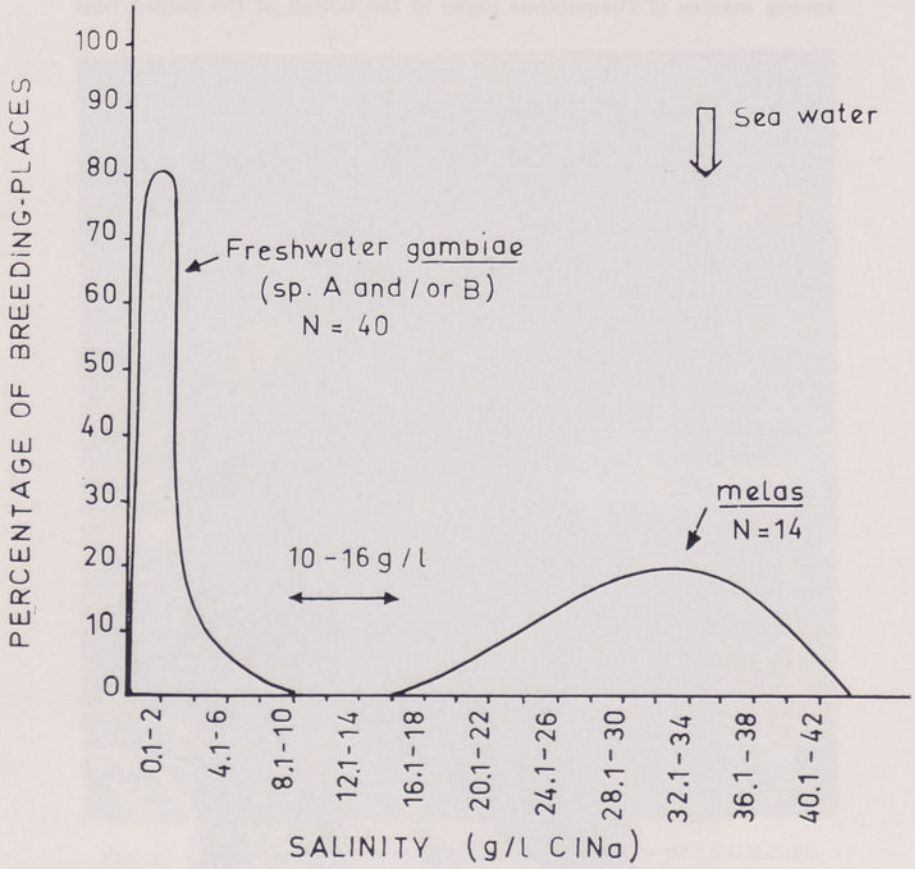


Fig. 2 — Frequency curves of salinities in breeding-places of freshwater *A. gambiae* and *A. melas*

Fig. 1 — Salt-pans at Moçâmedes, a typical and prolific larval biotope of *A. azevedoi* with a salt-content of 36 g/l. Plenty of larvae and pupae where caught among masses of filamentous algae in the botton of the ruined boat

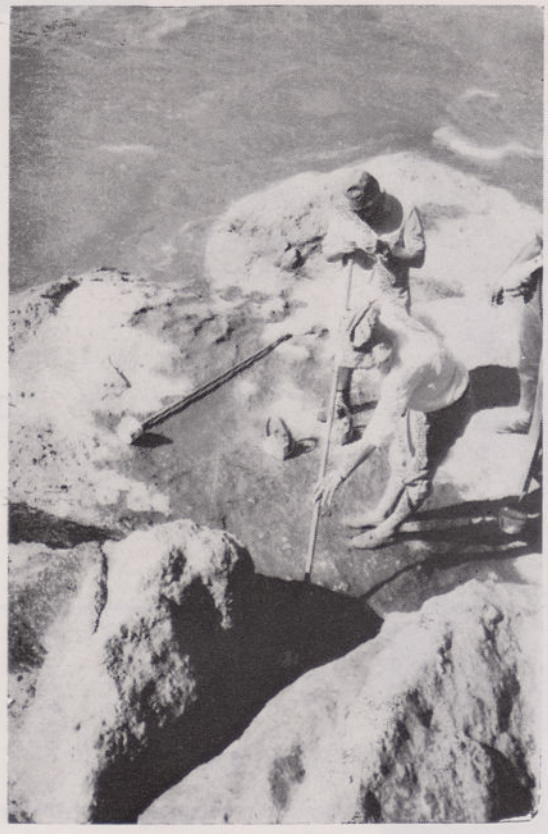


Fig. 2 — Rock-pools in the margins of Cunene River, larval biotope of *A. listeri*, *A. pretoriensis* and *A. r. rhodesiensis*

Fig. 1 — Backwaters of the Cubal da Hanha River, near Cubal, breeding-place of *A. maculipalpis*

Fig. 2 — Rock-pools in the Carlaongo River, near Carlaongo, a breeding-place of *A. rufipes rufipes*

Fig. 1 — Collecting larvae of *A. argenteolobatus* from a little irrigation drain at Ceilunga

Fig. 2 — Grassy margins of the Cubango River, at Calai, larval biotope of *A. squamosus* and *A. distinctus*

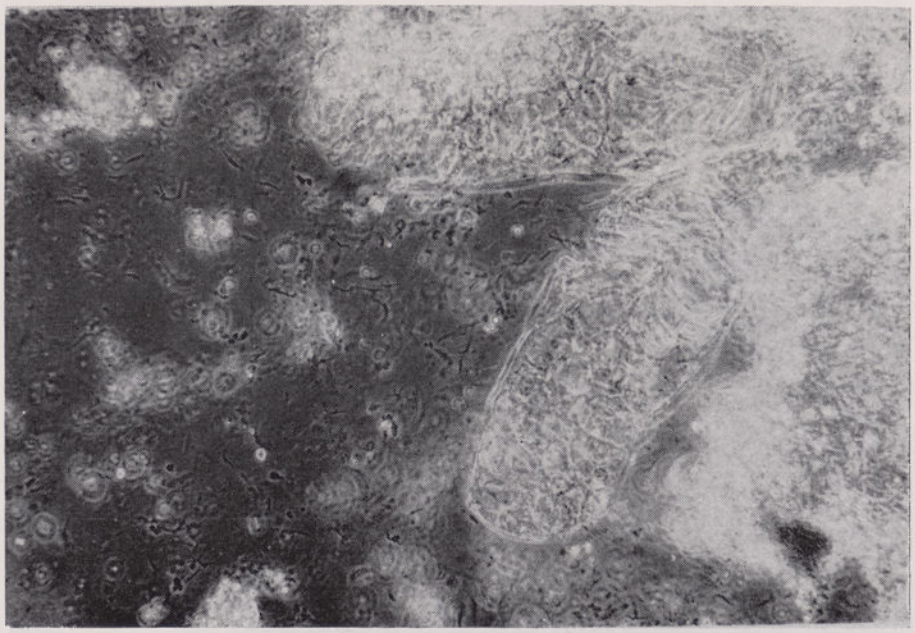


Fig. 1 — Infected salivary glands of *A. gambiae* from Calai. Phase contrast

Fig. 2 — Several infected *A. gambiae* females were caught in this house, at Calai

Fig. 1 — Several infected *A. funestus* females were also caught in these houses, at Cubal

Fig. 2 — Outdoor shelters at Camuele, near Calai, feeding and resting-places of *A. pharoensis*, *A. coustani* and *A. squamosus*

Fig. 1 — Capturing mosquitoes in a resting and feeding-area of *A. squamosus*, *A. coustani* and *A. pharoensis*, near Calai. In the background, the human habitations

Homoptera (Coccoidea) do arquipélago de Cabo Verde

IDINHA MÓNICA FERNANDES

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(Recebido em 6-VII-1974)

O A. estudou o material de *Homoptera (Coccoidea)* coligido pela Missão de Estudos Zoológicos do Ultramar nas ilhas de Cabo Verde, incluindo a descrição de algumas cochonilhas, citando os respectivos entomófagos e distribuição geográfica dentro do arquipélago.

The A. has studied several *Coccoidea (Homoptera)* of the islands of Cape Vert and describes some species, the entomophagous and geographical distribution are mentioned.

Continuando a estudar o material coligido pela Missão de Estudos Zoológicos do Ultramar, nas ilhas de Cabo Verde, em 1969, 1970 e 1972, identificámos mais algumas espécies, que referiremos no presente trabalho.

O arquipélago de Cabo Verde situa-se numa zona geográfica compreendida entre os paralelos 14° 50′ e 17° 10′ N e os meridianos 22° 30′ e 25° 30′ W, próximo da costa ocidental da África, tendo, por isso, clima tropical com influência do deserto africano; este clima caracteriza-se pela grande secura do ar, fracas chuvas e pequenas amplitudes térmicas, o que vai originar regiões pobres e áridas, com fauna e flora pouco variadas e pouco abundantes. A agravar esta situação, o arquipélago tem sofrido o flagelo de uma seca que se faz sentir há seis anos consecutivos, sendo, portanto, as terras ainda mais pobres. No caso que estamos a estudar — insectos *(Coccoidea)* — verificámos que há pequena variação de espécies, sendo o *Coccus hesperidum* L. e a *Parasaissetia nigra* Nietn. as espécies mais comuns e abundantes em várias ilhas e também dentro de cada ilha, sendo de salientar o facto de não ter sido coligido nenhum material na ilha de S. Vicente e nos ilhéus Raso e Branco.

Analisando todo o material estudado e a respectiva distribuição geográfica, podemos ter uma ideia das espécies existentes em cada ilha:

Santo Antão — *Icerya pulchasi* Mask.; *Pinnaspis strachani* Cool.; *Phenacoccus madeirensis* Green.

S. Vicente e ilhéus Branco e Raso — Não foi encontrada planta parasitada por cochonilhas.

Santa Luzia — Não foi prospectada.

S. Nicolau — *Phenacoccus madeirensis* Green; *Parasaissetia nigra* Niet.; *Coccus hesperitum* L.

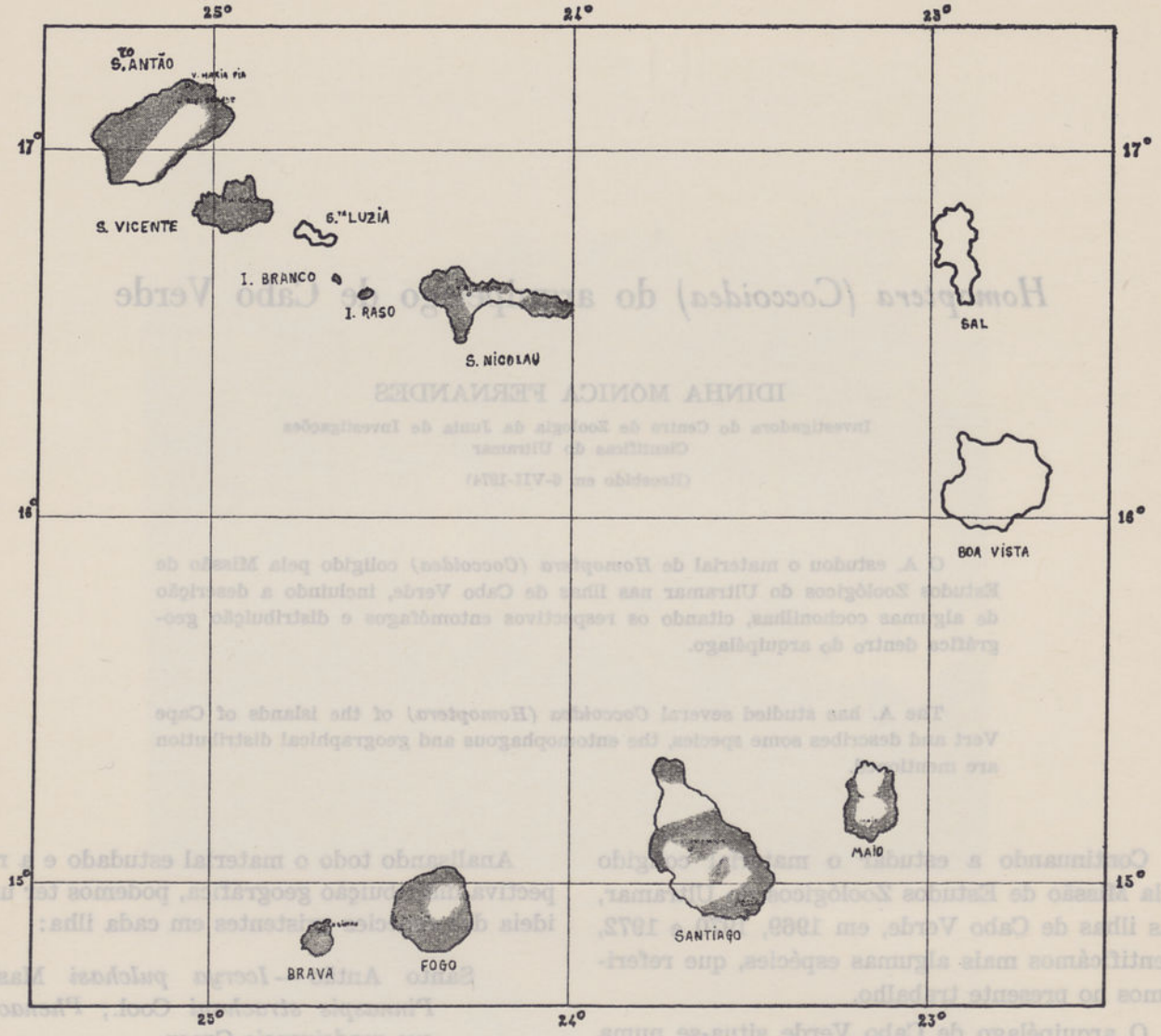
Sal e Boa Vista — Não prospectadas.

Brava — *Aspidiotus destructor* Sign.; *Parasaissetia nigra* Nietn.; *Phenacoccus madeirensis* Green; *Orthezia insignis* Dougl.

Fogo — *Asterolecanium pustulans* Ckll.; *C. hesperidum* L.; *P. nigra* Niet.; *Icerya purchasi* Mask.; *Ceroplastes rusci* L.

Santiago — *C. hesperidum* L.; *Coccus aethiopicus* De Lotto; *P. nigra* Nietn.; *Hemiberlesia lataniae* Sign.; *Lepidosaphes beckii* New.

Maio — *Pinnaspis strachani* Cool.



Arquipélago de Cabo Verde (as zonas sombreadas correspondem às áreas prospectadas pela Missão de Estudos Zoológicos do Ultramar)

FAM. **DIASPIDIDAE**

SUBFAM. *DIASPIDINAE*

Tribo *Diaspidini*

Pinnaspis strachani Cooley

Hemichionaspis minor strachani Cooley
Pinnaspis marchali Ckll.
P. townsendi Ckll.
P. gossypii News.
P. proxima Leon.
P. temporia Fer.
P. minor Mark.

MATERIAL E LOCALIDADES: Fragmentos de planta cardeal, parasitados por pequenas cochonilhas que identificámos com *Pinnaspis strachani* Cool.; o material está conservado em álcool a 70° e foi colhido na ilha de Santo Antão — Ribeira da Torre (Ribeira Grande) — em 29 de Outubro de 1972, registo n.° 3758.

Esta espécie já estava citada da ilha de Maio (Lagoa), parasitando caules de «charuteira» *(Hevea brasiliensis?)*.

FAM. **LECANIDAE**

SUBFAM. *ASTEROLECANINAE*

Asterolecanium pustulans Ckll.

Asterodiaspis pustulans Ckll.
Planchonia pustulans Ckll.

MATERIAL E LOCALIDADES: Folhas e caules de mafureira, parasitadas por várias cochonilhas, conservadas em álcool a 70°. Ilha do Fogo — S. Filipe —, 31-X-1969, registo n.° 3616.

DESCRIÇÃO: Fêmea adulta, vivendo em pequenas depressões do caule; corpo circular, quase oval, medindo 1 mm a 2 mm; escudo de forma semelhante, convexo, amarelo-translúcido, com franja marginal de cor ligeiramente mais clara. Ovos amarelos, ovóides.

Depois de preparada e montada, observámos na fêmea adulta (fig. 1) elementos específicos que coincidem com a descrição feita por L. Russell (1941). Contorno quase circular, com um pequeno prolongamento na região posterior. Antenas em tronco de cone, encimadas por dois pêlos de comprimento superior ao diâmetro da antena e outros dois mais pequenos e direitos. Estigmas em forma de saco cilíndrico, com glândulas pentaloculares periestigmáticas em número variável de três a seis elementos; a partir dos estigmas uma fiada de glândulas semelhantes distribui-se até à margem do corpo. Glândulas multiloculares dispostas em fiadas nos seis segmentos abdominais; dispersas na face ventral também observámos pequenas glândulas em 8 (menores que as marginais dorsais) e micróporos circulares. Face dorsal delimitada marginalmente por glândulas em 8 acompanhadas de uma fiada de glândulas quinqueloculares; distribuindo-se, irregularmente, por toda a superfície dorsal, observámos pequenas glândulas tubulares, micróporos circulares e glândulas em 8 de tamanho maior ou menor que as marginais. Anel anal com seis cerdas longas, maiores que o diâmetro do ânus. Lobos abdominais com três pares de pêlos, um dos quais muito mais comprido que os outros.

BIOLOGIA E «HABITAT»: Segundo a bibliografia estudada, esta espécie é vulgar, tendo sido assinalada na África central e sul, América do Norte, México, ilhas do Índico e Pacífico, onde parasita as mais variadas plantas, como cacaueiro, cafeeiro, *Hevea brasiliensis*, Casuarina, *Nerium*, *Hibiscus*, etc.

Os exemplares que estudámos são constituídos, na maior parte, por formas adultas com muitas posturas.

ENTOMÓFAGOS: No material estudado não foram encontrados exemplares parasitados; no entanto, são conhecidos vários himenópteros entomófagos desta cochonilha (Thompson, 1944):

Alaptus borinquensis Doz. — Porto Rico.
Aspidiotiphagus portoricensis Doz. — Porto Rico.
Mercetiella reticulata Doz. — Porto Rico.
Quaylea whittieri Gir. — Hawaii.
Tomocera californica How. — Hawaii.

SUBFAM. *LECANINAE*

Coccus hesperidum L.

MATERIAL E LOCALIDADES: Caules e folhas de mafureira parasitados, principalmente na página inferior e nas nervuras; conservados em álcool a 70°; ilha do Fogo (S. Filipe), 31-X-1969, registo n.° 3616;

Folhas e ramos de *Ficus religiosa*, ilha do Fogo (Mosteiros), 5-XI-1969, registo n.° 3621;

Folhas de goiabeira, ilha de S. Nicolau (Ribeira João), 11-XI-1970, registo n.° 3685.

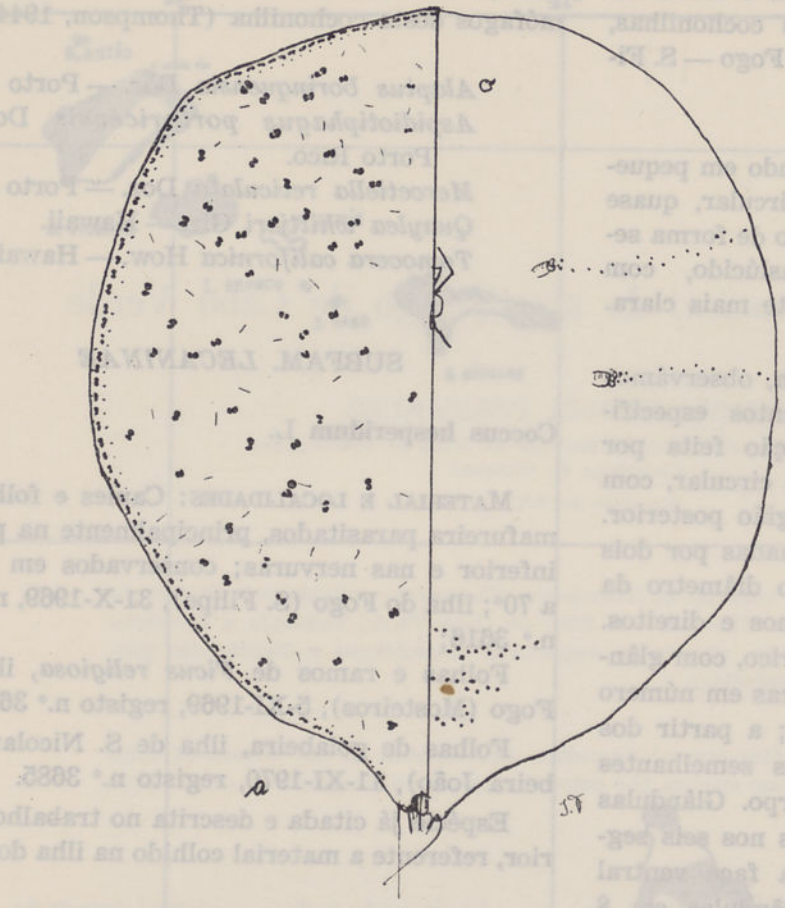
Espécie já citada e descrita no trabalho anterior, referente a material colhido na ilha do Fogo.

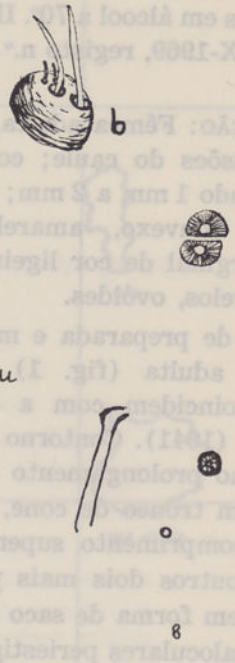
Parasaissetia nigra Nietn.

Lecanium nigrum Nietn.
Saissetia perseae Brain
S. nigra (Nietn.) De Lotto

MATERIAL E LOCALIDADES: Caules e folhas de amendoeira (nome vulgar), conservados em álcool a 70°. Ilha de Santiago (Santa Catarina), 6-IX-1969, registo n.° 3581; ilha de S. Nicolau (Ribeira João), 11-XI-1970, registo n.° 3685; neste local as cochonilhas parasitam mandioca; ilha de Santo Antão (Ponta do Sol), em caules e folhas de amendoeira, 30-X-1972, registo n.° 3762; ilha de S. Nicolau (Ribeira Brava), 22-XI-1970, registo n.° 3700.

DESCRIÇÃO: Fêmea adulta com antenas de oito artículos; sulco estigmático limitado no bordo por três espinhos estigmáticos, dos quais o central é maior; tubérculos glandulares submarginais, em número variável nos diferentes exemplares observados: uns têm quatro, outros dez. Placas anais, no seu conjunto, quase quadradas e localizadas no primeiro terço apical. Espinhos marginais pouco ramificados na extremidade, alguns pareceram-nos simples. Glândulas multiloculares pouco nu-





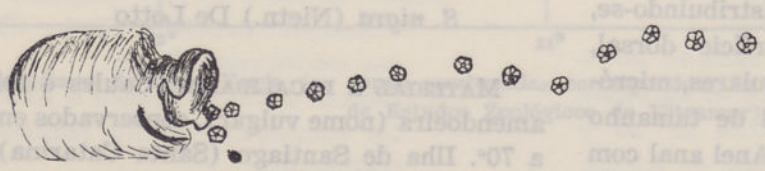


Fig. 1 — *Asterolecanium pustulans* Ckl. (*a* — fêmea adulta; *b* — antena; *d* — estigma; *e* — área anal)

merosas à volta da abertura genital e nos segmentos abdominais; glândulas tubulares numa faixa ventral, submarginal, interrompendo-se na zona de inserção das antenas; patas normais.

BIOLOGIA E «HABITAT»: Espécie comum, parasitando folhas e caules de diversas plantas, tem sido citada de toda a África e também da Madeira, Guianas, Índia e Europa.

ENTOMÓFAGOS: Alguns dos exemplares estudados estão parasitados por fungos e outros por himenópteros. Thompson (1944) cita vários entomófagos, dos quais referimos apenas *Baeoanusia oleae* Silv. (*Hym. Encyrtidae*) e *Coccophagus longifasciatus* How. (*Hym. Aphelinidae*), encontrados na África do Sul; os outros himenópteros citados são da Índia, América Central, Ceilão, etc.

FAM. **PSEUDOCOCCIDAE**

Phenacoccus madeirensis Green

MATERIAL E LOCALIDADES: Folhas de mandioca, conservadas em álcool a 70°. Ilha de S. Nicolau (Ribeira João), 11-XI-1970, registo n.° 3685. Folhas de «cardeal» colhidas na ilha de Santo Antão, em 29-X-1972, registo n.° 3758. Espécie já descrita e citada da ilha Brava (Nova Sintra).

FAM. **MARGARODIDAE**

SUBFAM. *MONOPHLEBINAE*

Icerya purchasi Mask

MATERIAL E LOCALIDADES: Pequenos ramos de plantas não identificadas, parasitados por cochonilhas que identificámos com *I. purchasi* Mask, material coligido na ilha de Santo Antão (Ribeira do Paul), 11-XI-1972, registo n.° 3766, e na Ribeira das Patas (Ponto Novo), parasitando feijoeiro, 20-X-1972, registo n.° 3755. Espécie citada no trabalho anterior, parasitando «feijão congo» na ilha do Fogo.

SUBFAM. *ORTHEZIINAE*

Tribo *Orthezini*

Orthezia insignis Douglas

O. nacrea Buck.

MATERIAL E LOCALIDADES: Planta espontânea («mata-joaquim») colhida na ilha Brava (Ribeira do Sorno), 10-X-1969, registo n.° 3604.

Fêmea adulta (fig. 2): corpo de forma oval, castanho-escuro, caracterizado pelas placas cerosas dorsais e laterais e pelo saco ovígero que se forma a partir da extremidade posterior do abdome, chegando a atingir duas vezes o comprimento do corpo; as placas dorsais posteriores são maiores que as restantes. Segmentação do corpo nítida. Olhos salientes; antenas de sete ou oito artículos (o número de artículos variava nos diferentes exemplares observados); patas fortes, com tíbia comprida, tarso com unha curva pontiaguda. Segmentos abdominais e torácicos com espinhos glandulares fortes, pontiagudos, coniformes, distribuindo-se em desenho quase uniforme em todos os exemplares observados; glândulas tetraloculares, micróporos e pequenos espinhos pontiagudos, dispersos na derme. Espécie muito comum nas regiões quentes, foi também citada da América e Europa, parasitando as mais diversas plantas e provocando-lhes graves prejuízos.

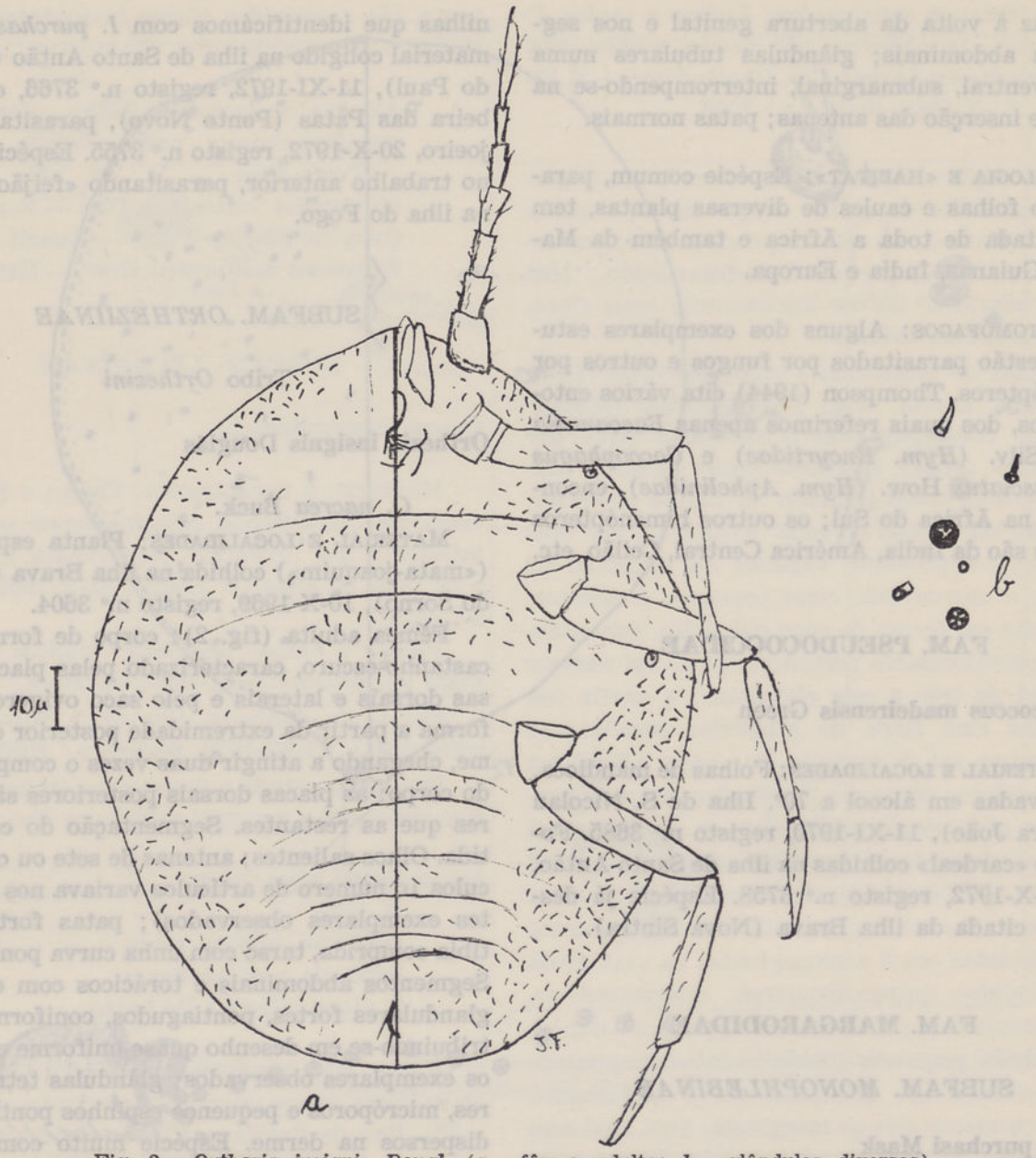


Fig. 2 — *Orthezia insignis Dougl.* (*a* — fêmea adulta; *b* — glândulas diversas)

BIBLIOGRAFIA

BALACHOWSKY, A. — *Les cochenilles de France, d'Europe, du Nord de l'Afrique et du Bassin Méditerranéen,* Paris, I, II, III, 1937.

—— *Les cochenilles paléarctiques de la tribu Diaspidini,* Paris, 1954.

DE LOTTO, G. — «Notes on some African species of *Saissetia* (*Homoptera : Coccoidea : Coccidae*)». *Journ. ent. Soc. South Afr.,* Pretória, 20, 1957.

—— «The soft scales (*Homoptera : Coccidae*) of South Africa. I». *South Afr. Journ. agri. Sci.,* Pretória, 10, 1967.

FERNANDES, I. — «Contribuição para o conhecimento de alguns *Homoptera, Coccoidea* do Arquipélago de Cabo Verde, 2.ª parte». *Garcia de Orta,* Sér. Zool., Lisboa, 1 (1), 1972.

GOMEZ MENOR, G. — *Cóccidos de España,* Madrid, 1940.

GREEN, E. — «Observations of the *Coccidae* of the Madeira Islands». *Bull. ent. res.,* Londres, 14, 1923.

HODGSON, C. J. — «Notes on Rhodesian *Coccidae* (*Homopt. Coccoidea*). Part. I: The genera *Coccus, Parasaissetia, Saissetia* and a new genus *Mashona*». *Arnoldia (Rhodesia),* Salisbúria, 3 (5), 1967.

LEONARDI, G. — *Monografia delle Cocciniglie Italiene,* Portici, 1920.

MAC GILLIVRAY, A. D. — *The Coccidae,* Urbana, 1921.

RUSSELL, M. L. — «A classification of the Scale Insect Genus *Asterolecanium*». *Unit. States Dep. of Agri.,* Washington, 1941.

TAKAGI, S. — «Key to the genera of *Coccidae* in Japan, with descriptions of two new genera and a little-known species». *Insecta Matsumurana Journ. of Fac. of Agric.,* Sapporo, 19 (1-2), 1955.

THOMPSON, F. R. S. — *A catalogue of the parasites and predators of insects-pests.* Belleville, Canadá, 1944.

Contribuição para o conhecimento dos copépodes marinhos de Cabo Verde (ilhas: Brava, Fogo, Santiago e Maio). 2.ª parte — *Harpacticoida* e *Ciclopoida*

EMERITA MARQUES

Centro de Zoologia

(Recebido em 6-VII-1974)

Com a determinação sistemática dos harpacticóides e dos ciclopóides, dá-se por findo o estudo dos copépodes colhidos de Agosto a Novembro de 1969 no arquipélago de Cabo Verde, pela Missão de Estudos Zoológicos do Ultramar. Das 20 espécies determinadas, 5 harpacticóides e 6 ciclopóides parece não terem ainda sido assinaladas nas águas do arquipélago.

In this working the author presents *Harpacticoida* and *Cyclopoida* copepods occurring in plankton samples made from Missão Zoológica do Ultramar of Centro de Zoologia of Lisbon in the surface waters of the Cabo Verde islands. The author suppose that 5 *Harpacticoida* species and 6 *Cyclopoida* species did not at the present registered in the waters of the Cabo Verde archipelago.

Com este trabalho termina-se o estudo sistemático dos copépodes contidos nas amostras colhidas no arquipélago de Cabo Verde, de Agosto a Novembro de 1969, pela Missão de Estudos Zoológicos do Ultramar. Nesta 2.ª parte apenas nos ocupámos das ordens *Harpacticoida* e *Ciclopoida,* visto a *Calanoida,* que constituiu a 1.ª parte desta contribuição, já ter sido publicada. Todas as indicações referentes às colheitas se encontram na 1.ª parte.

Registaram-se 20 espécies de copépodes: 6 de harpacticóides e 14 de ciclopóides. Dos 6 harpacticóides que determinámos, posto que, de um modo geral, sejam espécies de águas temperadas e tropicais, não encontrámos qualquer indicação referente à sua presença nas águas do arquipélago de Cabo Verde, excepção feita à espécie *Miracia efferata,* que Seguin em 1966 cita como rara nas águas desta região.

Dos 14 ciclopóides registados cremos que oito espécies ainda não tinham sido citadas das águas do arquipélago.

HARPACTICOIDA

ECTINOSOMIDAE

Microsetella Brady & Robertson, 1873

Microsetella rosea (Dana)

(*Harpacticus roseus* Dana, 1884)

Microsetella rosea Giesbrecht, 1892, p. 550, est. XLIV; A. Scott, 1909, p. 199; Farran, 1929, p. 297; Wilson, 1932, p. 177, fig. 122; Rose, 1933, p. 287, fig. 365; Mori, 1937, p. 116, est. LXIV;

Quadro das espécies identificadas e sua distribuição pelas amostras

Espécies	Número das amostras										
	1	2	4	5	6	8	9	10	11	12	13
Microsetella rosea	R	—	C	C	R	C	C	C	R	A	C
Clytemnestra scutellata	—	—	R	R	—	—	—	R	—	—	—
Miracia efferata	—	C	—	—	—	—	—	—	—	C	R
Macrosetella gracilis	—	A	R	—	R	C	C	C	C	A	C
Metamphiascopsis hirsutus	—	—	—	—	—	R	—	—	—	—	—
Laophonte cornuta	—	—	—	R	—	—	—	—	—	—	—
Oithona plumifera	C	C	A	A	A	A	A	C	A	A	C
Oithona nana	R	—	—	—	—	—	—	—	R	C	C
Oncaea conifera	—	—	—	—	—	R	—	—	—	—	—
Oncaea venusta	—	C	—	—	—	C	C	—	R	—	—
Oncaea venusta var. *venella*	C	C	C	—	C	—	C	C	C	C	C
Oncaea sp. (juv.)	—	—	—	C	—	—	—	—	—	—	—
Lubbockia squillimana	—	—	—	—	—	C	R	R	—	—	—
Sapphirina auronitens	—	R	—	—	—	R	—	—	—	—	—
Sapphirina nigromaculata	—	—	—	—	—	R	R	—	R	R	—
Sapphirina ovatolanceolata	—	C	—	—	—	—	—	—	—	—	—
Copilia mirabilis	—	C	R	—	R	C	C	—	R	C	R
Copilia quadrata	—	—	—	—	—	R	R	—	R	—	—
Corycaeus (Corycaeus) speciosus	—	A	—	—	C	A	C	R	A	C	R
Corycaeus (Onycocorycaeus) ovalis	—	R	—	—	—	R	R	—	C	R	R
Farranula gracilis	C	A	A	C	A	A	C	C	A	C	A

A — abundante (mais de 20); C — comum (5 a 20); R — raro (inferior a 5).

Sewell, 1947, p. 289; Lang, 1948, p. 232, fig. 122; Marques, 1957, p. 12; Neto & Paiva, 1966, p. 35; Estrada, 1970, p. 250.

MATERIAL E LOCALIDADES — 103 ♀♀ presentes em todas as amostras, excepto na n.º 2.

Comprimento total: ♀♀ — 0,61 mm a 0,75 mm.

OBSERVAÇÕES — Não se encontrou nenhum ♂; muitas fêmeas apresentavam sacos ovígeros. Alguns dos exemplares observados, principalmente os das amostras n.os 1, 9 e 13, tinham ainda o corpo rosado, e mais nítido na extremidade do urossoma e nas patas.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões quentes dos oceanos Atlântico, Índico e Pacífico e mares Mediterrâneo e Vermelho.

Não conhecemos qualquer indicação de ter sido capturada no arquipélago de Cabo Verde.

PSEUDO-PELTIDIIDAE

Clytemnestra Dana, 1848

Clytemnestra scutellata Dana

Clytemnestra rostrata Th. Scott, 1894, p. 106, ests. XII e XIII.

Clytemnestra scutellata Giesbrecht, 1892, p. 566, ests. I e XLV; Sars, 1921, p. 100, est. XLIX; Rose, 1933, p. 291, fig. 370; Mori, 1937, p. 118, est. LXV; Wilson, 1942, p. 178; Klie, 1943, fig. 4; Sewell, 1947, p. 291; Lang, 1948, p. 461, fig. 195, 1; Owre & Foyo, 1967, p. 104, figs. 764 a 766; Vilela, 1968, p. 44, est. XVII.

MATERIAL E LOCALIDADES — 1 ♂, 2 ♀♀ adultas e 1 ♀ juv. nas amostras n.os 4, 5 e 10.

Comprimento total: ♂ — 0,93 mm; ♀♀ — 0,94 mm a 0,99 mm; ♀ juv. — 0,69 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Águas temperadas e tropicais dos oceanos Atlântico, Pacífico e Índico e mar Vermelho.

Não temos conhecimento de que tenha sido registada no arquipélago de Cabo Verde.

MIRACIDAE

Miracia Dana, 1846

Miracia efferata Dana

Miracia efferata, Brady, 1883, p. 102, est. XLIII; Giesbrecht, 1892, p. 563, est. XLV; Th. Scott, 1894, p. 102; Farran, 1929, p. 54; Wilson, 1932, p. 284,

fig. 176; Sewell, 1947, p. 291; Lang, 1948, p. 768, fig. 311, 1; Marques, 1956, p. 200, est. II (*a-c*); Owre & Foyo, 1967, p. 105, figs. 23, 267 e 268.

MATERIAL E LOCALIDADES — 12 ♂♂, 10 ♀♀ e 4 imaturos, colhidos nas amostras n.os 2, 12 e 13.

Comprimento total: ♂♂ — 1,46 mm a 1,84 mm; ♀♀ — 1,48 mm a 1,75 mm.

OBSERVAÇÕES — Os jovens apresentavam os olhos vermelho-vivos, ao passo que os adultos os mostravam azul-escuros quase negros.

DISTRIBUIÇÃO GEOGRÁFICA — Águas das regiões tropicais, subtropicais e temperadas dos oceanos Atlântico, Pacífico e Índico.

Espécie citada como rara na região de Cabo Verde por Seguin em 1966.

Macrosetella A. Scott, 1909

Macrosetella gracilis (Dana)

Setella gracilis, Brady, 1883, p. 108, est. L; Giesbrecht, 1892, p. 559, ests. I e XLV; Th. Scott, 1894, p. 109; Mori, 1937, p. 115, est. LXIV.

Macrosetella gracilis, A. Scott, 1909, p. 230; Früchtl, 1924, p. 104; Rose, 1933, p. 288, fig. 367; Wilson, 1932, p. 281, fig. 174, e 1942, p. 230; Sewell, 1947, p. 290; Lang, 1948, p. 770, fig. 311; Marques, 1956, p. 201; 1957, p. 12; Neto & Paiva, 1966, p. 36; Owre & Foyo, 1967, p. 105, figs. 772-774.

MATERIAL E LOCALIDADES — 30 ♂♂, 38 ♀♀ e vários imaturos distribuídos por 8 amostras, n.os 2, 4, 6, 8, 9, 11, 12 e 13.

Comprimento total: ♂♂ — 1,12 mm a 1,39 mm; ♀♀ — 1,33 mm a 1,68 mm.

OBSERVAÇÕES — Muitas fêmeas com sacos ovígeros.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões temperadas e tropicais dos oceanos Atlântico, Pacífico e Índico e mar Mediterrâneo.

Não conhecemos nenhuma citação de esta espécie ter sido colhida nas águas de Cabo Verde.

DIOSACCIDAE

Metamphiascopsis Lang, 1948

Metamphiascopsis hirsutus (Thompson & A. Scott) (fig. 1)

Dactylophusia hirsuta Thompson & A. Scott, 1903, p. 269, est. IX.

Amphiascus hirsutus Monard, 1928, p. 364, 384; A. Scott, 1909, p. 221.

Metamphiascopsis hirsutus, Lang, 1948, p. 683, fig. 275, 1.

MATERIAL E LOCALIDADES — 1 ♀, colhida na amostra n.º 8.

Comprimento total: ♀ — 1,14 mm.

OBSERVAÇÕES — A única fêmea encontrada mantinha-se ainda com um certo colorido. A antena (fig. 1) com a base azul e o ápice roxo. O rostro azul e as sedas furcais rosadas com a cor mais acentuada na base.

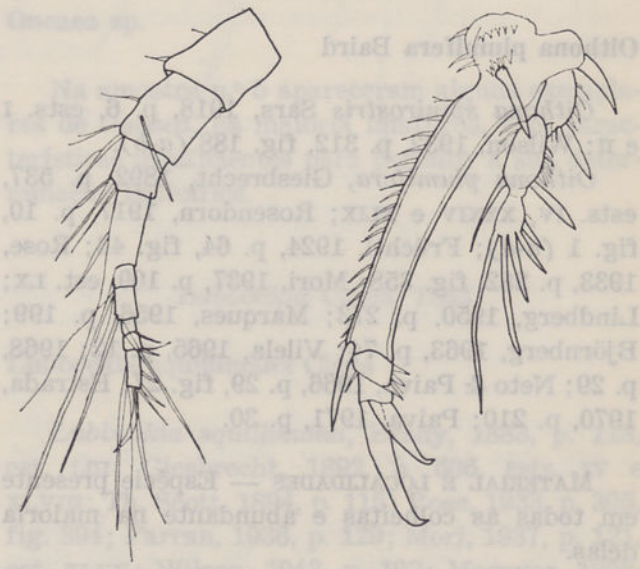


Fig. 1 — *Metamphiascopsis hirsutus* (♀ antenula e primeiro par de patas)

DISTRIBUIÇÃO GEOGRÁFICA — Mar Mediterrâneo, Banyuls, Argélia e Ceilão.

Supomos que não foi ainda registada no arquipélago de Cabo Verde.

LAOPHONTIDAE

Laophonte Philippi, 1840

Laophonte cornuta Philippi

Laophonte serrata Th. Scott, 1894, p. 96, est. XII.

Laophonte cornuta, Sars, 1911, p. 235, ests. CLVII e CLVIII; Monard, 1928, p. 415, fig. 39; Wilson, 1932, p. 275, fig. 171; Lang, 1948, p. 1347, figs. 543 e 544; Marques, 1957, p. 21, est. II (*a-b*).

MATERIAL E LOCALIDADES — 1 ♂, encontrado na amostra n.º 5.

Comprimento total: ♂ — 0,67 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico, Norte de África, Guiné Portuguesa, Golfo da Guiné (Acra), mar Mediterrâneo e oceano Índico.

Não conhecemos qualquer citação das águas de Cabo Verde.

CICLOPOIDA

OITHONIDAE

Oithona Baird, 1843

Oithona plumifera Baird

Oithona spinirostris Sars, 1918, p. 6, ests. I e II; Wilson, 1932, p. 312, fig. 188 *(a-b)*.

Oithona plumifera, Giesbrecht, 1892, p. 537, ests. IV, XXXIV e XLIX; Rosendorn, 1917, p. 10, fig. 1 *(a-d)*; Früchtl, 1924, p. 64, fig. 43; Rose, 1933, p. 282, fig. 358; Mori, 1937, p. 109, est. LX; Lindberg, 1950, p. 273; Marques, 1956, p. 199; Björnberg, 1963, p. 74; Vilela, 1965, p. 12; 1968, p. 29; Neto & Paiva, 1966, p. 29, fig. 27; Estrada, 1970, p. 210; Paiva, 1971, p. 30.

MATERIAL E LOCALIDADES — Espécie presente em todas as colheitas e abundante na maioria delas.

Comprimento total: ♂♂ — 0,61 mm a 0,66 mm; ♀♀ — 1,1 mm a 1,23 mm.

OBSERVAÇÕES — Nalgumas das fêmeas, apesar de conservadas em formol a 4 %, notavam-se as sedas plumosas, coloridas e perfeitamente nítidas. Também na maioria, se não no total, é bem visível o tufo de pêlos central no segmento genital, que, segundo Rosendorn, não se encontra em nenhuma outra espécie.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões tropicais e temperadas dos oceanos Atlântico, Índico e Pacífico e mares do Norte, Mediterrâneo e Vermelho.

Espécie registada do arquipélago de Cabo Verde por Paiva em 1971.

Oithona nana Giesbrecht

Oithona nana Giesbrecht, 1892, p. 541, ests. IV, XXXIV e XLIV; Rosendorn, 1917, p. 40, fig. 24 *(a-d)*; Früchtl, 1924, p. 70; Pesta, 1928, p. 76, fig. 58 *(a-c)*; Rose, 1933, p. 281, fig. 357; Mori, 1937, p. 113, est. LXIII; Marques, 1956, p. 199, e 1957, p. 4; Estrada, 1970, p. 213.

MATERIAL E LOCALIDADES — 30 ♀♀, distribuídas pelas amostras n.ºs 1, 11, 12 e 13.

Comprimento total: ♀♀ — 0,57 mm a 0,67 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico temperado e quente, Guiné Portuguesa, oceanos Índico e Pacífico e mares Mediterrâneo, Negro, Adriático e Vermelho.

ONCAEIDAE

Oncaea Philippi, 1843

Oncaea conifera Giesbrecht (fig. 2)

Oncaea conifera Giesbrecht, 1892, p. 591, ests. II e XLVII; Rose, 1933, p. 298, fig. 381; Farran, 1929, p. 285; 1936, p. 127, figs. 25 *(a-f)* e 26 *(a-c)*; Mori, 1937, p. 120, est. XLVI; Sewell, 1947; p. 259; Marques, 1957, p. 5; Owre & Foyo, 1967, p. 111, figs. 807 a 811; Neto & Paiva, 1966, p. 31; Estrada, 1970, p. 220.

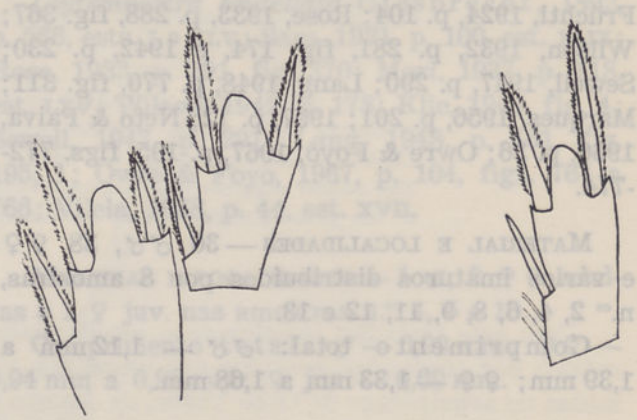


Fig. 2 — *Oncaea conifera* (♀ terceiro ramo interno de P_2, P_3 e P_4)

MATERIAL E LOCALIDADES — 1 ♀ adulta, colhida na amostra n.º 8.

Comprimento total: ♀ — 1,16 mm.

OBSERVAÇÕES — O espécime estudado apresenta muitas semelhanças com a «forma Angola» por nós descrita em 1958, p. 6. No entanto, há certas divergências, tais como: um menor comprimento, 1,16 mm, para o nosso exemplar, ao

passo que a «forma Angola» mede de 1,23 mm a 1,32 mm; a saliência dorsal do segundo segmento torácico é pequena e não «bem marcada», e os ramos furcais são menores (duas vezes e meia tão compridos como largos). Comparando-o com qualquer das outras «formas», somos levados a concluir que é a «forma Angola» aquela em que teremos de incluir o exemplar único de Cabo Verde.

DISTRIBUIÇÃO GEOGRÁFICA — Nova Zelândia, oceano Atlântico, mar Mediterrâneo, mar Vermelho, arquipélago Malaio, oceano Índico, mar da Arábia, costa leste da África e oceano Antárctico.

Posto que seja uma espécie de dispersão quase cosmopolita, não encontramos nenhuma citação para o arquipélago de Cabo Verde.

Oncaea venusta Philippi

Oncaea venusta, Giesbrecht, 1892, p. 590, ests. II, III e XLVII; Früchtl, 1924, p. 88; Farran, 1929, p. 284, fig. 33; Wilson, 1932, p. 353, fig. 213 (*a-d*); Rose, 1933, p. 296, fig. 376; Mori, 1937, p. 119, est. XLVI; Sewell, 1947, p. 263; Marques, 1958, p. 5; Vilela, 1965, p. 14; 1968, p. 31; Neto & Paiva, 1966, p. 30, fig. 29; Owre & Foyo, 1967, p. 111, figs. 3 e 823 a 825; Estrada, 1970, p. 216; Paiva, 1971, p. 30.

MATERIAL E LOCALIDADES — 11 ♂♂ e 32 ♀♀ colhidos nas amostras n.os 2, 8, 9 e 11.

Comprimento total: ♂♂ — 0,88 mm a 0,96 mm; ♀♀ — 0,92 mm a 1,39 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico temperado e tropical, mares Mediterrâneo, Adriático e Vermelho e oceanos Pacífico e Índico.

Espécie já citada das águas de Cabo Verde por Seguin em 1966 e por Paiva em 1971.

Oncaea venusta var. **venella** Farran

Oncaea venusta var. *venella* Farran, 1929, p. 284, fig. 33; Rose, 1933, p. 297, fig. 377; Sewell, 1947, p. 263; Marques, 1956, p. 199, est. I (*d-e*); Neto & Paiva, 1966, p. 30, fig. 30; Estrada, 1970, p. 216; Paiva, 1971, p. 31.

MATERIAL E LOCALIDADES — 48 ♂♂ e 87 ♀♀ presentes em todas as amostras, excepto nas n.os 5 e 8.

Comprimento total: ♂♂ — 0,61 mm a 0,84 mm; ♀♀ — 0,82 mm a 1,02 mm.

OBSERVAÇÕES — É uma das espécies mais abundantemente representadas nesta colecção, encontrando-se na maioria das colheitas apenas a forma *venella,* mas em três delas, nas n.os 2, 9 e 11, verificámos a existência da forma *typica* e da forma *venella* simultaneamente. A coloração púrpura perfeitamente nítida. Muitas fêmeas apresentavam-se com sacos ovígeros.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico, S. Tomé, Angola, mar da Arábia e Nova Zelândia.

Citada do arquipélago por Paiva em 1971.

Oncaea sp.

Na amostra n.º 5 apareceram alguns exemplares de *Oncaea,* na maioria imaturos, com características insuficientes para permitir a sua determinação específica.

Lubbockia Claus, 1863

Lubbockia squillimana Claus

Lubbockia squillimana, Brady, 1883, p. 118, est. LIII; Giesbrecht, 1892, p. 606, ests. IV e XLVIII; Th. Scott, 1894, p. 115; Rose, 1933, p. 305, fig. 394; Farran, 1936, p. 129; Mori, 1937, p. 121, est. XLVII; Wilson, 1942, p. 192; Marques, 1958, p. 6, est. III (*e*); Neto & Paiva, 1966, p. 32; Owre & Foyo, 1967, p. 113, figs. 75, 832 e 833; Estrada, 1970, p. 227.

MATERIAL E LOCALIDADES — 11 ♀♀, distribuídas pelas amostras n.os 8, 9 e 10.

Comprimento total: ♀♀ — 1,43 mm a 1,56 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico, mar Mediterrâneo e oceano Pacífico.

SAPPHIRINIDAE

Sapphirina J. V. Thompson, 1829

Sapphirina auronitens Claus (fig. 3)

Sapphirina auronitens, Giesbrecht, 1892, ests. IV, LII, LIII e LIV; Wilson, 1932, p. 365, fig. 222; Mori, 1937, p. 127, est. LXX; Estrada, 1970, p. 230.

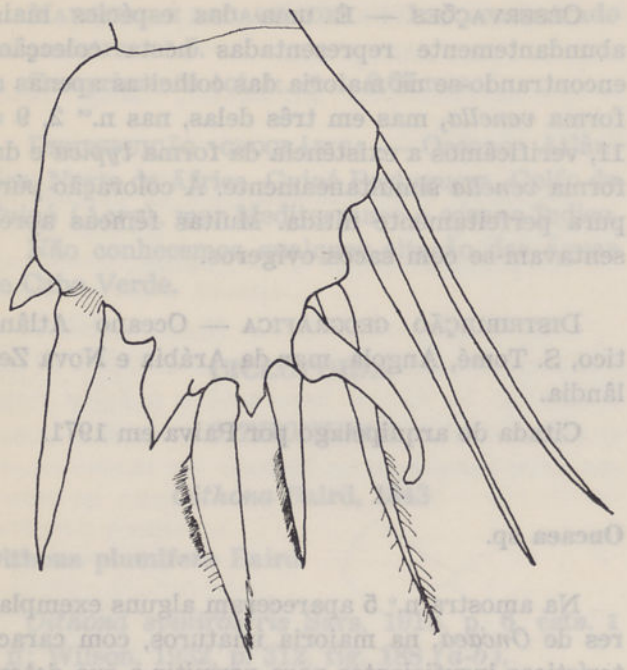


Fig. 3 — *Sapphirina auronitens* (♂ terceiro ramo interno do P_2)

Sapphirina sinuicauda Brady, 1883, p. 129, est. XLIX; Giesbrecht, 1892, p. 624, ests. LII, LIII e LIV; Th. Scott, 1894, p. 125; A. Scott, 1909, p. 258; Sewell, 1947, p. 268.

Sapphirina pyrosomatis Giesbrecht, 1892, p. 624, ests. LII, LIII e LIV; Wilson, 1932, p. 366, fig. 223.

Sapphirina auronitens — sinuicauda Lehnhofer, 1929, p. 289, figs. 22 a 28, 50 e 60; Rose, 1933, p. 314, figs. 408 a 411.

MATERIAL E LOCALIDADES — 1 ♂ e 1 ♀, colhidos nas amostras n.os 2 e 8.

Comprimento total: ♂ — 1,30 mm; ♀ — 1,31 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Águas temperadas e tropicais dos oceanos Atlântico, Pacífico e Índico e mares Mediterrâneo, Adriático e Vermelho.

Não conhecemos qualquer citação da sua existência nas águas de Cabo Verde.

Sapphirina nigromaculata Claus

Sapphirina inaequalis, Brady, 1883, p. 124, est. XLVIII; Th. Scott, 1894, p. 122.

Sapphirina nigromaculata, Giesbrecht, 1892, p. 619, ests. LII, LIII e LIV; Pesta, 1912, p. 60, fig. 26 (*c*); Lehnhofer, 1929, p. 304, figs. 38 a 41, 65 e 66; Wilson, 1932, p. 372, fig. 228; Rose, 1933, p. 312, fig. 406; Mori, 1937, p. 129, est. LXX; Sewell, 1947, p. 246; Marques, 1958, p. 7; Neto & Paiva, 1966, p. 34; Owre & Foyo, 1967, p. 116, figs. 845 a 849; Estrada, 1970, p. 228.

MATERIAL E LOCALIDADES — 3 ♀♀ e 4 juv. nas amostras n.os 8, 9, 11 e 12.

Comprimento total: ♀♀ adultas — 1,36 mm a 1,94 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Oceanos Atlântico (temperado e tropical), Pacífico e Índico e mar Vermelho.

Registada de regiões próximas, mas não do arquipélago de Cabo Verde.

Sapphirina ovatolanceolata Dana

Sapphirina ovatolanceolata, Giesbrecht, 1892, p. 618, ests. I, LII e LIV; A. Scott, 1909, p. 257; Wilson, 1932, p. 369, fig. 225; Estrada, 1970, p. 232; Paiva, 1971, p. 39.

Sapphirina gemma Brady, 1883, p. 127, est. XLVIII; Giesbrecht, 1892, p. 620, ests. LII, LIII e LIV; Wilson, 1932, p. 368, fig. 224; Mori, 1937, p. 125, est. XLVIII.

Sapphirina ovatolanceolata — gemma Lehnhofer, 1929, p. 298, figs. 33 a 37, 63 e 64; Rose, 1933, p. 318, fig. 415; Sewell, 1947, p. 268.

MATERIAL E LOCALIDADES — 6 ♀♀ adultas e 4 jovens na amostra n.º 2.

Comprimento total: ♀♀ adultas — 1,71 mm a 2,09 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Águas tropicais, subtropicais e temperadas dos oceanos Atlântico, Índico e Pacífico, mares Mediterrâneo, Adriático e Vermelho e arquipélago Malaio.

Citada do arquipélago de Cabo Verde por Paiva em 1971.

Copilia Dana, 1849

Copilia mirabilis Dana

(*Sapphirina stylifera* Lübbock, 1856)
(*Copilia atlantica* Lübbock, 1856)

Copilia mirabilis, Brady, 1883, est. LIII; Giesbrecht, 1892, p. 650, est. L; Th. Scott, 1894, p. 113; A. Scott, 1909, p. 260; Lehnhofer, 1926,

p. 135, figs. 3, 4 e 13; Wilson, 1932, p. 374, fig. 229; 1942, p. 179; Rose, 1933, p. 322, fig. 419; Mori, 1937, p. 139, est. LXXVIII; Sewell, 1947, p. 270; Marques, 1957, p. 8, ests. I, *b*, e II, *d*; Neto & Paiva, 1966, p. 34; Paiva, 1971, p. 40, fig. 9.

MATERIAL E LOCALIDADES — 3 ♂♂, 29 ♀♀ e vários imaturos colhidos nas amostras n.os 2, 4, 6, 8, 9, 11, 12 e 13.

Comprimento total: ♂♂ — 5,28 mm a 5,92 mm; ♀♀ — 2,69 mm a 4,03 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões tropicais e temperadas dos oceanos Atlântico, Pacífico e Índico e mar Mediterrâneo.

Espécie já registada de Cabo Verde por Seguin em 1966 e por Paiva em 1971 e próximo do arquipélago por Wolfenden, 1911.

Copilia quadrata Dana

Copilia quadrata, Giesbrecht, 1892, p. 647, ests. II e L; Th. Scott, 1894, p. 113; A. Scott, 1909, p. 261; Lehnhofer, 1926, pp. 130 e 140, figs. 10 a 16; Farran, 1929, p. 291; 1936, p. 134; Rose, 1933, p. 323, fig. 421; Mori, 1937, p. 140, ests. LXXV e LXXIX; Sewell, 1947, p. 271; Neto & Paiva, 1966, p. 35; Owre & Foyo, 1967, p. 119, figs. 30 e 871 a 873; Estrada, 1970, p. 233.

MATERIAL E LOCALIDADES — 4 ♀♀ adultas e 3 jovens, nas amostras n.os 8, 9 e 11.

Comprimento total: ♀♀ adultas — 4,42 mm a 4,58 mm.

OBSERVAÇÕES — Os exemplares das colheitas n.os 8 e 9 apresentavam-se com a região distal dos ramos furcais cor de zarcão nítido.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões tropicais e temperadas dos oceanos Atlântico, Índico e Pacífico, mares Mediterrâneo e Adriático e arquipélago Malaio.

CORYCAEIDAE

Corycaeus Dana, 1849

Corycaeus (Corycaeus) speciosus Dana

Corycaeus speciosus, Brady, 1883, p. 115, est. LIV; Giesbrecht, 1892, p. 660, est. LI; Th. Scott, 1894, p. 112; Mori, 1937, p. 113, est. LXXII.

Corycaeus (Corycaeus) speciosus Dahl, 1912, p. 13, ests. I e II; Früchtl, 1924, p. 102; Rose, 1933, p. 326, fig. 422; Sewell, 1947, p. 276; Marques, 1958, p. 14; Motoda, 1963, p. 213, fig. 34; Neto & Paiva, 1966, p. 32, fig. 33; Estrada, 1970, p. 235.

MATERIAL E LOCALIDADES — Espécie presente em oito amostras (n.os 2, 6, 8, 9, 10, 11, 12 e 13) e abundante em três delas e representada por 17 ♂♂ e 59 ♀♀.

Comprimento total: ♂♂ — 1,64 mm a 1,88 mm; ♀♀ — 2,01 mm a 2,26 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões tropicais e temperadas dos oceanos Atlântico, Pacífico e Índico.

Espécie registada na região de Cabo Verde em 1966, por Seguin.

Onychocorycaeus M. Dahl, 1912

Corycaeus (Onychocorycaeus) ovalis Claus

Corycaeus obtusus Giesbrecht, 1892, p. 637, ests. XLIX e LI.

Corycaeus ovalis, Farran, 1929, p. 296; Wilson, 1932, p. 359, fig. 218; 1942, p. 182; Mori, 1937, p. 136, est. LXXIV.

Corycaeus (Onychocorycaeus) ovalis Dahl, 1912, p. 96, est. XIII; Rose, 1933, p. 331, fig. 429; Vilela, 1968, p. 40, est. XV; Estrada, 1970, p. 244.

MATERIAL E LOCALIDADES — 22 ♀♀ distribuídas por seis amostras (n.os 2, 8, 9, 11, 12 e 13).

Comprimento total: ♀♀ — 1,12 mm a 1,18 mm.

DISTRIBUIÇÃO GEOGRÁFICA — Regiões tropicais e temperadas dos oceanos Atlântico, Pacífico e Índico e mares Mediterrâneo e Vermelho.

Não conhecemos qualquer citação desta espécie nas águas do arquipélago de Cabo Verde.

Farranula Wilson, 1932

Farranula gracilis (Dana)

Corycaeus (Corycella) gracilis Dahl, 1912, p. 108, ests. XIV e XV; Marques, 1958, p. 18.

Corycaeus pellucidus, Brady, 1883, p. 112, est. III; Th. Scott, 1894, p. 110.

Corycella gracilis, Farran, 1929, p. 296; Björnberg, 1963, p. 85, fig. 47; Gaudy, 1963, p. 33; Neto & Paiva, 1966, p. 34.

Farranula gracilis, Wilson, 1942, p. 187, fig. 34; Owre & Foyo, 1967, p. 124, figs. 896 e 897; Paiva, 1971, p. 34.

MATERIAL E LOCALIDADES — Espécie presente em todas as amostras e abundante em muitas delas.

Comprimento total: ♂♂ — 0,77 mm a 0,89 mm; ♀♀ — 0,92 mm a 0,99 mm.

OBSERVAÇÕES — Encontrou-se grande número de fêmeas ovadas.

DISTRIBUIÇÃO GEOGRÁFICA — Oceano Atlântico, Angola (Marques, 1958), S. Tomé (Scott, 1894) e oceano Pacífico.

Espécie registada das águas do arquipélago de Cabo Verde por M. Dahl em 1912 e por Paiva em 1971.

BIBLIOGRAFIA

BRADY, G. P. — «Report on the Copepoda collected by H. M. S. 'Challenger' 1873-76». *Rep. Challenger Exped. Zool.,* Londres, 8, 1883.

BJÖRNBERG. T. — «On the marine Free-living Copepoda of Brazil». *Bol. Inst. Ocean. S. Paulo XIII,* S. Paulo, (1), 1963.

DAHL, M. — «Die Copepoden der Plankton — Expedition. I Die Corycaeinen». *Erg. Plankt. Exped. Humboldt--Stiftung,* Leipzig, Bd II, Gf I, 1912.

ESTRADA, J. C. — «Contribución al conocimiento del Plancton de Canarias». *Univ. Madrid, Faculd. Ciencias,* Madrid, 1970.

FARRAN, G. P. — «Copepoda British Antarctic 'Terra Nova' Exped. 1910». *Nat. Hist. Rept. Zool.,* Londres, VIII (3), 1929.

—— «Copepoda». *Sci. Repts. Great Barrier Reef Exped. 1928-29,* Londres, V (3), 1936.

FRÜCHTL, F. — «Die Cladoceren und Copepoden Fauna des Aru-Archipels». *Arb. Zool. Ins. Univ. Innsbruck,* Berlim, II (2), 1924.

GAUDY, R. — «Copépodes pélagiques. Camp. nav. océan. *Calypso* dans les eaux côtières du Brésil (Jan.-Fev. 1962)». *Rec. Trav. St. Mar. Endoume, Bull.,* Marselha, 30 (45), 1963.

GIESBRECHT, W. — «Sistematik und Faunistik der Pelagischen Copepoden des Golfes von Neapel». *Fauna und Flora des Golfes von Neapel,* Berlim, 19, 1892.

LANG, K. — *Monographie der Harpacticiden,* Lund, 1, 2, 1948.

LEHNHOFER, K. — «Copepoda 2. *Copilia* DANA 1849». *Wiss. Ergeb. Deutsch Tiefsee-Exped. «Valdivia»,* Jena, 23 (3), 1926.

—— «Copepoda 5. *Sapphirina* J. V. THOMPSON, 1829». *Idem,* Jena, 21 (5), 1929.

LINDBERG, K.—«Cyclopoïdes nouveaux ou peu connus». *Mem. Mus. Nat. Hist. Nat.,* nouv. sér., Paris, t. XXIX (3), 1950.

MARQUES, E. — «Copépodes marinhos de S. Tomé». *Conf. Int. Afric. Ocid., S. Tomé,* S. Tomé, 4, 1956, pp. 193-206, 2 est.

—— «Nova contribuição para o conhecimento dos copépodes da Guiné Portuguesa». *An. J. I Ul.,* Lisboa, 10 (4), 1957.

—— «Copépodes dos mares de Angola. II. *Ciclopoida* e *Harpacticoida.* Trabalhos da Missão de Biologia Marítima, Campanhas de Angola». *An. J. I. Ul.,* Lisboa, 12 (2), 1958.

MONARD, A. — «Les harpacticoïdes marins de Banyuls». *Arch. Zool. Exp. Générale Paris,* Paris, 1928, pp. 259-443.

MORI, T. — *The pelagic copepoda from the neighbouring waters of Japan,* Tóquio, 1937 (1.ª ed.) e 1964 (2.ª ed.).

MOTODA, S. — «*Corycaeus* and *Farranula* in Hawaiian waters». *Publ. Seto Mar. Biol. Laboratory,* Japão, 11 (2), 1963, pp. 209-262, 29 figs.

NETO, S. & PAIVA, I. — «Ciclo anual do zooplâncton colhido na Baía Farta em 1960». *Not. Mimeogr. Centro Biol. Aquat. Trop.,* Lisboa, (2), 1966.

OWRE, H. B. & FOYO, M.— «Copepods of the Florida Current. *Fauna Caribaea,* No. 1, Crustacea. Part I — Copepoda». *Inst. Mar. Sci. Univ. Miami,* 1967.

PAIVA, I. — «Nova contribuição para o conhecimento dos copépodes das ilhas de Cabo Verde». *J. I. U., Notas Cent. Biol. Aquat. Trop.,* Lisboa, (25), 1971.

PESTA, O. — «Crustacean, I. Teil — Copepoden aus dem Golf von Persian. Wiss. Erg. Expedition nach Mesopotamien». *Ann. Nat. Hofmuseums,* Bd XXVI 1.2. Viena, 1912.

—— «Krebstiere oder Crustacea. 1. *Calanoida.* 2. *Cyclopoida». Die Tierwelt Deutschlands,* Jena, 9, Teil, 1928.

ROSE, M. — «Copépodes pélagiques». *Faune de France,* Paris, 26, 1933, 374 p.

ROSENDORN, I. — «Die Gattung *Oithona». Wiss. Erg. Deutschen Tiefsee Exp. «Valdivia» 1898-99,* Jena, 23, 1917, pp. 1-58, 27 figs.

SARS, G. O. — «Copepoda *Harpacticoida». Crustacea of Norway,* Bergen, 5, 1911, p. 449, 284 est.

—— «Copepoda *Cyclopoida». Crustacea of Norway,* Bergen, 6, 1918, p. 225, 118 est.

—— «Copepoda supplement». *Crustacea of Norway,* Bergen, 7, 1921, p. 121, 76 est.

SCOTT, A. — «Copepoda of the Silboga Exped. Part I. Free-swimming litoral and semi-parasitic copepoda». *Siboga Exp.,* 29, 1909, 323 p., 68 pls.

SCOTT, TH. — Report on Entomostraca from the Gulf of Guinea». *Trans. Linn. Soc. London, Zool.,* ser. 2, Londres, 6, 1894, 161 p., 15 pls.

SEGUIN, G. — «Sur le zooplancton récueilli par le *Coriolis* au large des côtes d'Afrique occidentale». *Bull. IFAN*, Dakar, 24, s. A. (4), 1966, pp. 1332-1355, 2 figs.

SEWELL, R. B. S. — «The free-swimming planktonic copepoda. John Murray Exped. 1933-34». *Sci. Rept. Zool.*, Londres, 8, 1947, p. 303, fig. 71.

VILELA, M. H. — «Copépodes da ria de Faro-Olhão. *Notas e Est. Inst. Biol. Marítima*, Lisboa, 31, 1965, pp. 1-38, 8 ests.

—— «Copépodes da campanha do N. R. P. *Faial*, 1958-59», *Notas e Est. Inst. Biol. Marítima*, Lisboa, 35, 1968, pp. 1-55, 17 ests.

WILSON, C. B. — «The copepods of the Woods Hole Region, Massachusetts». *Bull. U. S. Nat. Mus.*, Washington, 158, 1932, pp. 1-633, 41 ests., 316 figs.

—— «The copepoda of the Plankton gathered during the last cruise of the *Carnegie*». *Scient. Res. of Cruise VIII of the Carnegie 1928-29. Publ. Carnegie Inst.*, Washington, 1942.

en todas as amostras e abundante em muitas delas.

Comprimento total: ♂♂ — 0,77 mm a 0,80 mm; ♀♀ — 0,92 mm a 0,99 mm.

BIBLIOGRAFIA

Goniodidés *(Mallophaga, Ischnocera)* parasites des Columbiformes: diagnose générique et position phylogénétique (1)

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(Recebido em 1-X-1974)

Esta comunicação tem por finalidade definir a posição taxonómica dos géneros de Goniodídeos dos Columbiformes, respectivamente *Saussurites* Tendeiro, 1971, *Auricotes* Kéler, 1939, *Physconelloides* Ewing, 1927, *Campanulotes* Kéler, 1939, *Coloceras* Taschenberg, 1882, *Coloceroides* Tendeiro, 1972, *Patellinirmus* Tendeiro, 1972, *Altericornu* Tendeiro, 1969, *Stephanius* Tendeiro, 1969, *Nitzschiella* Kéler, 1939, *Nitzschielloides* Tendeiro, 1969, *Ancistrodes* Kéler, 1939, e *Kodocephalon* Kéler, 1939. Estabeleceram-se chaves dicotómicas para estes géneros, baseadas nos seguintes caracteres: 1 — dimorfismo sexual na região ocular *(Nitzschiella, Coloceroides)* ou temporal *(Altericornu)*; 2 — clavas com uma protuberância nodosa ventral retrógrada *(Auricotes)* ou prolongadas por processos laterais, associados *(Physconelloides)* ou não *(Stephanius)* a processos ventrais paramedianos; 3 — antenas fortemente dimorfas *(Coloceras, Coloceroides, Nitzschiella, Ancistrodes, Kodocephalon)*; 4 — bandas temporais marginais reforçadas por uma larga banda quitinizada *(Campanulotes)*; 5 — abdome foliáceo *(Nitzschiella, Nitzschielloides)*; 6 — placas pleurais simples, estreitas, com uma extensão ântero-interna recurva *(Saussurites)*, sem esta extensão mas com uma incisão interna longitudinal *(Campanulotes)* ou com outra disposição; 7 — aparelho copulador do macho muito especializado *(Kodocephalon, Patellinirmus)*; 8 — abertura genital da fêmea glabra *(Coloceras, Nitzschiela)*, com cerdas espiniformes características *(Auricotes)* ou com outra disposição; 9 — gonapófises presentes nas fêmeas *(Coloceras, Coloceroides, Nitzschiella, Patellinirmus)*. Finalmente, com base em certos caracteres morfológicos, em particular a estrutura das placas pleurais, a forma da cabeça, o dimorfismo sexual das antenas e da região ocular e a quetotaxia vulvar, o autor discute a posição filogenética relativa dos Goniodídeos dos Columbiformes, bem como as suas possíveis afinidades com os dos Galiformes.

Cette communication a pour objet de préciser la position taxonomique des genres de Goniodidés des Columbiformes, respectivement *Saussurites* Tendeiro, 1971, *Auricotes* Kéler, 1939, *Physconelloides* Ewing, 1927, *Campanulotes* Kéler, 1939, *Coloceras* Taschenberg, 1882, *Coloceroides* Tendeiro, 1972, *Patellinirmus* Tendeiro, 1972, *Altericornu* Tendeiro, 1969, *Stephanius* Tendeiro, 1969, *Nitzschiella* Kéler, 1939, *Nitzschielloides* Tendeiro, 1969, *Ancistrodes* Kéler, 1939, et *Kodocephalon* Kéler, 1939. Des clés dichotomiques ont été établies pour ces genres, appuyées sur les caractères suivants: 1 — dimorphisme sexuel dans la région oculaire *(Nitzschiella, Coloceroides)* ou temporale *(Altericornu)*; 2 — cônes latéraux avec une protubérance noueuse ventrale rétrograde *(Auricotes)* ou prolon-

(1) Communication au III[e] Congrès International de Parasitologie, Munich, août 1974.

gés par des procès latéraux, associés *(Physconelloides)* ou non *(Stephanius)* à des procès ventraux para-médians; 3 — antennes fortement dimorphes *(Coloceras, Coloceroides, Nitzschiella, Ancistrodes, Kodocephalon);* 4 — bandes temporales marginales renforcées par une large bande chitinisée *(Campanulotes);* 5 — abdomen foliacé *(Nitzschiella, Nitzschielloides);* 6 — plaques pleurales simples, étroites, avec une extension antéro-interne courbée *(Saussurites),* sans cette extension mais avec une incision interne longitudinale *(Campanulotes),* ou d'autre sorte; 7 — appareil copulateur du mâle très spécialisé *(Kodocephalon, Patellinirmus);* 8 — vulve glabre *(Coloceras, Nitzschiella),* avec des soies spiniformes caractéristiques *(Auricotes)* ou ayant une autre disposition; 9 — gonapophyses présentes chez les femelles *(Coloceras, Coloceroides, Nitzschiella, Patellinirmus).* La comparaison de quelques caractères morphologiques, en particulier la structure des plaques pleurales, la forme de la tête, le dimorphisme sexuel des antennes et de la région oculaire et la chètotaxie vulvaire, permettent quelques conclusions sur la position phylogénétique relative des Goniodidés des Columbiformes et leurs possibles affinités avec ceux des Galliformes. Il faut conclure, notamment, que les Goniodidés n'ont pas eu une origine monophylétique à partir d'un tronc unique décalquant l'arbre généalogique des hôtes; mais, bien au contraire, que certains d'entre d'eux proviennent des mêmes branches que les formes parasites des Galliformes, représentées, on peut le supposer, par des ancêtres communs, aujourd'hui disparus. Les Goniodidés les moins spécialisés des Columbiformes — *Saussurites, Auricotes* et *Physconelloides* — se rattachent au genre *Goniocotes,* des Galliformes, tandis que les plaques pleurales plus spécialisées des *Campanulotes* en font supposer une parenté avec quelques *Goniodes* s. str. Les genres *Coloceras, Coloceroides* et *Patellinirmus,* ainsi que, dans une certaine mesure, *Altericornu, Stephanius* et *Ancistrodes,* forment un ensemble avec des plaques pleurales pratiquement superposables à celles du genre *Homocerus,* des Galliformes. Avec l'abdomen foliacé et des plaques pleurales très différentes, le genre *Nitzschiella* a en commun avec *Coloceras* la forme des antennes et la présence de gonapophyses — ce qui fait supposer qu'une macromutation serait à son origine. À ce genre se rattachent *Nitzschielloides* et *Coloceroides,* celui-ci avec des caractères communs à *Coloceras. Kodocephalon* est un genre très spécialisé, le seul qu'on rencontre sur les Columbidés de la sous-famille *Gourinae.*

Suite à nos études précédentes sur le même sujet (2), cette communication a pour objet la position taxonomique des genres de Goniodidés des Columbiformes, respectivement *Saussurites* Tendeiro, 1971, *Auricotes* Kéler, 1939, *Physconel-*

(2) J. Tendeiro, «Estudos sobre os Goniodídeos *(Mallophaga, Ischnocera)* des Columbiformes. I — Género *Nitzschiella* Kéler, 1939», *Rev. Ciênc. Vet.,* (A) 2 (1): 1-124, 1969; «II — Descrição de uma nova espécie do género *Physconelloides* Ewing, 1927: *Ph. australiensis* n. sp., parasita da *Phaps ch. chalcoptera* (Latham)», *Rev. Ciênc. Vet.* (Lourenço Marques), (A) 2 (2): 313-331, 1969; «III — Novas observações sobre o género *Nitzschiella* Kéler, 1939, com descrição de uma espécie nova, *N. emersoni* n. sp., parasita da *Columba vitiensis griseigularis* (Walden e Layard)», *id.,* pp. 333-363; «IV — Género *Campanulotes* Kéler, 1939», *ibid.,* pp. 365-466; «V — *Nitzschielloides campanulatus* n. gen. sp., parasita de *Streptopelia* p. *picturata* (Temminck)», *ibid.,* pp. 467-481; «VI — Descrição de dois géneros novos, para três espécies parasitas de Columbídeos do género *Ducula* Hodgson», *ibid.,* pp. 483-532; «VII — Género *Kodocephalon* Kéler, 1939», *ibid.,* pp. 533-576; «VIII — Uma nova espécie para o género *Nitzschiella* Kéler, 1939: *N. hemiphagae* n. sp., parasita da *Hemiphaga novaeseelandiae spadicea* (Latham)», *Rev. Ciênc. Vet.* (Lourenço Marques), (A) 5: 1-15, 1972; «IX — Género *Coloceroides* n. gen., com caracteres comuns a *Coloceras* Taschenberg e *Nitzschiella* Kéler», *ibid.,* pp. 17-53; «X — Descrição do género *Patellinirmus* nov., para três espécies novas parasitas de Columbídeos do género *Hemiphaga* Bonaparte», *ibid.,* pp. 55-99; «XI — Descrição de uma segunda espécie do género *Altericornu* Tendeiro, 1969: *A. marshalli* n. sp., parasita da *Ducula bakeri* (Kinnear)», *ibid.,* pp. 101-126; «XII — Novas observações sobre o género *Kodocephalon* Kéler, 1939», *ibid.,* pp. 127-151; «XIII — Nova espécie do género *Coloceroides* Tendeiro, 1972, parasita da *Columba hodgsoni* (Vigors)», *Rev. Ciênc. Vet.* (Lourenço Marques), (A) 6: 187-195, 1973 (1974); «XIV — Género *Coloceras* Taschenberg, 1882», *ibid.,* pp. 199-524, «XV — Género *Auricotes* Kéler, 1939» (en publication); «XVI — Observações adicionais sobre o género *Nitzschiella* Kéler, 1939, com descrição de quatro espécies novas», *Rev. Ciênc. Vet.* (Lourenço Marques) (en publication); «XVII — Género *Physconelloides* Ewing, 1927» (en préparation); «XVIII — Novas observações sobre os géneros *Campanulotes* Kéler, *Saussurites* Tendeiro e *Stephanius* Tendeiro» (en préparation). — «Quelques relations mutuelles chez les Goniodidés *(Mallophaga, Ischnocera)* des Columbiformes», *Rev. Ciênc. Vet.* (Lourenço Marques), (A) 4: 155-174, 1971.

loides Ewing, 1927, *Campanulotes* Kéler, 1939, *Coloceras* Taschenberg, 1882, *Coloceroides* Tendeiro, 1972, *Patellinirmus* Tendeiro, 1972, *Altericornu* Tendeiro, 1969, *Stephanius* Tendeiro, 1969, *Nitzschiella* Kéler, 1939, *Nitzschielloides* Tendeiro, 1969, *Ancistrodes* Kéler, 1939, et *Kodocephalon* Kéler, 1939.

Les Goniodidés comprennent des *Ischnocera* au corps plus ou moins élargi, dépourvu de trabécules, avec des antennes à 5 articles, dont au moins un plus développé que les autres, des pattes à 2 griffes et le dernier segment de l'abdomen du mâle non échancré.

La distinction entre les genres de Goniodidés parasites des Columbiformes est faite par les clés dichotomiques suivantes:

1 — Tête campanulée. Bande marginale fine, légèrement dilatée dans la portion médiane. Soie oculaire plantée du côté interne, plus ou moins loin du bord latéral de la tête. Bandes marginales renforcées en dedans par une large bande chitinisée. Bandes pleurales sans prolongement antéro-interne, formant un ensemble continu, avec une incision longitudinale interne, moins chitinisée, dans chaque pleurite. Gonapophyses absentes.

Genre *Campanulotes* Kéler, 1939

Sans cet ensemble de caractères 2

2 (1) — Antennes filiformes dans les deux sexes. Gonapophyses absentes 3

Antennes dimorphes. Gonapophyses présentes ou absentes 8

3 (2) — Plaques pleurales étroites, avec des prolongements internes courbés. Cônes latéraux courts, peu saillants, prolongés parfois en arrière par une protubérance ventrale, triangulaire ou noueuse. Appareil copulateur du mâle ayant le sac génital non denticulé. Ouverture génitale de la femelle non saillante en arrière, avec une ou deux rangées de soies à dimension et disposition variables.

Genre *Saussurites* Tendeiro, 1971

Sans cet ensemble de caractères 4

4 (3) — Abdomen non foliacé 5

Abdomen foliacé, avec sa largeur maximum au niveau du segment II. Tête campanulée, semblable dans les deux sexes, avec la région oculaire peu saillante. Antennes filiformes dans les deux sexes. Bandes tergales I et II beaucoup plus larges que les autres. Bande pleurale large, sans renfort chitineux bien délimité ni prolongement antéro-interne. Ouverture génitale ayant 2 fortes soies externes espacées dans l'espèce type. Gonapophyses absentes.

Genre *Nitzschielloides* Tendeiro, 1969

5 (4) — Gonapophyses présentes, courtes, avec de grandes soies apicales. Tête semblable dans les deux sexes, avec la région oculaire peu saillante. Antennes présentant un léger dimorphisme sexuel se traduisant par le 1er article plus dilaté chez le mâle. Abdomen discoïde chez le mâle et ovale large chez la femelle. Plaques tergo-pleurales II aussi larges que les suivantes. Plaques pleurales étroites, avec des renforts chitineux larges, bien delimités, ayant de courts prolongements antéro-internes et des protubérances tuberculifor-

mes ou semi-elliptiques aux pleurites II-VI. Appareil copulateur du mâle avec le sac génital très caractéristique, présentant des denticulations fines et denses, aussi que de grandes formations chitineuses patelliformes, coniques, avec des stries radiées. Segment postérieur de la femelle avec une paire de plaques sternales disposées transversalement. Ouverture génitale de la femelle bordée d'épines et des soies spiniformes.

Genre *Patellinirmus* Tendeiro, 1972

Gonapophyses absentes 6

6 (5) — Tête avec des procès pré-antennaires allongés, prolongeant en arrière les cônes latéraux. Antennes filiformes dans les deux sexes 7

Cônes latéraux non prolonges par des procès allongés. Suture dorsale pré-antennaire très marquée, étroite ou plus ou moins élargie, s'étendant ou non en arrière. Cônes latéraux prolongés par une forte protubérance rétro-ventrale noueuse. Antennes en général filiformes dans les deux sexes, parfois dimorphes, avec le 1er article dilaté et très robuste chez le mâle. Plaques pleurales avec des prolongements ou des dilatations antéro-internes, capitées ou non. Appareil copulateur du mâle ayant le sac génital denticulé ou non. Ouverture génitale de la femelle typique, arrondie ou parabolique, saillante en arrière, bordée latéralement par une rangée d'épines plus ou moins robustes et avec une seconde rangée de spinules.

Genre *Auricotes* Kéler, 1939

7 (6) — Procès ventraux paramédians présents, le longueur variable, situés latéralement dans la région pré-antennaire. Procès latéraux épineux, triangulaires, robustes et plus ou moins allongés. Abdomen piriforme ou ovale. Bandes pleurales courtes, trapues, avec des renforts internes plus ou moins développés et des prolongements antéro-internes capités, courbés en arrière chez la femelle. Ouverture génitale de la femelle bordée de soies sur toute sa longueur ou ayant seulement des soies latérales.

Genre *Physconelloides* Ewing, 1927

Procès ventraux paramédians absents. Procès latéraux se terminant en pointe émoussée. Plaques pleurales relativement larges, avec des renforts chitineux bien délimités et des prolongements antéro-internes recourbés. Ouverture génitale de la femelle bordée par une rangée de soies alternant en dedans avec des épines ou des spinules.

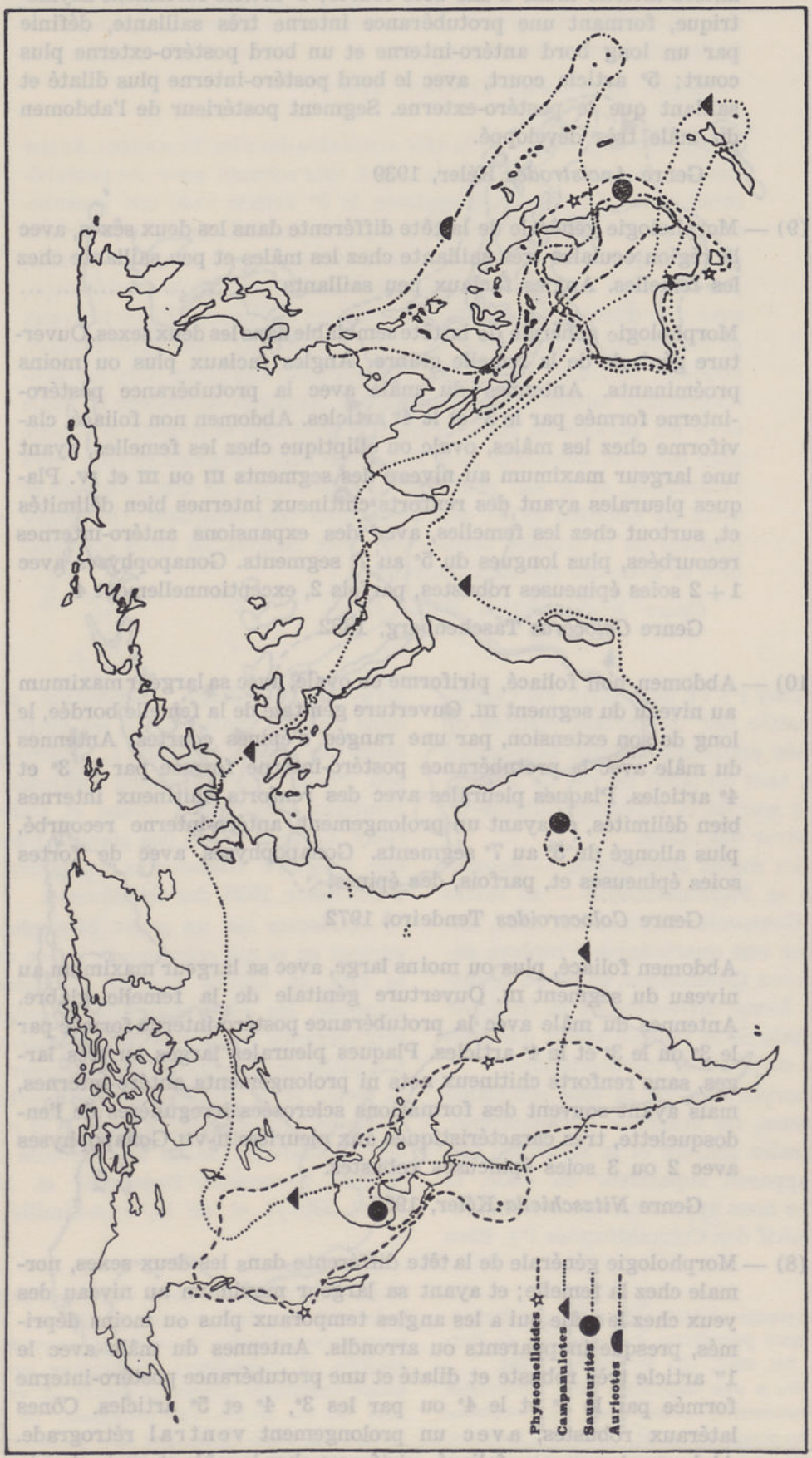
Genre *Stephanius* Tendeiro, 1969

8 (2) — Gonapophyses présentes 9

Gonapophyses absentes 12

9 (8) — Antennes du mâle ave une protubérance postéro-interne plus ou moins saillante, formée par le 3^{e}, le 3^{e} et le 4^{e} ou le 3^{e}, le 4^{e} et le 5^{e} articles; 1er article non appendiculé 10

Antennes du mâle avec le 1er article dilaté et très robuste, sans protubérance; 2^{e} article cylindrique, épais, également sans protu-



Distribution géographique des genres *Physconelloides*, *Campanulotes*, *Saussurites* et *Auricotes*

bérance; 3e article moins robuste et avec un petit procès conique antéro-interne muni d'une soie courte; 4e article fortement asymétrique, formant une protubérance interne très saillante, définie par un long bord antéro-interne et un bord postéro-externe plus court; 5e article court, avec le bord postéro-interne plus dilaté et saillant que le postéro-externe. Segment postérieur de l'abdomen du mâle très développé.

Genre *Ancistrodes* Kéler, 1939

10 (9) — Morphologie générale de la tête différente dans les deux sexes, avec la région oculaire très saillante chez les mâles et peu saillante chez les femelles. Angles faciaux peu saillants 11

Morphologie générale de la tête semblable dans les deux sexes. Ouverture génitale de la femelle glabre. Angles faciaux plus ou moins proéminants. Antennes du mâle avec la protubérance postéro-interne formée par le 3e et le 4e articles. Abdomen non foliacé, claviforme chez les mâles, ovale ou elliptique chez les femelles, ayant une largeur maximum au niveau des segments III ou III et IV. Plaques pleurales ayant des renforts chitineux internes bien délimités et, surtout chez les femelles, avec des expansions antéro-internes recourbées, plus longues du 5e au 7e segments. Gonapophyses avec 1 + 2 soies épineuses robustes, parfois 2, exceptionnellement 4.

Genre *Coloceras* Taschenberg, 1882

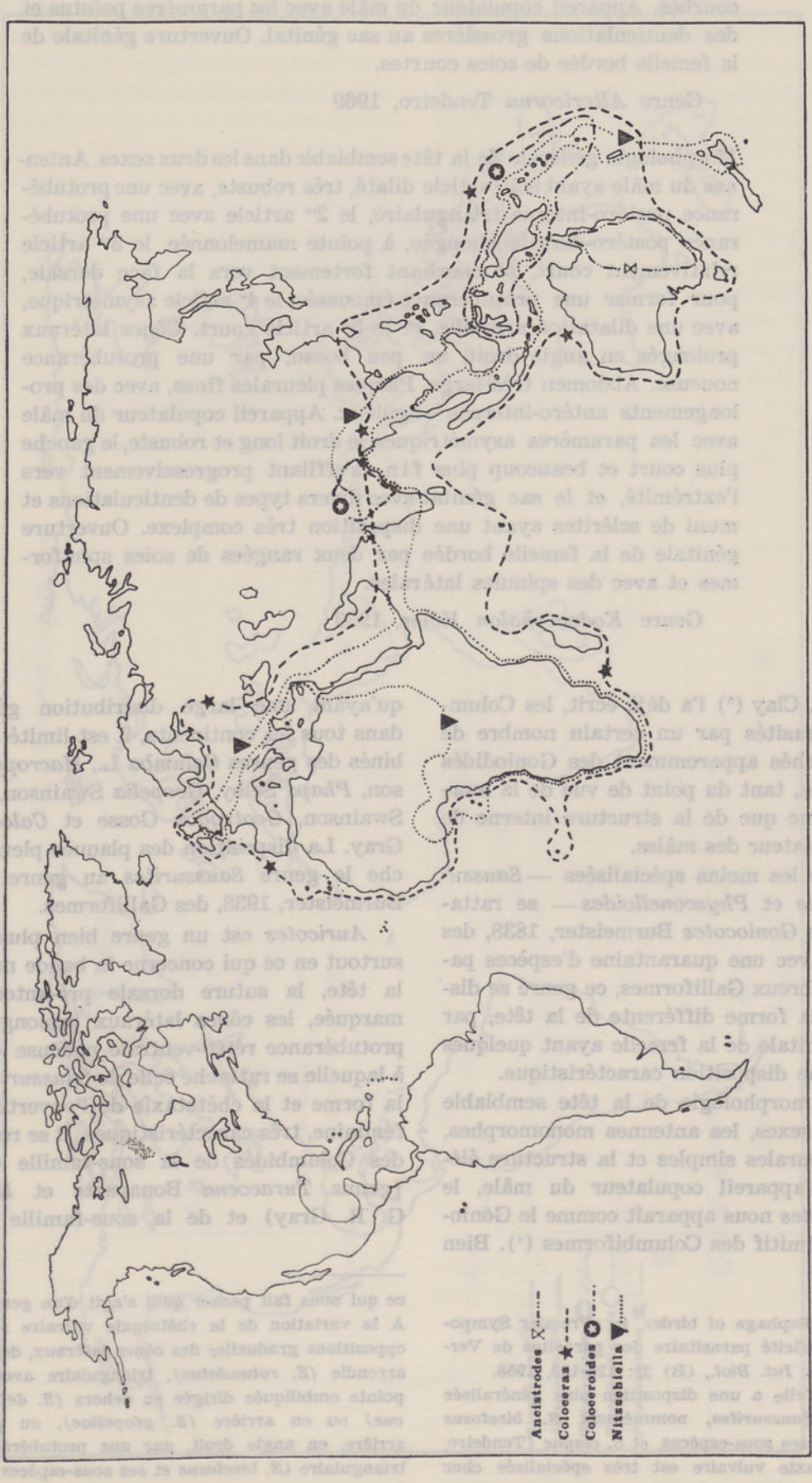
11 (10) — Abdomen non foliacé, piriforme ou ovale, avec sa largeur maximum au niveau du segment III. Ouverture génitale de la femelle bordée, le long de son extension, par une rangée d'épines courtes. Antennes du mâle avec la protubérance postéro-interne formée par le 3e et 4e articles. Plaques pleurales avec des renforts chitineux internes bien délimités, et ayant un prolongement antéro-interne recourbé, plus allongé du 5e au 7e segments. Gonapophyses avec de fortes soies épineuses et, parfois, des épines.

Genre *Coloceroides* Tendeiro, 1972

Abdomen foliacé, plus ou moins large, avec sa largeur maximum au niveau du segment III. Ouverture génitale de la femelle glabre. Antennes du mâle avec la protubérance postéro-interne formée par le 3e ou le 3e et le 4e articles. Plaques pleurales larges ou très larges, sans renforts chitineux nets ni prolongements antéro-internes, mais ayant souvent des formations sclerosées irregulières de l'endosquelette, très caractéristiques, aux pleurites II-VII. Gonapophyses avec 2 ou 3 soies épineuses robustes.

Genre *Nitzschiella* Kéler, 1939

12 (8) — Morphologie générale de la tête différente dans les deux sexes, normale chez la femelle; et ayant sa largeur maximum au niveau des yeux chez le mâle qui a les angles temporaux plus ou moins déprimés, presque inapparents ou arrondis. Antennes du mâle avec le 1er article très robuste et dilaté et une protubérance postéro-interne formée par le 3e et le 4e ou par les 3e, 4e et 5e articles. Cônes latéraux robustes, avec un prolongement ventral rétrograde. Abdomen large, non foliacé, piriforme chez le mâle et ovale chez la femelle. Bande tergale I plus large que les suivantes. Plaques pleu-



Distribution géographique des genres *Ancistrodes*, *Coloceras*, *Coloceroides* et *Nitzschiella*

rales simples, étroites, avec des prolongements antéro-internes courbés. Appareil copulateur du mâle avec les paramères pointus et des denticulations grossières au sac génital. Ouverture génitale de la femelle bordée de soies courtes.

Genre *Altericornu* Tendeiro, 1969

Morphologie générale de la tête semblable dans les deux sexes. Antennes du mâle ayant le 1er article dilaté, très robuste, avec une protubérance postéro-interne triangulaire, le 2er article avec une protubérance postéro-dorsale allongée, à pointe mamelonnée, le 3er article relativement court, se courbant fortement vers la face dorsale, pour former une protubérance émoussée, le 4e article asymétrique, avec une dilatation arrondie, et le 5e article court. Cônes latéraux prolongés en angle droit, un peu bossu, par une protubérance noueuse. Abdomen très large. Plaques pleurales fines, avec des prolongements antéro-internes anguleux. Appareil copulateur du mâle avec les paramères asymétriques, le droit long et robuste, le gauche plus court et beaucoup plus fin, s'effilant progressivement vers l'extrémité, et le sac génital avec divers types de denticulations et muni de sclérites ayant une disposition très complexe. Ouverture génitale de la femelle bordée par deux rangées de soies spiniformes et avec des spinules latérales.

Genre *Kodocephalon* Kéler, 1939

Comme Th. Clay ([3]) l'a déjà écrit, les Columbidés sont parasités par un certain nombre de genres rapprochés apparemment des Goniodidés des Galliformes, tant du point de vue de la morphologie externe que de la structure interne de l'appareil copulateur des mâles.

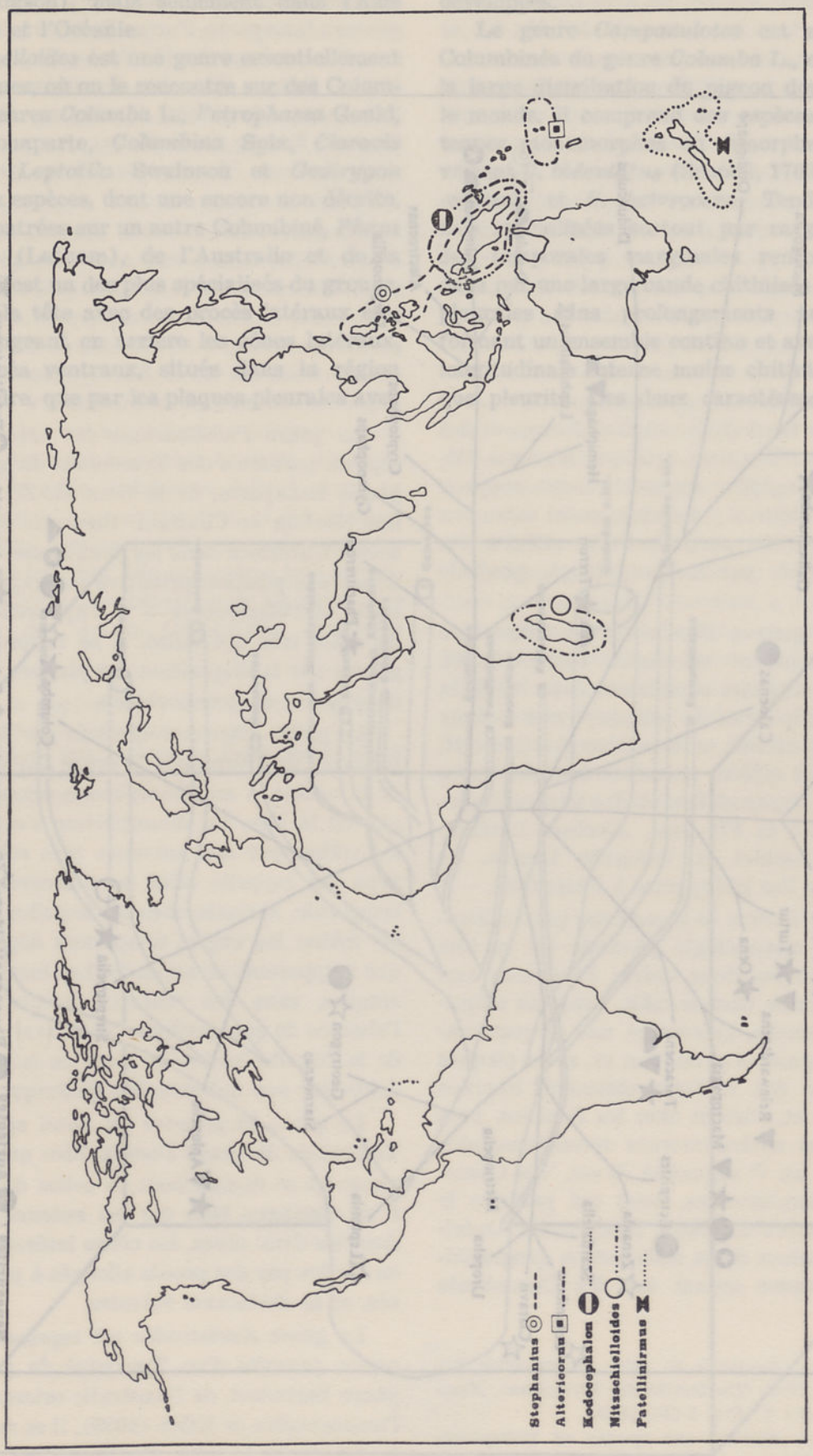
Les formes les moins spécialisées — *Saussurites, Auricotes* et *Physconelloides* — se rattachent au genre *Goniocotes* Burmeister, 1838, des Galliformes. Avec une quarantaine d'espèces parasites de nombreux Galliformes, ce genre se distingue, outre la forme différente de la tête, par l'ouverture génitale de la femelle ayant quelques épines avec une disposition caractéristique.

De par la morphologie de la tête semblable chez les deux sexes, les antennes monomorphes, les plaques pleurales simples et la structure élémentaire de l'appareil copulateur du mâle, le genre *Saussurites* nous apparaît comme le Goniodidé le plus primitif des Columbiformes ([4]). Bien qu'ayant une large distribution géographique dans tous les continents, il est limité aux Columbinés des genres *Columba* L., *Macropygia* Swainson, *Phaps* Selby, *Geopelia* Swainson, *Ectopistes* Swainson, *Geotrygon* Gosse et *Caloenas* G. R. Gray. La disposition des plaques pleurales rattache le genre *Saussurites* au genre *Goniocotes* Burmeister, 1938, des Galliformes.

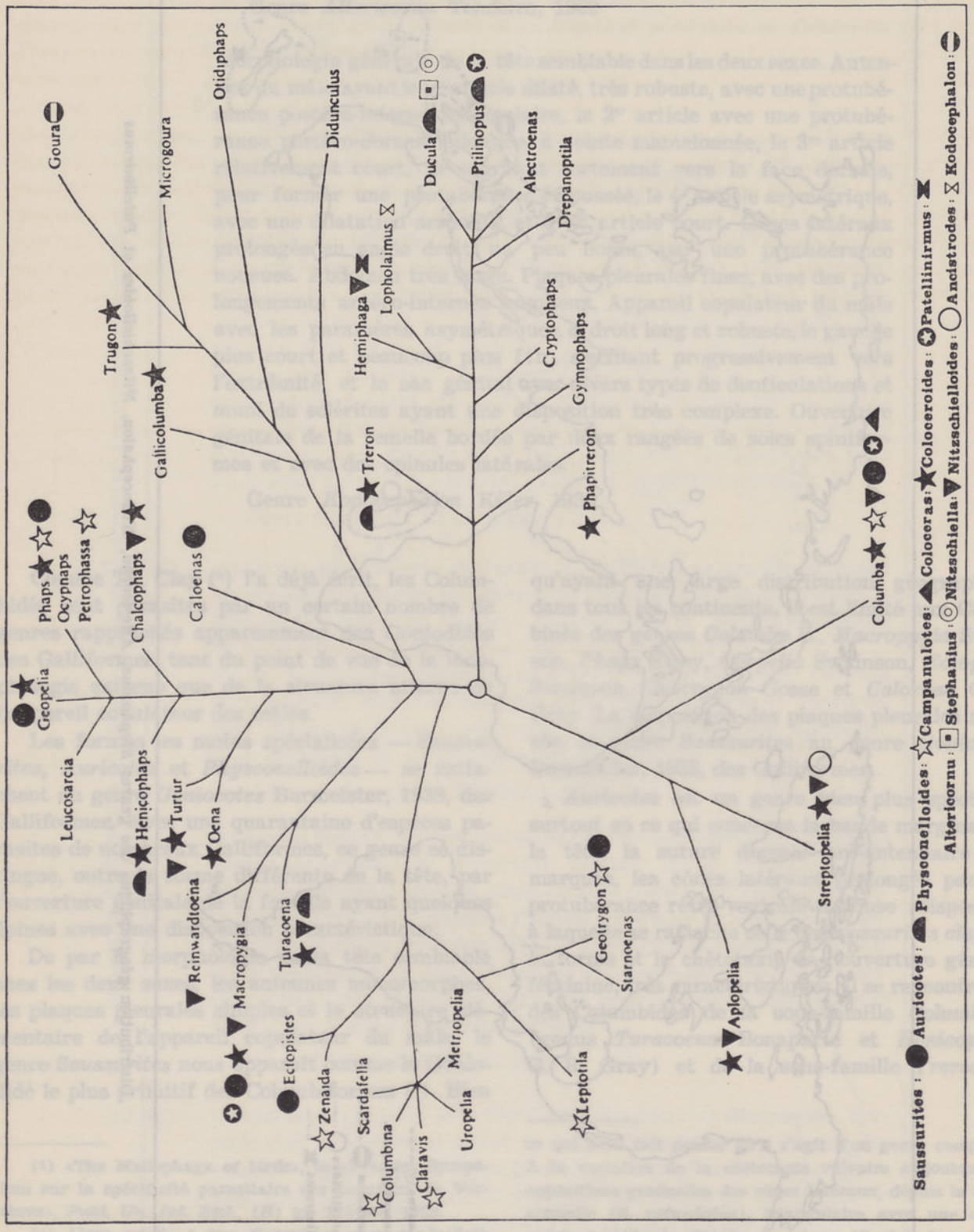
Auricotes est un genre bien plus spécialisé, surtout en ce qui concerne la bande marginale de la tête, la suture dorsale pré-antennaire très marquée, les cônes latéraux prolongés par une protubérance rétro-ventrale noueuse (disposition à laquelle se rattache celle de *Saussurites clayae*), la forme et la chètotaxie de l'ouverture génitale féminine, très caractéristiques. Il se rencontre sur des Columbidés de la sous-famille *Columbinae* (genus *Turacoena* Bonaparte et *Henicophaps* G. R. Gray) et de la sous-famille *Treroninae*

([3]) «The Mallophaga of birds», *in* «Premier Symposium sur la spécificité parasitaire des parasites de Vertébrés», *Publ. Un. Int. Biol.*, (B) 32: 120-158, 1958.

([4]) Alors qu'elle a une disposition plus généralisée dans quelques *Saussurites*, nommément *S. bisetosus* (Piaget, 1880) et ses sous-espèces, et *S. clayae* (Tendeiro, 1969), la chètotaxie vulvaire est très spécialisée chez *S. flavus* (Rudow, 1869) et *S. defectus* (Tendeiro, 1969), ce qui nous fait penser qu'il s'agit d'un genre composite. A la variation de la chètotaxie vulvaire s'ajoutent des oppositions graduelles des cônes latéraux, depuis la forme arrondie *(S. rotundatus)*, triangulaire avec une courte pointe ombiliquée dirigée en dehors *(S. defectus, S. flavus)* ou en arrière *(S. geopeliae)*, ou prolongée en arrière, en angle droit, par une protubérance ventrale, triangulaire (*S. bisetosus* et ses sous-espèces) ou noueuse, du type *Auricotes (C. clayae)* (Tendeiro, 1971).



Distribution géographique des genres *Stephanius*, *Altericornu*, *Kodocephalon*, *Nitzschiellolides* et *Patellinirmus*

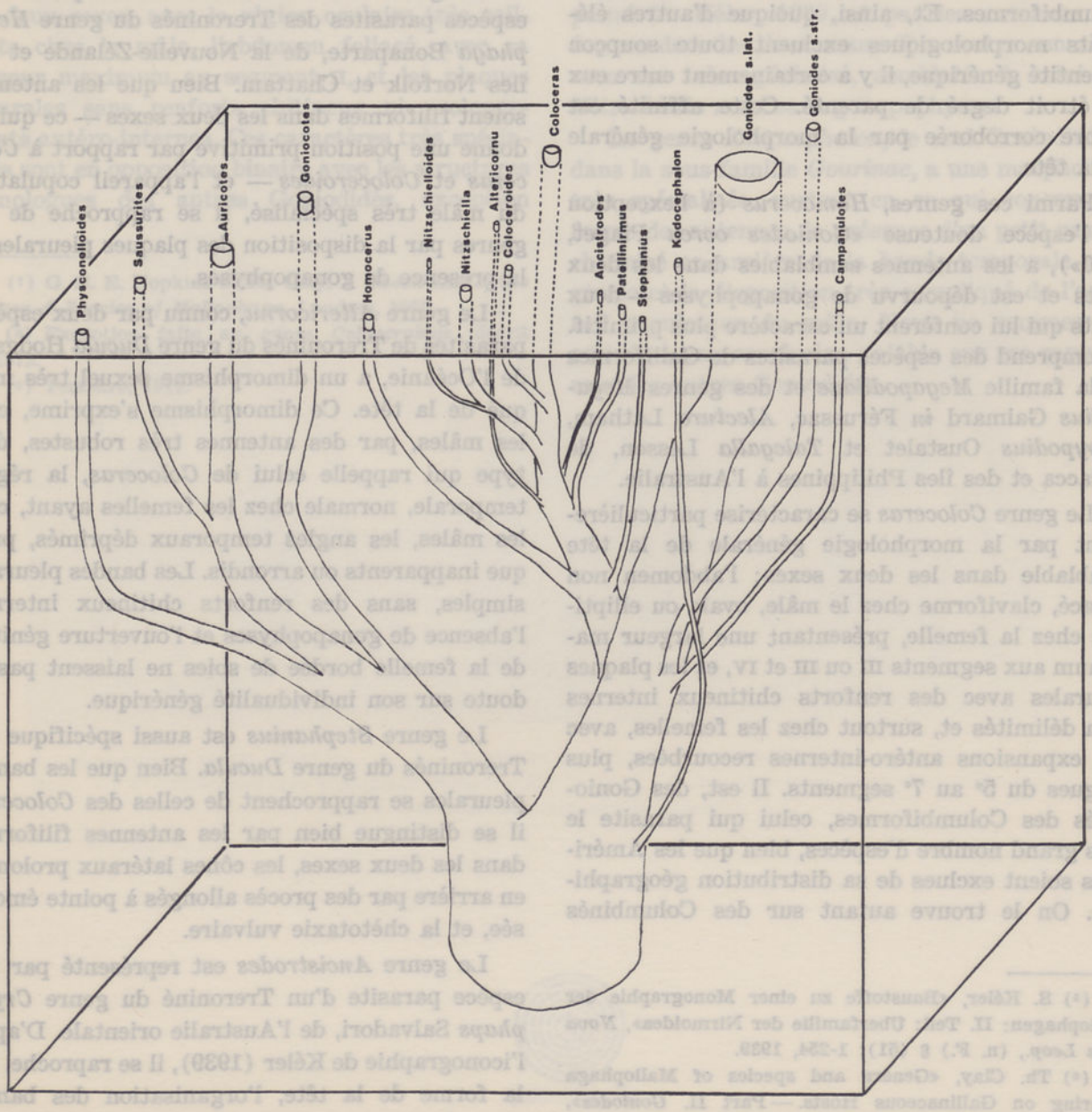


Distribution des Goniodidés par hôtes, sur un arbre généalogique des Columbiformes, de D. Goodwin, *Pigeons and Doves of the World*, Londres, 1970

(genres *Treron* Vieillot, *Ptilinopus* Swainson et *Ducula* Hodgson), mais seulement dans l'Asie méridionale et l'Océanie.

Physconelloides est une genre essentiellement des Amériques, où on le rencontre sur des Columbinés des genres *Columba* L., *Petrophassa* Gould, *Zenaida* Bonaparte, *Columbina* Spix, *Claravis* Oberholser, *Leptotila* Swainson et *Geotrygon* Gosse; deux espèces, dont une encore non décrite, on été rencontrées sur un autre Columbiné, *Phaps chalcoptera* (Latham), de l'Australie et de la Tasmanie. C'est un des plus spécialisés du groupe, autant par la tête avec des procès latéraux épineux, prolongeant en arrière les cônes latéraux, et des procès ventraux, situés dans la région pré-antennaire, que par les plaques pleurales avec des renforts chitineux internes plus ou moins développés.

Le genre *Campanulotes* est spécifique des Columbinés du genre *Columba* L., et accompagne la large distribution du pigeon domestique dans le monde. Il comprend des espèces avec des antennes monomorphes ou dimorphes — respectivement *C. bidentatus* (Scopoli, 1763), et ses sous-espèces, et *C. heteroceros* Tendeiro, 1969 —, très spécialisées surtout par rapport aux bandes temporales marginales renforcées en dedans par une large bande chitinisée et aux plaques pleurales sans prolongements antéro-internes, formant un ensemble continu et avec une incision longitudinale interne moins chitinisée dans chaque pleurite. Ces deux caractères, qu'ils soient



Possibles relations phylogénétiques des Goniodidés des Columbiformes et des Galliformes

pris ensemble ou isolément, sont en opposition binaire pertinente, distinctive, avec les structures homologues de tous les autres Goniodidés. En ce qui concerne les incisions pleurales, leur présence, malgré une disposition différente (respectivement fermées et ouvertes en arrière), est en faveur d'une parenté entre les *Campanulotes* et quelques *Goniodes* s. str. des Galliformes.

Les bandes pleurales du complexe *Coloceras-Coloceroides-Patellinirmus,* des Columbiformes, sont du même type structural qu'on rencontre dans le genre *Homocerus* Kéler, 1939 (5), correspondant au groupe M des *Goniodes* des Galliformes, de Th. Clay (1940) (6). Ce type est très caractéristique et ne se trouve chez aucun autre genre, ce que le met en opposition privative avec tous les autres Goniodidés des Galliformes et des Columbiformes. Et, ainsi, quoique d'autres éléments morphologiques excluent toute soupçon d'identité générique, il y a certainement entre eux un étroit degré de parenté. Cette affinité est encore corroborée par la morphologie générale de la tête.

Parmi ces genres, *Homocerus* (à l'exception de l'espèce douteuse «*Goniodes ocrea* Piaget, 1880»), a les antennes semblables dans les deux sexes et est dépourvu de gonapophyses — deux traits qui lui confèrent un caractère plus primitif. Il comprend des espèces parasites de Galliformes de la famille *Megapodiidae* et des genres *Megapodius* Gaimard *in* Férussac, *Alectura* Latham, *Aepypodius* Oustalet et *Talegalla* Lesson, de Malacca et des îles Philippines à l'Australie.

Le genre *Coloceras* se caractérise particulièrement par la morphologie générale de la tête semblable dans les deux sexes; l'abdomen non foliacé, claviforme chez le mâle, ovale ou elliptique chez la femelle, présentant une largeur maximum aux segments III ou III et IV, et les plaques pleurales avec des renforts chitineux internes bien délimités et, surtout chez les femelles, avec des expansions antéro-internes recourbées, plus longues du 5e au 7e segments. Il est, des Goniodidés des Columbiformes, celui qui parasite le plus grand nombre d'espèces, bien que les Amériques soient exclues de sa distribution géographique. On le trouve autant sur des Columbinés (genres *Columba* L., *Streptopelia* Bonaparte, *Aplopelia* Bonaparte, *Macropygia* Swainson, *Turacoena* Bonaparte, *Turtur* Boddaert, *Oena* Swainson, *Chalcophaps* Gould, *Henicophaps* G. R. Gray, *Phaps* Selby, *Geopelia* Swainson, *Metriopelia* Bonaparte, *Leptotila* Swainson, *Gallicolumba* Heck et *Trugon* G. R. Gray) que sur des Treroninés (genres *Phapitreron* Bonaparte et *Treron* Vieillot).

Le genre *Coloceroides,* avec la tête du type *Nitzschiella,* c'est-à-dire avec la région oculaire très saillante chez le mâle et peu saillante chez la femelle, et l'abdomen du type *Coloceras,* comprend quatre espèces parasites de Columbinés des genres *Columba* L. et *Macropygia* Swainson, de l'Asie méridionale et de l'Océanie.

Le genre *Patellinirmus* fut créé pour trois espèces parasites des Treroninés du genre *Hemiphaga* Bonaparte, de la Nouvelle-Zélande et des îles Norfolk et Chattam. Bien que les antennes soient filiformes dans les deux sexes — ce qui lui donne une position primitive par rapport à *Coloceras* et *Coloceroides* — et l'appareil copulateur du mâle très spécialisé, il se rapproche de ces genres par la disposition des plaques pleurales et la présence de gonapophyses.

Le genre *Altericornu,* connu par deux espèces parasites de Treroninés du genre *Ducula* Hodgson, de l'Océanie, a un dimorphisme sexuel très marqué de la tête. Ce dimorphisme s'exprime, chez les mâles, par des antennes très robustes, d'un type qui rappelle celui de *Coloceras,* la région temporale, normale chez les femelles ayant, chez les mâles, les angles temporaux déprimés, presque inapparents ou arrondis. Les bandes pleurales simples, sans des renforts chitineux internes, l'absence de gonapophyses et l'ouverture génitale de la femelle bordée de soies ne laissent pas de doute sur son individualité générique.

Le genre *Stephanius* est aussi spécifique des Treroninés du genre *Ducula.* Bien que les bandes pleurales se rapprochent de celles des *Coloceras,* il se distingue bien par les antennes filiformes dans les deux sexes, les cônes latéraux prolongés en arrière par des procès allongés à pointe émoussée, et la chètotaxie vulvaire.

Le genre *Ancistrodes* est représenté par une espèce parasite d'un Treroniné du genre *Crytophaps* Salvadori, de l'Australie orientale. D'après l'iconographie de Kéler (1939), il se raproche, par la forme de la tête, l'organisation des bandes pleurales et la présence de gonapophyses, du

(5) S. Kéler, «Baustoffe zu einer Monographie der Mallophagen: II. Teil: Überfamilie der Nirmoidea», *Nova Acta Leop.,* (n. F.) 8 (51): 1-254, 1939.

(6) Th. Clay, «Genera and species of Mallophaga occuring on Gallinaceous Hosts. — Part II. *Goniodes*», *Proc. Zool. Soc. Lond.,* (B) 110: 1-120, 1940.

genre *Coloceras,* lequel, pour Hopkins et Th. Clay (7) lui était synonyme. Il en diffère, chez les mâles, par la morphologie très spécialisée des antennes et le grand développement du segment postérieur de l'abdomen.

Par la forme des antennes et la présence de gonapophyses, le genre *Nitzschiella* s'approche aussi beaucoup du genre *Coloceras,* duquel il a été considéré également comme synonyme, par Hopkins et Th. Clay, en 1952. Les deux caractères constituent «une réserve structurale correspondant à une articulation primaire, laquelle ne se rencontre pas chez aucun autre genre décrit dans la famille Goniodidae» (8), et se reflète «en même temps, mais indépendamment, chez les mâles et les femelles» (9). Il se distingue, cependant, par la morphologie générale de la tête différente dans les deux sexes, avec la région oculaire très saillante chez le mâle, l'abdomen foliacé, avec sa largeur maximum au segment II, et les plaques pleurales sans renforts chitineux ni prolongements antéro-internes. Ces caractères très spécialisés sont en opposition binaire avec les structures homologues des autres Goniodidés, exception faite, en ce qui concerne respectivement la région oculaire et l'abdomen, des genres *Coloceroides* et *Nitzchielloides.* Les *Nitzschiella,* issues vraisemblablement d'une macromutation à partir d'un *Coloceras,* sont essentiellement des parasites des Columbinés des genres *Columba* L., *Streptopelia* Bonaparte, *Aplopelia* Bonaparte, *Macropygia* Swainson, *Reinwardtoena* Bonaparte, *Turacoena* Bonaparte, *Turtur* Boddaert et *Chalcophaps* Gould; une espèce fut décrite, peut-être par transgression parasitaire, sur un Treroniné du genre *Hemiphaga* Bonaparte, de la Région Australienne.

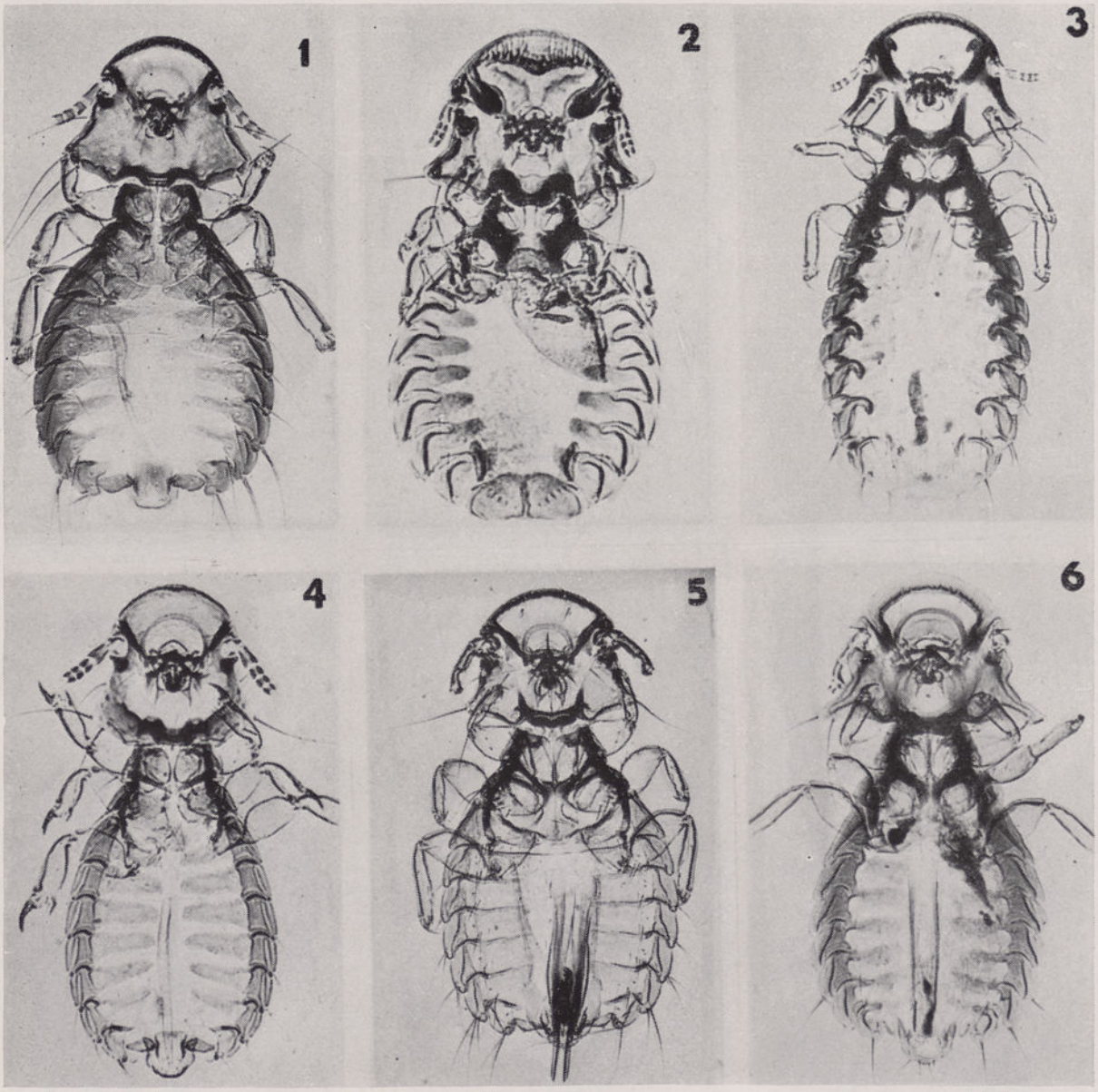
Le genre *Nitzschielloides* comprend une seule espèce de la sous-région malgache, obtenue sur un Columbiné du genre *Streptopelia* Bonaparte. Il est plus primitif de par le contour générale de la tête, par lequel il se rapproche du genre *Campanulotes* Kéler, 1939, et par les antennes filiformes dans les deux sexes. Par contre son abdomen est très spécialisé, semblable à celui des *Nitzschiella* mais sans gonapophyses.

Le genre *Kodocephalon,* le seul Goniodidé vu dans la sous-famille *Gourinae,* a une morphologie très spécialisée, surtout en ce qui concerne la forme des antennes, la présence d'un petit renfort chitinisé en arrière de la bande temporale marginale et la disposition très compliqué de l'appareil copulateur du mâle. Nous ne sommes pas arrivés à une conclusion valable sur ses rapports avec les autres Goniodidés.

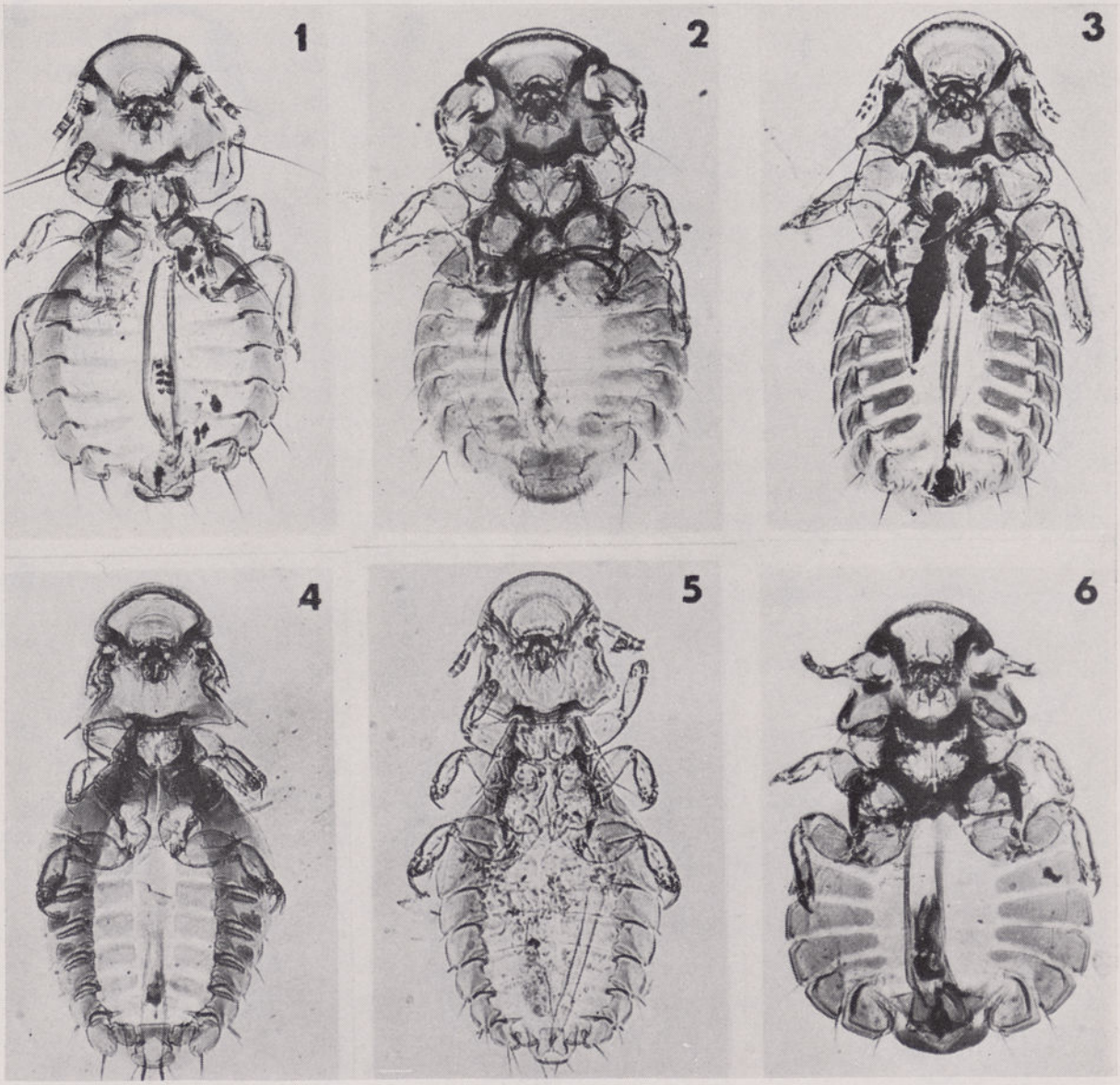
(7) G. H. E. Hopkins et Th. Clay, *A Check List of the Genera & Species of Mallophaga,* Londres, 1952.

(8) Exception faite au genre *Coloceroides,* décrit en 1972.

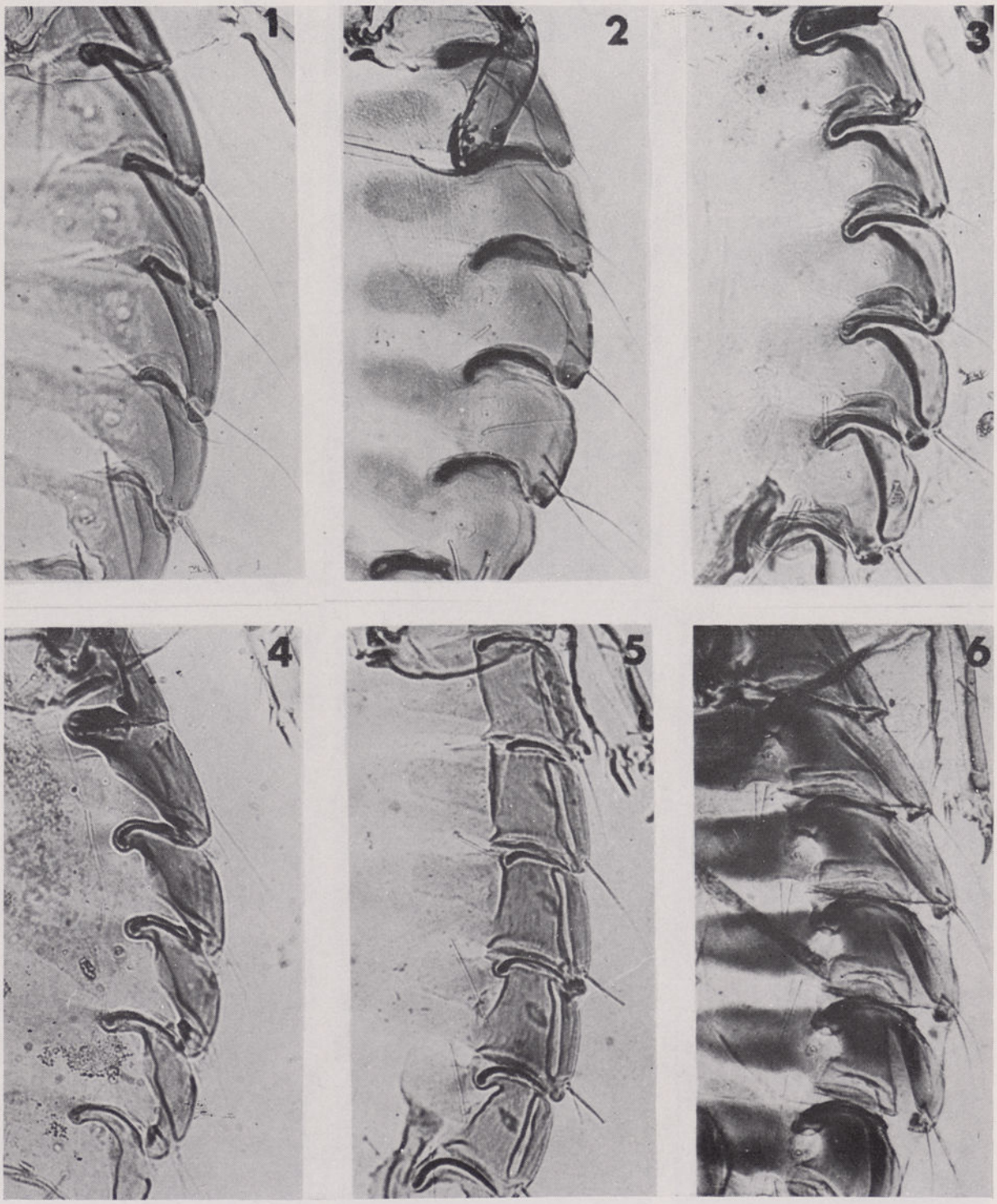
(9) Tendeiro, 1971.



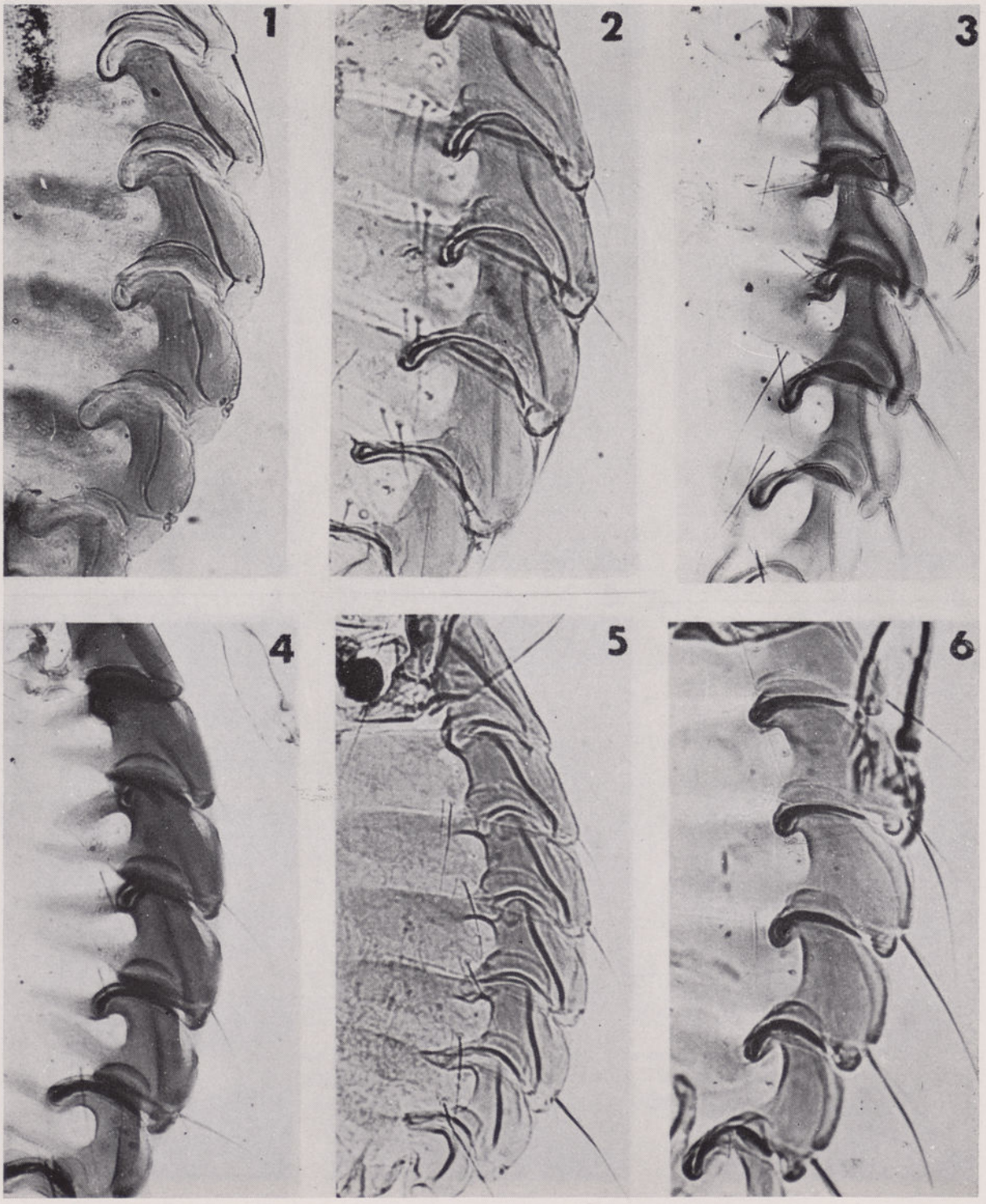
1 — *Saussurites flavus* (Rudow), ♂; 2 — *Auricotes* sp., ♀; 3 — *Physconelloides zenaidurae* (McGregor), ♀; 4 — *Campanulotes bidentatus compar* (Burmeister), ♂; 5 — *Coloceras demicorne* (Nitzsch), ♂; et 6 — *Coloceroides temporalis* Tendeiro, ♂



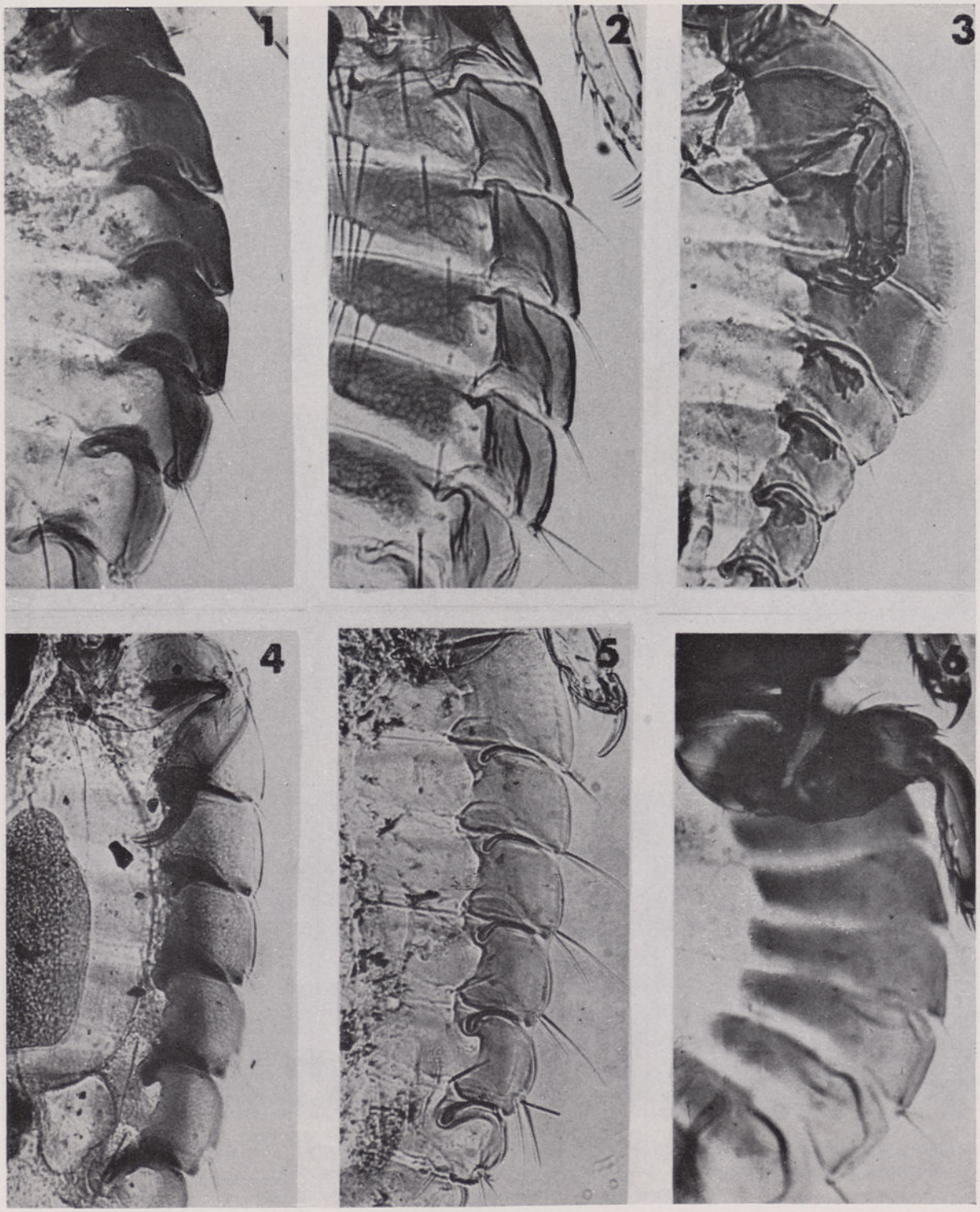
1 — *Patellinirmus novaeseelandiae* Tendeiro, ♂; 2 — *Altericornu coloceroides* Tendeiro, ♂; 3 — *Stephanius affinis* (Taschenberg), ♂; 4 — *Nitzschiella carrikeri* Tendeiro, ♂; 5 — *Nitzschielloides campanulatus* Tendeiro, ♂; et 6 — *Kodocephalon suborbiculatum bradicephalum* Tendeiro, ♂



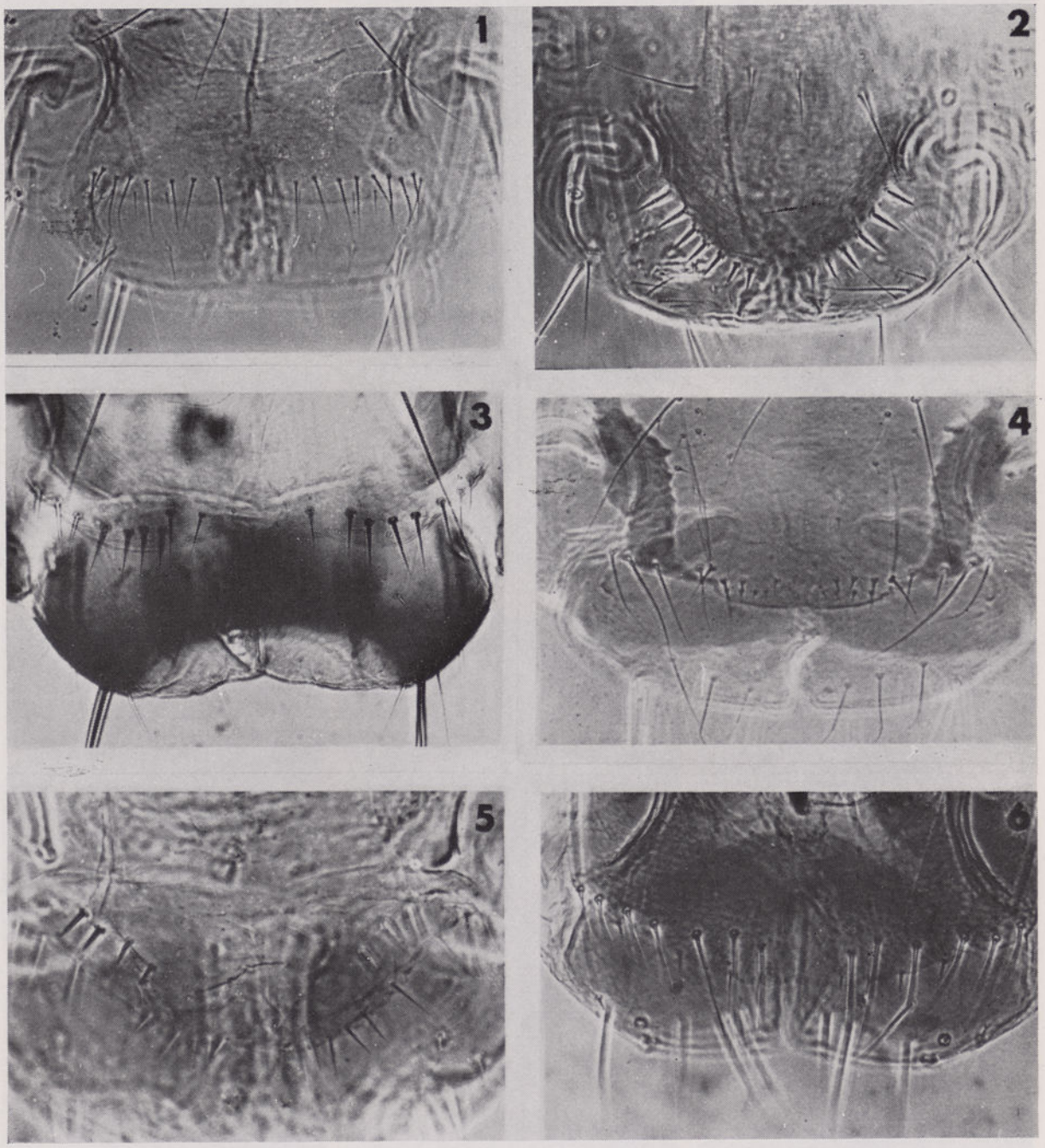
Bandes pleurales de: 1 — *Saussurites flavus* (Rudow), ♂; 2 — *Goniocotes gallinae* (De Geer), ♀; 3 — *Auricotes* sp., ♀; 4 — *Physconelloides zenaidurae* (McGregor), ♂; 5 — *Campanulotes b. bidentatus* (Scopoli), ♀; et 6 — *Goniodes pavonis* (L.), ♀



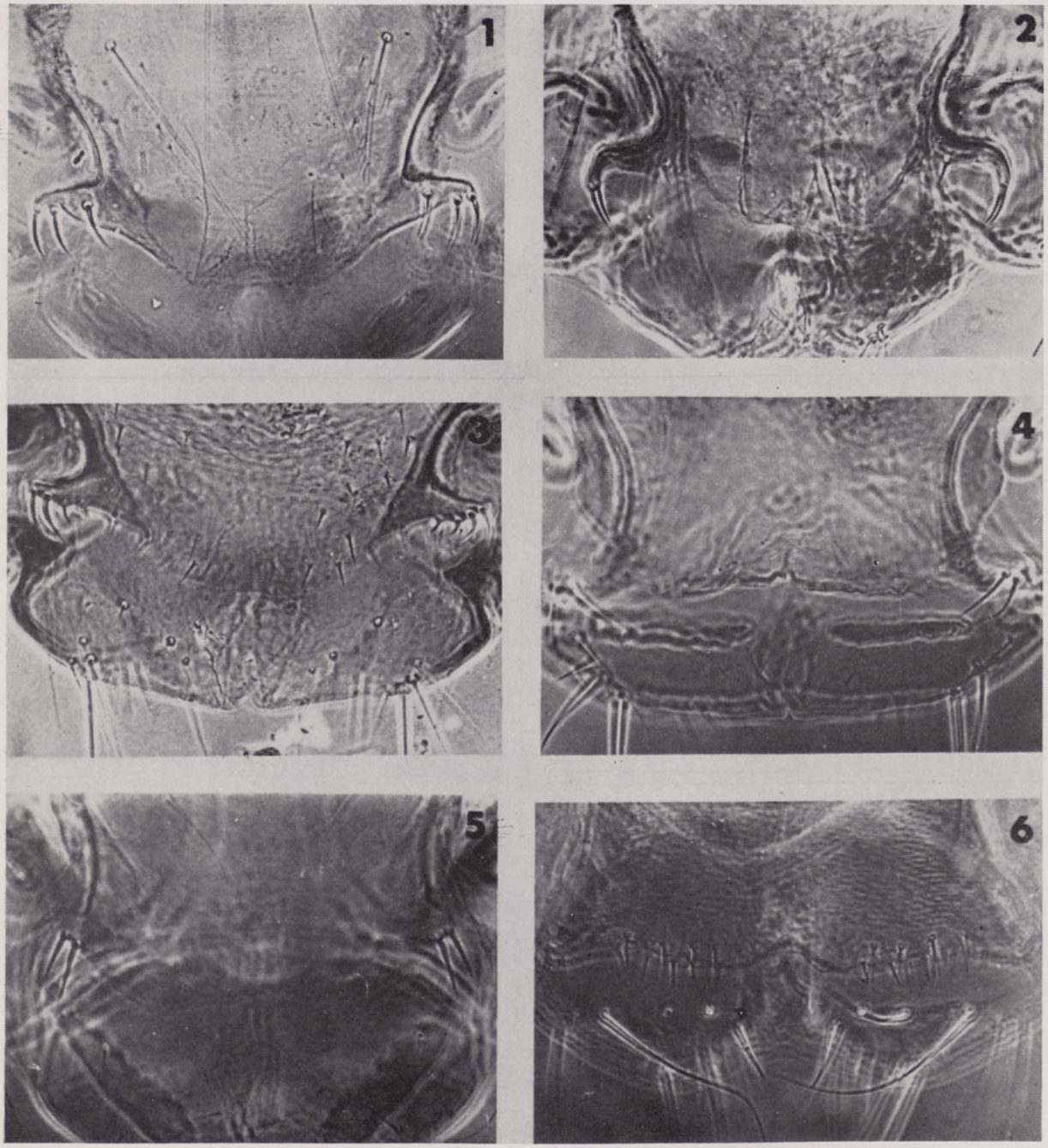
Bandes pleurales de: 1 — *Homocerus minor* (Piaget), ♀; 2 — *Coloceras theresae* Tendeiro, ♂; 3 — *Coloceras chinense* (Kellogg et Chapman), ♀; 4 — *Coloceroides nitens* Tendeiro, ♀; 5 — *Coloceroides temporalis* Tendeiro, ♀; et 6 — *Patellinirmus novaeseelandiae* Tendeiro, ♀



Bandes pleurales de: 1 — *Altericornu marshalli* Tendeiro, ♀; 2 — *Stephanius affinis* (Taschenberg), ♂; 3 — *Nitzschiella piriformis* Tendeiro, ♂; 4 — *Nitzschiella hilli* (Bedford), ♀; 5 — *Nitzschielloides campanulatus* Tendeiro, ♀; et 6 — *Kodocephalon suborbiculatum bradicephalum* Tendeiro, ♀



Région sous-génitale des femelles de: 1 — *Saussurites clayae* (Tendeiro); 2 — *Auricotes* sp.; 3 — *Physconelloides passerinae* Emerson; 4 — *Campanulotes b. bidentatus* (Scopoli); 5 — *Altericornu marshalli* Tendeiro; et 6 — *Stephanius affinis* (Taschenberg)



Région sous-génitale des femelles de: 1 — *Coloceras chinense* (Kellogg et Chapman); 2 — *Coloceras piageti* (Johnston et Harrison); 3 — *Coloceroides nitens* Tendeiro; 4 — *Patellinirmus novaeseelandiae* Tendeiro; 5 — *Nitzschiella hilli* (Bedford); et 6 — *Kodocephalon s. suborbiculatum* (Piaget)

CDU 595.771(673)

RIBEIRO, H.
RAMOS, Helena da Cunha

Estudo dos mosquitos de Angola. VI — O género «Anopheles» Meigen, 1818 («Diptera», «Culicidae»). Lista de novos registos, chaves para as fêmeas e larvas, distribuição e notas bioecológicas.

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 1-40

Trata-se de um trabalho sobre o *Anopheles*, género de mosquito existente em Angola. Além de dados bibliográficos, são fornecidos dados inéditos obtidos ao longo de vários anos em diversas regiões e baseados na identificação de mais de 7000 espécimes. A lista dos anofelíneos angolanos é aumentada de 38 para 48 elementos, assinalando-se 14 espécies, 3 subespécies e 1 nova forma. Indica-se o material e localidades onde foram estudados, apresentam-se mapas de distribuição para cada espécie, procurando relacioná-la com a zoogeografia de Angola, de que se propõe um primeiro esboço. Além de certas notas bioecológicas, considera-se a importância que tem para a medicina o estudo destas espécies angolanas, particularmente no que respeita a transmissão da malária.

CDU 595.771(673)

RIBEIRO, H.
RAMOS, Helena da Cunha

Research on the mosquitoes of Angola. VI — The genus «Anopheles» Meigen, 1818 («Diptera», «Culicidae»). Check-list with new records, keys to the females and larvae, distribution and bioecological notes

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 1-40

The analysis consists of a research on the *Anopheles*, a sort of mosquito of Angola. Beyond bibliographical references, unpublished data obtained along several years in different places and based on the identification of more than 7000 specimen are also provided. The list of the Anophelinea of Angola is enlarged from 33 to 48 elements being pointed out 14 species, 3 subspecies and 1 new form. The material and the places where they were observed are shown, and maps of local distribution for each species are presented trying to relate it with the zoogeography of Angola of which a first sketch is proposed. Besides few bioecological notes, consideration is given to the relevant contribution of the study of these species of Angola to the medicine, particulary in what concerns the transmission of malaria.

CDU 595.753(665.8)

FERNANDES, Idinha Mónica

«Homoptera» («Coccoidea») do arquipélago de Cabo Verde

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 41-46

Estudo do material de *Homoptera (Coccoidea)* coligido pela M. E. Z. U. nas ilhas de Cabo Verde, incluindo a descrição de algumas cochonilhas, citando os respectivos entomófagos e distribuição geográfica dentro do arquipélago.

CDU 595.753(665.8)

FERNANDES, Idinha Mónica

«Homoptera» («Coccoidea») from the Cape Vert islands

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 41-46

Study of *Homoptera (Coccoidea)* colected by the M. E. Z. U. in the Cape Vert islands, including the description of some species, their entomophagous and respective geographical distribution.

CDU 595.34(665.8)

MARQUES, Emerita

Contribuição para o conhecimento dos copépodes marinhos de Cabo Verde (ilhas: Brava, Fogo, Santiago e Maio). 2.º parte — «Harpacticoida» e «Ciclopoida»

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 47-56

Com a determinação sistemática dos harpacticóides e dos ciclopóides, dá-se por findo o estudo dos copépodes colhidos de Agosto a Novembro de 1969 no arquipélago de Cabo Verde, pela Missão de Estudos Zoológicos do Ultramar. Das 20 espécies determinadas, 5 harpacticóides e 6 ciclopóides parece não terem ainda sido assinalados nas águas do arquipélago.

CDU 595.34(665.8)

MARQUES, Emerita

Contribution to the study of the marine copepods in the Cabo Verde waters (islands: Brava, Fogo, Santiago and Maio). Part 2nd — «Harpacticoida» and «Cyclopoida»

Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 47-56

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Garcia de Orta, Sér. Zool., Lisboa, 4 (1), 1975, p. 57-70

Este texto trata do estado taxinómico das espécies *Goniodidae* das Columbiformes, respectivamente *Saussurites* Tendeiro, 1971, Auricotes Kéler, 1939, *Physconelloides* Ewing, 1927, *Campanulotes* Kéler, 1939, *Coloceras* Tashenberg, 1882, *Coloceroides* Tendeiro, 1969, *Patellirmus* Tendeiro, 1972, *Altericornu* Tendeiro, 1969, *Stephanius* Tendeiro, 1969, *Nitzschiella* Kéler, 1939, *Nitzschielloides* Tendeiro, 1969, *Ancistrodes* Kéler, 1939, e *Kodocephalon* Kéler, 1939.

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SUMÁRIO