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Ticks (Ixodidae) on Migrating Birds in Egypt, Spring and Fall 1962 *

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Over a number of years studies have been carried out in Egypt on the transport by migrating birds of ticks that may transmit pathogens of man and animals. In continuation of these investigations 11 036 birds migrating southwards through Egypt were examined for ticks during the fall of 1962. The 881 infested birds (comprising 24 species and subspecies represented by 10 612 individuals) yielded 1442 ticks. Tick-host relationships were similar to those of previous years except that in 1962 the prevalence of infestation was almost invariably much higher than the averages for 1959-61. Five species of birds were added to the previous list of 40 infested forms. Previously unrecorded tick species taken during 1962 were Ixodes redikorzevi *(a species from Asia very occasionally found in rodent burrows in Egypt), the rare* Haemaphysalis inermis, *and* Hyalomma a. anatolicum, H. anatolicum excavatum *and* H. dromedarii, *which may have been carried from Asia or have attached themselves to the birds at the time of netting.*

During the spring of 1962, altogether 1774 birds migrating northwards through Egypt were also examined. The 56 tick-infested birds (comprising 13 species represented by 867 individuals) yielded 186 ticks. As in previous years, Hyalomma marginatum rufipes *was the chief species (89.25 %) parasitizing spring migrants. A single specimen of* Amblyomma variegatum *was taken on* Anthus cervinus *and 19 specimens of* Ixodes ?*sp. nov. were collected from* Sylvia c. communis *and* Motacilla a. alba.

INTRODUCTION

During the fall of 1962, the prevalence of tick infestation of birds migrating southwards through Burg El Arab, Egypt, was considerably higher than that recorded from 1959 to 1961. The periods of observation and methods of capture were similar to those in previous years (Hoogstraal et al., 1963). Five species of birds were added to the list of tick-infested fall migrants and five species and subspecies of ticks were added to the list of parasites taken at this period (see Table 1).

In 1962, spring migrants were trapped in mist nets and Arab nets only in the Burg El Arab area on the Mediterranean coast west of Alexandria. Between 1956 and 1960, we had studied spring migrants almost exclusively in the Cairo area (Hoogstraal et al., 1961). Previous spring migrants around Cairo were mostly obtained at grub-baited traps, although a few were mist-netted. Some interesting incidental tick records were obtained from spring migrants at Burg El Arab in 1962, but *Hyalomma marginatum rufipes*, as in previous years, was the chief parasite infesting these birds (see Table 2).

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BIRD HOSTS, FALL 1962

FAMILY FALCONIDAE (FALCONS)

Falco naumanni Fleisher. Lesser Kestrel. (See p. 198 and Fig. 2 of Hoogstraal et al., 1961, for range, and p. 236 of Hoogstraal et al., 1963.)

One of two lesser kestrels examined during the fall bore a nymph of *Hyalomma m. marginatum*. A single fall bird collected previously had been infested by *Hyalomma* sp.

Falco tinnunculus tinnunculus Linnaeus. European Kestrel. (See p. 198 and Fig. 3 of Hoogstraal et al., 1961, for range.)

The European kestrel is not commonly seen in Egypt during the fall migration and none has previously been examined for ticks during this period. In the fall of 1962, one of four birds obtained yielded three larvae of *Hyalomma m. marginatum*.

FAMILY PHASIANIDAE (QUAIL AND PHEASANTS)

Coturnix coturnix coturnix (Linnaeus). European Quail. (See p. 200 and Fig. 4 of Hoogstraal et al., 1961, for range, and p. 237 of Hoogstraal et al., 1963.)

During the autumn of 1962, 6520 European quail were examined; in the three previous falls a total of 9828 was taken. The 393 (6.03%) infested in 1962 by 559 ticks (1.42 ticks per host) represents a higher prevalence of infestation than the over-all average for earlier years (3.05%), though the number of ticks per host was approximately the same. Comparison of September results from Burg El Arab, however, shows a surprising uniformity of prevalence of infestation (1959: 6.90%; 1960: 8.64%; 1961: 4.79%; 1962: 6.03%).

The species composition of ticks on these birds in 1962 was rather similar to that of previous years, except that a few specimens of species that were not previously obtained were taken this year. There were: *Ixodes redikorzevi* (4), *Haemaphysalis inermis* (1), *H. sulcata* (1), *Hyalomma a. anatolicum* (1), *H. anatolicum excavatum* (1), and *H. dromedarii* (2). The four *Hyalomma* may have attached while these birds were in traps at the base of fig trees, or they may have been carried here from elsewhere. Otherwise, tick species and numbers in 1962 were typical of those of other years. *Ixodes* sp. (16), *I. ricinus* (7), *Haemaphysalis punctata* (308), *Hyalomma* sp. (4), *H. aegyptium* (22), *H. m. marginatum* (146), and ticks lost (46), were recorded from these birds, in addition to those mentioned above.

FAMILY RALLIDAE (RAILS, CRAKES, MOORHENS, COOTS)

Porzana porzana (Linnaeus). Spotted Crake. Fig. 1.

The spotted crake breeds throughout most of Europe and the USSR east to Central Asia. It winters in southern Europe, southern Asia, and eastern Africa from Egypt to South West Africa and the Orange Free State. It is common on both spring and fall passages in Egypt, and some birds winter here. Birds seen in Egypt probably come from eastern Europe and Russia; however, some western European birds may be expected because the species is unknown in tropical West Africa, even as a passage migrant.

Nine spotted crakes examined during the previous fall migrations were free of ticks (Hoogstraal et al., 1963, p. 251). In 1962 during the fall passage, two of 16 *P. porzana* were infested by one nymph of *Hyalomma m. marginatum* and one female *Ixodes* sp.

Crex crex (Linnaeus). Corncrake. Fig. 2.

The corncrake breeds throughout most of Europe and the USSR, east to central Asia and south to Iran. Its winter quarters are in tropical Africa, south to eastern Cape Province. This bird is fairly common in Egypt on both spring and fall passage. It has been observed migrating with flocks of quail during the fall. Corncrakes passing through Egypt presumably come from eastern Europe and Russia.

Twenty-eight *C. crex* examined during previous fall migrations were free of ticks (Hoogstraal et al., 1963, p. 251). In 1962, during fall passage, five of 66 *C. crex* were infested by five nymphs, one *Haemaphysalis punctata*, one *Haemaphysalis sulcata*, and three *Ixodes* sp. (one of which was identified as " probably *ricinus* ").

FAMILY COLUMBIDAE (PIGEONS AND DOVES)

Streptopelia turtur (Linnaeus). Turtle Dove. (See p. 200 and Fig. 5 of Hoogstraal et al., 1961, for range, and p. 238 of Hoogstraal et al., 1963.)

Tick infestation of turtle doves is rare. Two nymphs of *Hyalomma aegyptium* were taken from a single bird in the fall of 1962; 124 other turtle doves were free of ticks.

FAMILY STRIGIDAE (OWLS)

Otus scops scops (Linnaeus). Scops Owl. (See p. 238 and Fig. 3 of Hoogstraal et al., 1963, for range.)

Although we do not collect a large number of scops owls by the methods we use, the general impression is that these birds are fairly important hosts of *Hyalomma m. marginatum*. During the fall of 1962, 13 nymphs of this tick were taken from three of the 14 birds inspected. In previous years, three of five scops owls were infested by 10 specimens of this tick.

FAMILY PICIDAE (WOODPECKERS AND WRYNECKS)

Jynx torquilla torquilla Linnaeus. Wryneck. (See p. 240 and Fig. 6 of Hoogstraal et al., 1963, for range.)

The single infested wryneck, out of 29 inspected during the fall of 1962, escaped and the tick on it was not identified. Previously, a few *Hyalomma* sp. were found on these birds.

FAMILY ORIOLIDAE (ORIOLES)

Oriolus oriolus oriolus (Linnaeus). Golden Oriole. (See p. 240 and Fig. 7 of Hoogstraal et al., 1963, for range.)

Fourteen of 96 (14.58%) golden orioles examined in the fall of 1962 were infested by 16 nymphs of *Hyalomma m. marginatum* and one of *Hyalomma* sp. In previous years the average prevalence of infestation of these birds was 2.36%.

FAMILY TURDIDAE (THRUSHES AND CHATS)

Saxicola rubetra (Linnaeus). Whinchat. (See p. 240 and Fig. 8 of Hoogstraal et al., 1963, for range.)

Eight of 60 whinchats taken in the fall of 1962 provided 22 ticks, all of which were larvae (6) and nymphs (15) of *Hyalomma m. marginatum*, except for one nymph of *H. aegyptium*. The average prevalence of infestation in 1962 (13.33%) was higher than in previous years (3.35%), when 17 of 506 whinchats were infested.

Oenanthe hispanica melanoleuca (Güldenstädt). Black-eared Wheatear (Eastern form). (See p. 204 and Fig. 11 of Hoogstraal et al., 1961, for range.)

During previous fall migrations, we examined 11 of these wheatears, all of which were free of ticks. In 1962, one of three birds was infested by a single tick which was lost and not identified.

Oenanthe pleschanka (Lepschin). Pied Wheatear. Fig. 3.

There are two subspecies of the pied wheatear, the nominate *pleschanka* which breeds from southern USSR and Iran east to central Asia, and *cypriaca* which breeds only on Cyprus. Both have been taken in small numbers in Egypt on passage, *cypriaca* probably being more common. The only difference is one of average size, and some migrants cannot be identified to subspecies. Any individuals of *cypriaca* reaching Egypt would, of course, come from Cyprus, and any individuals of *pleschanka* would probably come from the western part of the breeding range in southern USSR.

A few specimens of *cypriaca* yielded ticks during previous spring migrations (Hoogstraal et al., 1961, p. 204) but none of either subspecies was seen in the fall. In 1962, however, a single fall bird was collected; it was infested by a nymph of *Haemaphysalis punctata*, a tick that may have come from either Cyprus or the USSR.

Monticola solitarius solitarius (Linnaeus). Blue Rockthrush. Fig. 4.

The blue rockthrush breeds in northwest Africa, in the Mediterranean countries of Europe, and in Turkey, and winters in northern Africa. It is found in Egypt on both passages, more commonly in spring, and a few individuals may remain at Giza and elsewhere throughout the year. Meinertzhagen (1930) considered the eastern race, *M. s. longirostris*, to be more common than *M. s. solitarius*, but we have yet to collect a specimen of the former. Blue rockthrushes reaching Egypt probably come from the Balkans or Turkey.

Six blue rockthrushes examined during earlier fall migrations and 19 during spring passage were free of ticks. During 1962, one of three fall birds carried two nymphs of *Hyalomma m. marginatum*.

Phoenicurus phoenicurus phoenicurus (Linnaeus). Common Redstart. (See p. 204 and Fig. 13 of Hoogstraal et al., 1961, for range, and p. 242 of Hoogstraal et al., 1963).

Although the prevalence of infestation during the fall of 1962, when 134 out of 617 (21.74%) common redstarts were infested, was much higher than the average for previous years (6.70%), the species composition of ticks was much the same. The 166 ticks from these 134 birds were four larvae and 6 nymphs of *Ixodes* sp., one larva and one nymph of *Ixodes frontalis*, three larvae and four nymphs of *Haemaphysalis punctata*, seven larvae of *Hyalomma* sp., 21 larvae and 103 nymphs of *H. m. marginatum*, 11 nymphs of *H. aegyptium*, and five ticks lost and not identified.

Luscinia luscinia (Linnaeus). Thrush Nightingale. (See p. 242 and Fig. 10 of Hoogstraal et al., 1963, for range.)

The 1962 fall prevalence of infestation (39.08%) was even higher than the average of previous years (24.40%). The 145 infested thrush nightingales, out of 371 inspected, yielded 355 ticks: 216 larvae and 50 nymphs of *Ixodes* sp., four larvae of *I. ricinus*, 19 larvae and seven nymphs of *Haemaphysalis punctata*, one larva of *Hyalomma* sp., three larvae and 34 nymphs of *H. m. marginatum*, 16 larvae and two nymphs of *H. aegyptium*, and three ticks lost and not identified. Previously, when more ticks were preserved for identification, *L. luscinia* was found to be an especially important host for *Ixodes ricinus*; in 1962 most of the 270 *Ixodes* specimens from these birds were turned over alive to the Virology Department of the United States Naval Medical Research Unit, No. 3 (NAMRU-3) and could be identified only as *Ixodes* sp.

Luscinia megarhynchos megarhynchos Brehm. Nightingale. (See p. 242 and Fig. 11 of Hoogstraal et al., 1963, for range.)

In the fall of 1962, six of 22 nightingales (27.27%) were infested, an average comparable to that of 1961 (23.52%) but higher than in 1960 (3.44%). The thirteen nightingale ticks were one larva and four nymphs of *Hyalomma m. marginatum*, five larvae, one nymph, and one female of *Ixodes* sp., and one lost. Previously, *Ixodes ricinus* was fairly numerous on these birds.

FAMILY SYLVIIDAE (WARBLERS)

Acrocephalus palustris (Bechstein). Marsh Warbler. Fig. 5.

The marsh warbler breeds in Europe and the USSR through to western Siberia, and winters in eastern Africa from Kenya south. It occurs in small numbers in Egypt on both passages. Birds from the whole of Europe probably move east and south on their migration to winter quarters; west of Egypt this species is not known from the southern Mediterranean coast. The recovery on Cyprus of a bird banded in Belgium supports this pattern. Marsh warblers reaching Egypt, therefore, may come from anywhere in Europe or the USSR.

During previous fall migrations, no ticks were found on 18 *A. palustris* (Hoogstraal et al., 1963, p. 251). In 1962, one of 38 was infested by a nymph of *Ixodes ricinus*.

Sylvia communis communis Latham. Whitethroat. (See p. 244 and Fig. 15 of Hoogstraal et al., 1963, for range.)

The 5.42% prevalence of infestation during the 1962 fall migration was considerably higher than the average of 0.44% recorded during the previous years. In 1962, 22 out of 406 whitethroats bore 23 ticks; these were two larvae, four nymphs, and two females of *Ixodes* sp., one nymph of *I. frontalis*, one nymph of *Haemaphysalis punctata*, one larva of *Hyalomma* sp., one nymph of *H. aegyptium*, one larva and eight nymphs of *H. m. marginatum*, and two ticks lost and not identified. *Ixodes ricinus* was also taken from whitethroats before 1962.

One uninfested *Sylvia c. communis* taken at Burg El Arab had been banded by the Museum of Stockholm, Sweden.

Sylvia curruca curruca (Linnaeus). Lesser Whitethroat. (See p. 244 and Fig. 16 of Hoogstraal et al., 1963, for range.)

The earlier prevalence of fall infestation of lesser whitethroats was 0.44%, like that of *S. c. communis* (above), but in 1962 it, again like that of *S. c. communis*, was also higher (4.69%). The 25 tick-bearing *S. c. curruca*, out of 532 inspected, had 16 larvae and four nymphs of *Ixodes* sp., three larvae and one nymph of *I. frontalis*, two larvae of *Hyalomma* sp., two nymphs of *H. aegyptium*, and six larvae and eight nymphs of *H. m. marginatum*.

Phylloscopus trochilus subspp. Willow Warbler. (See p. 244 and Fig. 17 of Hoogstraal et al., 1963, for range.)

During the falls of 1959 to 1961, the prevalence of infestation of willow warblers ranged from 2.28% to 8.51%. In 1962, 63 of 950 (6.63%) were infested. The 103 ticks on these birds were 18 larvae and five nymphs of *Ixodes* sp., eight larvae and one nymph of *I. ricinus*, one female of *I. frontalis*, two larvae of *Haemaphysalis inermis*, 13 larvae and three nymphs of *H. punctata*, 12 larvae of *Hyalomma* sp., four larvae of *H. aegyptium*, 27 larvae and four nymphs of *H. m. marginatum*. and five ticks lost and not identified.

FAMILY MUSCICAPIDAE (FLYCATCHERS)

Muscicapa striata striata (Pallas). Spotted Flycatcher. (See p. 248 and Fig. 20 of Hoogstraal et al., 1963, for range.)

The 1962 fall prevalence of infestation (9.58%) was over twice that of the average of previous years

FIG. 1-4. WINTER AND SUMMER RANGE OF TICK HOSTS

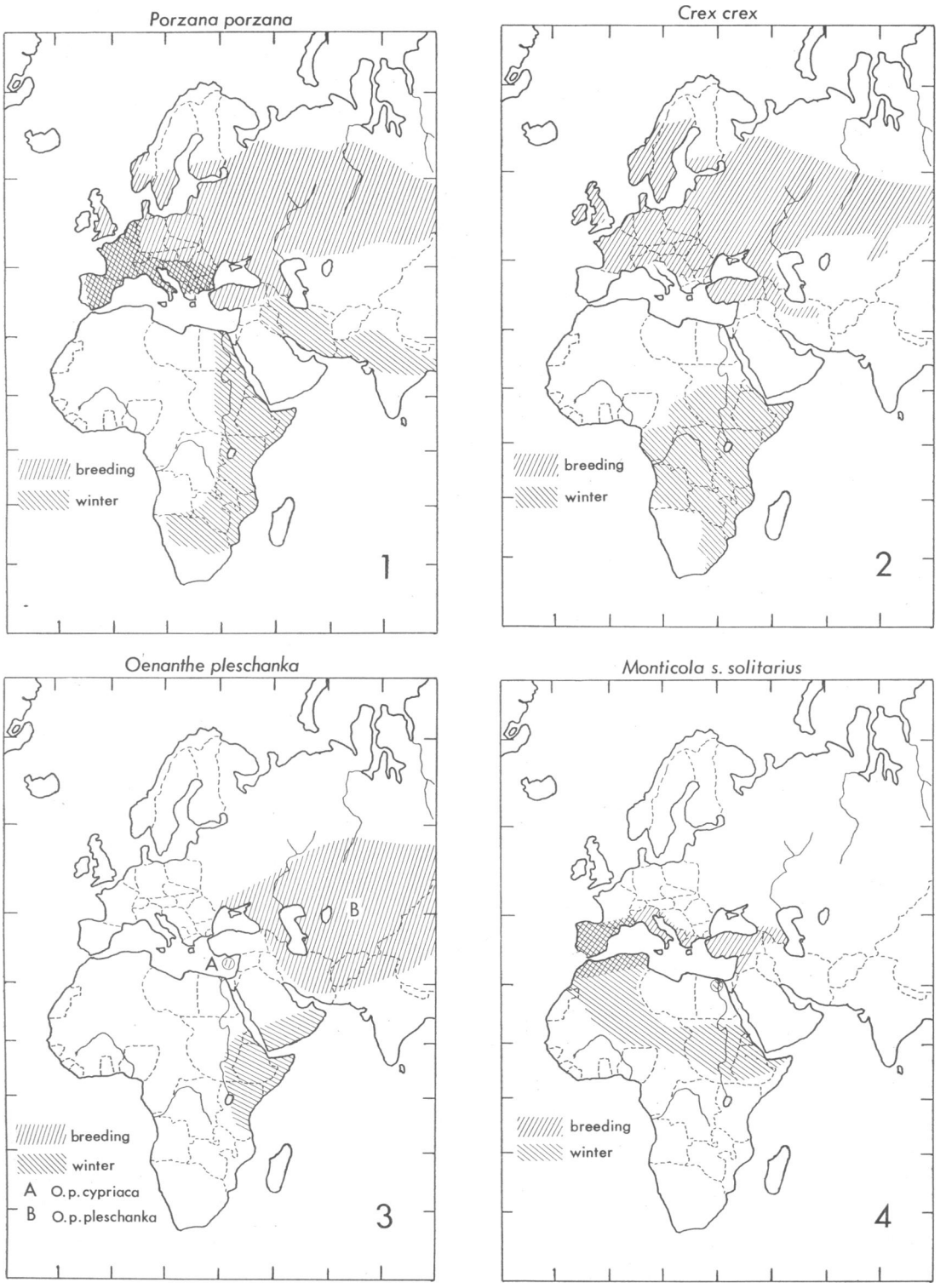


TABLE 1

TICKS FROM FALL MIGRATORY BIRDS IN EGYPT, 1962

Species	Bird hosts			Immature ticks															
				Ixodes [a]				*Haemaphysalis*			*Hyalomma*								
	No. examined	Infested		sp.?	*frontalis*	*ricinus*	*redikorzevi*	*punctata*	*sulcata*	*inermis*	sp.	*aegyptium*	*m. marginatum*	*a. anatolicum*	*anatolicum excavatum*	*dromedarii*	Ticks lost	Total ticks	No. ticks per host
		No.	%																
Falco naumanni	2	1	50.00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1.00
Falco t. tinnunculus	4	1	25.00	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3.00
Coturnix c. coturnix	6 520	393	6.03	16 (5 A)	0	7	4	308	1	1	4	22	146	1	1	2	46	559	1.42
Porzana porzana	16	2	12.50	1 A	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1.00
Crex crex	66	5	7.57	3	0	0	0	1	1	0	0	0	0	0	0	0	0	5	1.00
Streptopelia turtur	125	1	0.80	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	2.00
Otus s. scops	14	3	21.4	0	0	0	0	0	0	0	0	0	13	0	0	0	0	13	4.33
Jynx t. torquilla	29	1	3.44	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.00
Oriolus o. oriolus	96	14	14.58	0	0	0	0	0	0	0	1	0	16	0	0	0	0	17	1.21
Saxicola r. rubetra	60	8	13.33	0	0	0	0	0	0	0	0	1	21	0	0	0	0	22	2.75
Oenanthe hispanica melanoleuca	3	1	33.33	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.00
Oenanthe pleschanka subsp.	1	1	100.00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1.00
Monticola s. solitarius	3	1	33.33	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2.00
Phoenicurus p. phoenicurus	617	134	21.74	10	2	0	0	7	0	0	7	11	124	0	0	0	5	166	1.23
Luscinia m. megarhynchos	22	6	27.27	7	0	0	0	0	0	0	0	0	5	0	0	0	1	13	2.16
Luscinia luscinia	371	145	39.08	266	0	4	0	26	0	0	1	18	37	0	0	0	3	355	2.44
Acrocephalus palustris	38	1	2.63	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1.00
Sylvia c. communis	406	22	5.42	8	1	0	0	1	0	0	1	1	9	0	0	0	2	23	1.05
Sylvia c. curruca	532	25	4.69	20	4	0	0	0	0	0	2	2	14	0	0	0	0	42	1.68
Phylloscopus trochilus subspp.	950	63	6.63	23	1	9	0	16	0	2	12	4	31	0	0	0	5	103	1.63
Muscicapa s. striata	313	30	9.58	0	1	0	0	4	0	3	6	3	20	0	0	0	3	40	1.33
Anthus t. trivialis	22	12	54.54	9	0	0	0	10	0	0	2	0	34	0	0	0	2	57	4.75
Motacilla a. alba	8	3	37.50	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	1.00
Lanius c. collurio	394	8	2.03	2	0	0	0	0	0	0	1	0	7	0	0	0	0	10	1.25
Total (24 forms)	10 612	881		365	9	21	4	374	2	6	37	64	486	1	1	2	70	1 442	1.63
Percentage of total		8.30		25.31	0.62	1.46	0.28	25.94	0.14	0.42	2.56	4.44	33.70	0.07	0.07	0.14	4.85		

[a] A = adult specimens.

(4.06%). The 40 ticks on the 30 hosts, out of 313 spotted flycatchers examined, were one female of *Ixodes frontalis*, three larvae of *Haemaphysalis inermis*, three larvae and one nymph of *H. punctata*, six larvae of *Hyalomma* sp., three larvae of *H. aegyptium*, 20 larvae of *H. m. marginatum*, and three ticks lost and not identified.

FAMILY MOTACILLIDAE (WAGTAILS AND PIPITS)

Anthus trivialis trivialis (Linnaeus). Tree Pipit. (See p. 248 and Fig. 21 of Hoogstraal et al., 1963, for range.)

The tree pipit is consistently one of the most frequently infested fall migrants reaching Egypt, but the prevalence of infestation in 1962 (54.54%) greatly exceeded the average of previous years (16.06%). The number of ticks per host (4.75), though the greatest for any bird species recorded in 1962, did not, however, equal the earlier high of 9.33 ticks per host. The 57 ticks on the 12 out of 22 tree pipits examined were one larva and eight nymphs of *Ixodes* sp., eight larvae and two nymphs of *Haemaphysalis punctata*, two larvae of *Hyalomma* sp., 23 larvae and 11 nymphs of *H. m. marginatum*, and two ticks lost and not identified.

Motacilla alba alba Linnaeus. White Wagtail. (See p. 206 and Fig. 16 of Hoogstraal et al., 1961, for range, and p. 248 of Hoogstraal et al., 1963.)

Previously, only one of 43 white wagtails yielded a tick (*Hyalomma m. marginatum*) but in 1962 three of eight birds were infested by two nymphs of this same tick and by another tick that was lost and not identified. The 1962 white wagtails were examined at Burg El Arab (Bahig) in mid-October; the 1959-61 birds were taken at Port Said in October.

FAMILY LANIIDAE (SHRIKES)

Lanius collurio collurio Linnaeus. Red-backed Shrike. (See p. 248 and Fig. 23 in Hoogstraal et al., 1963, for range.)

The 1962 prevalence of fall infestation (2.03%) for eight out of 394 red-backed shrikes is somewhat higher than the average of 1.24% recorded for 16 out of 1274 birds from 1959 to 1961. The 10 ticks taken in 1962 were two females of *Ixodes* sp., one larva of *Hyalomma* sp., and four larvae and three nymphs of *H. m. marginatum*.

NON-INFESTED FALL MIGRANTS, 1962

The following 40 forms of birds, represented by 424 specimens, were not tick-infested (numbers in parentheses indicate numbers examined and an asterisk indicates bird forms that were infested in fall migrations in previous years): *Ixobrychus m. minutus* (1), *Nycticorax n. nycticorax* [1] (3), *Anas c. crecca* (1), *Pernis a. apivorus* (2), *Falco p. peregrinus* (1), *Falco s. subbuteo* (2), *Rallus a. aquaticus* (1), *Gallinula c. chloropus* (2), *Charadrius a. asiaticus* (1), *Cursorius c. cursor* (2), **Cuculus c. canorus* (20), *Caprimulgus e. europaeus* (20), *Alcedo a. atthis* (4), **Merops apiaster* (30), **Coracias g. garrulus* (3), *Upupa e. epops* (20), *Calandrella b. brachydactyla* (1), *Hirundo r. rustica* (7), **Saxicola torquata rubicola* (1), **Oenanthe o. oenanthe* (8), **Monticola saxatilis* (4), *Erithacus r. rubecula* (3), *Luscinia svecica cyanecula* (2), *Turdus p. philomelos* (4), **Acrocephalus schoenobaenus* (125), *Acrocephalus scirpaceus* (23), *Acrocephalus a. arundinaceus* (7), *Sylvia n. nisoria* (1), **Sylvia b. borin* (79), **Sylvia a. atricapilla* (20), *Sylvia ruppelli* (8), *Phylloscopus sibilatrix* (3), *Ficedula p. parva* (2), **Ficedula a. albicollis* (4), *Anthus cervinus* (2), **Motacilla flava* subsp. (1), *Motacilla cinerea* subsp. (2), *Lanius minor* (1), *Lanius excubitor elegans* (2), **Passer h. hispaniolensis* (1).

BIRD HOSTS, SPRING 1962

FAMILY STRIGIDAE (OWLS)

Otus scops scops (Linnaeus). Scops Owl. (See pages 356 and 357 above.)

At Burg El Arab in 1962, 13 scops owls were inspected. One bore a nymph of *Hyalomma marginatum rufipes*. We have not collected this bird during spring passage in the Cairo area.

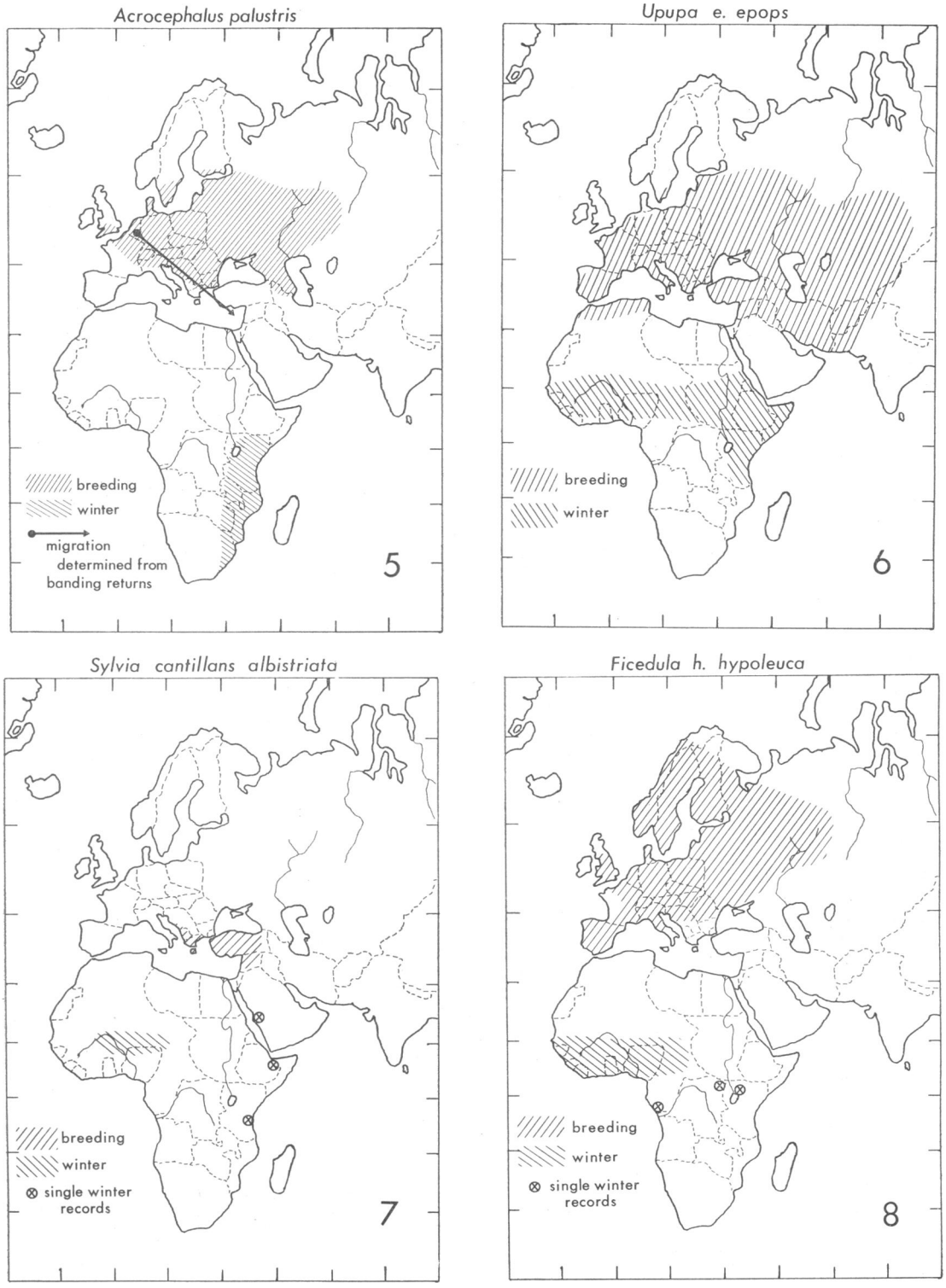
FAMILY UPUPIDAE (HOOPOES)

Upupa epops epops Linnaeus. European Hoopoe. Fig. 6.

The European hoopoe breeds over much of Europe north to southern Sweden and the Baltic states, east to central Asia, and south to north-western Africa, Israel, Jordan, Iran and West Pakistan. It winters in tropical Africa, south to Tanganyika. This bird is abundant in Egypt on both passages. Those reaching Egypt in spring undoubtedly have wintered or passed through the Sudan on their way to eastern Europe and western USSR.

[1] Two of the three night herons, *Nycticorax n. nycticorax*, reported here bore leg bands, one from Bucharest, Romania, and the other from Prague, Czechoslovakia.

FIG. 5-8. WINTER AND SUMMER RANGE OF TICK HOSTS



Two nymphs of *Hyalomma marginatum rufipes* were collected from a hoopoe at Burg El Arab. Five other hoopoes were not infested. In the Cairo area, four hoopoes inspected during the 1960 spring migration were free of ticks.

FAMILY TURDIDAE (THRUSHES AND CHATS)

Oenanthe oenanthe oenanthe (Linnaeus). European Wheatear. (See p. 202 and Fig. 9 of Hoogstraal et al., 1961, for range, and p. 240 of Hoogstraal et al., 1963.)

Between 24 March and 23 April 1962 at Burg El Arab, 273 European wheatears were examined. Of these, 28 were infested by 119 *Hyalomma marginatum rufipes* (76 larvae, 43 nymphs). This pattern of infestation is similar to that noted in the Cairo area from 1955 to 1960. The European wheatears and the eastern black-eared wheatears are probably the most numerous and commonly tick-infested of spring migrants passing through Egypt.

Oenanthe hispanica melanoleuca (Güldenstädt). Black-eared Wheatear (Eastern form). (See page 357 above.)

Five eastern black-eared wheatears, out of 49 examined at Burg El Arab in March and April of 1962, carried eight larvae and 12 nymphs of *Hyalomma marginatum rufipes.*

Phoenicurus phoenicurus phoenicurus (Linnaeus). Common Redstart. (See page 357 above.)

Four larvae and eight nymphs of *Hyalomma marginatum rufipes* were found on eight common redstarts at Burg El Arab in March and April of 1962. One hundred and four other common redstarts were free of ticks at this time.

Luscinia luscinia (Linnaeus). Thrush Nightingale. (See page 358 above.)

Three out of 64 thrush nightingales examined at Burg El Arab in March and April 1962 bore two larvae and two nymphs of *Hyalomma marginatum rufipes.* We did not encounter this bird during spring migrations in the Cairo area, and the present data are the first implicating *L. luscinia* as a tick host during the spring migration.

FAMILY SYLVIIDAE (WARBLERS)

Sylvia atricapilla atricapilla (Linnaeus). Blackcap. (See p. 244 and Fig. 14 of Hoogstraal et al., 1963, for range.)

We have not seen this bird during earlier spring migrations and have examined few during autumn migrations. In April 1962, one of 16 blackcaps was carrying a single nymph of *Hyalomma marginatum rufipes.*

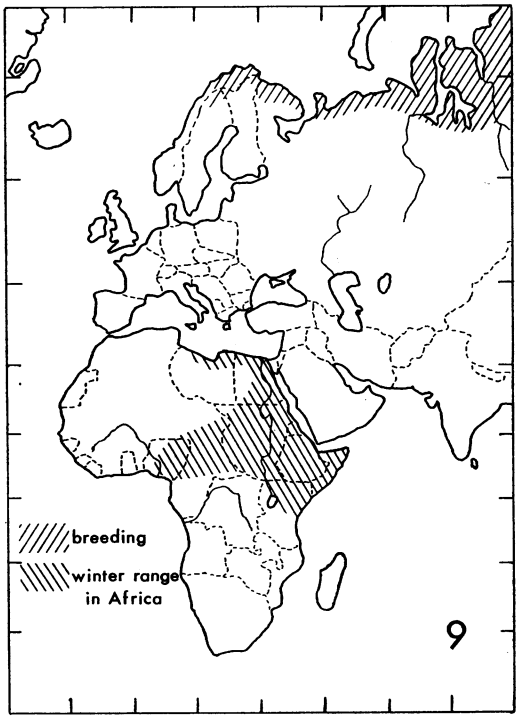
Sylvia communis communis Latham. Whitethroat. (See page 358 above.)

Although the whitethroat is said to be common on both passages in Egypt, we have not seen it in the Cairo area during spring migrations. At Burg El Arab in March and April 1962, three out of 186 whitethroats were carrying two nymphs of *Hyalomma marginatum rufipes* and one female of *Ixodes* sp.

Sylvia cantillans albistriata (Brehm). Subalpine Warbler. Fig. 7.

The subalpine warbler breeds in Yugoslavia, Greece, and Asia Minor; it winters along the southern edge of the Sahara from Mali to Chad. Single specimens have been taken in Arabia, Somalia, and Tanganyika. Although it is common in Egypt on spring passage, none has been taken in autumn. The birds reaching Egypt in spring undoubtedly

FIG. 9. WINTER AND SUMMER RANGE OF TICK HOST *Anthus cervinus*



came from their regular wintering grounds in West Africa. We did not encounter this bird on spring migration in the Cairo area.

At Burg El Arab in March and April 1962, two subalpine warblers each bore a nymph of *Hyalomma marginatum rufipes*. Fifty-one other birds of this species were uninfested.

FAMILY MUSCICAPIDAE (FLYCATCHERS)

Ficedula hypoleuca hypoleuca (Pallas). Pied Flycatcher. Fig. 8.

The pied flycatcher breeds in most of Europe and western USSR; it winters in tropical West Africa. Single specimens have been taken in Cabinda, north-eastern Congo, and East Africa. In Egypt it is rare on autumn migration but abundant in spring. Banding returns show that migration is predominantly south-west–north-east. Birds passing through Egypt in spring probably come from Chad and the Central African Republic on their way to breeding-grounds in the Urals.

We have examined only one of these birds previously; this one, during an autumn passage, was uninfested. A single nymph of *Hyalomma marginatum rufipes* was taken from one of 18 pied flycatchers at Burg El Arab in the spring of 1962.

FAMILY MOTACILLIDAE (WAGTAILS AND PIPITS)

Anthus campestris campestris (Linnaeus). Tawny Pipit. (See p. 206 and Fig. 18 of Hoogstraal et al., 1961, for range, and p. 248 of Hoogstraal et al., 1963.)

Of the 46 tawny pipits examined at Burg El Arab in the spring of 1962, one carried two larvae of *Hyalomma marginatum rufipes*.

Anthus cervinus (Pallas). Red-throated Pipit. Fig. 9.

The breeding range of the red-throated pipit is in the extreme north of Europe and Asia. The winter range in Africa includes the eastern Mediterranean littoral, Egypt, and tropical areas from Nigeria to Somalia and Tanganyika. In Egypt, it is abundant on both passages, and common in winter.

TABLE 2

TICKS FROM SPRING MIGRATORY BIRDS IN EGYPT, 1962

Bird hosts				Immature ticks				
Species	No. examined	Infested		*Hyalomma m. rufipes*	*Ixodes* ?sp. nov.	*Amblyomma variegatum*	Total ticks	No. ticks per host
		No.	%					
Otus s. scops	13	1	7.69	1	0	0	1	1.00
Upupa e. epops	6	1	16.66	2	0	0	2	2.00
Oenanthe o. oenanthe	273	28	10.26	119	0	0	119	4.25
Oenanthe hispanica melanoleuca	49	5	10.20	20	0	0	20	4.00
Phoenicurus p. phoenicurus	112	8	7.14	12	0	0	12	1.50
Luscinia luscinia	64	3	4.68	4	0	0	4	1.25
Sylvia a. atricapilla	16	1	6.25	1	0	0	1	1.00
Sylvia c. communis	186	3	1.61	2	1	0	3	1.00
Sylvia cantillans albistriata	53	2	3.77	2	0	0	2	1.00
Ficedula h. hypoleuca	18	1	5.55	1	0	0	1	1.00
Anthus c. campestris	46	1	2.17	2	0	0	2	2.00
Anthus cervinus	24	1	4.17	0	0	1	1	1.00
Motacilla a. alba	7	1	14.28	0	18 [a]	0	18	18.00
Total (13 forms)	867	56		166	19	1	186	3.32
Percentage of total		6.46		89.25	10.21	0.54		

[a] 3 female adults included.

A single nymph of *Amblyomma variegatum* infested one of 24 *Anthus cervinus* inspected at Burg El Arab in the spring of 1962. This tick is confined to tropical Africa. The nymph was reared to an adult in the laboratory. We have not previously examined migrating red-throated pipits.

Motacilla alba alba Linnaeus. White Wagtail. (See page 361 above.)

Fifteen nymphs and three adult females of *Ixodes* ? sp. nov. were taken from one white wagtail at Burg El Arab on 24 March 1962. Seven other birds were uninfested. *Hyalomma marginatum rufipes* nymphs were found on one of these birds near Cairo in March 1960.

NON-INFESTED SPRING MIGRANTS, 1962

The following 31 forms of birds, represented by 907 specimens, were not tick-infested (numbers in parentheses indicate numbers examined and an asterisk indicates bird forms that were infested in spring migrations in previous years): *Ardeola ralloides* (7), *Nycticorax n. nycticorax* (1), *Milvus m. migrans* (6), *Accipter n. nisus* (1), *Falco s. subbuteo* (1), **Falco t. tinnunculus* (16), **Falco naumanni* (29), **Coturnix c. coturnix* (4), *Porzana porzana* (3), *Gallinula c. chloropus* (3), **Streptopelia t. turtur* (11), *Cuculus c. canorus* (5), *Asio f. flammeus* (1), *Caprimulgus e. europaeus* (2), *Jynx t. torquilla* (14), **Calandrella b. brachydactyla* (2), *Hirundo r. rustica* (8), *Saxicola r. rubetra* (4), **Monticola saxatilis* (11), *Monticola s. solitarius* (6), *Phoenicurus ochruros gibraltariensis* (1), *Erithacus r. rubecula* (4), *Turdus p. philomelos* (2), *Acrocephalus palustris* (11), *Acrocephalus a. arundinaceus* (7), *Sylvia c. curruca* (436), *Sylvia ruppelli* (193), *Ficedula a. albicollis* (81), *Anthus t. trivialis* (6), *Motocilla flava* subsp. (14), **Lanius s. senator* (17).

DISCUSSION AND CONCLUSIONS

FALL MIGRATION

During the fall migration periods of 1959, 1960, and 1961, 32 086 birds (comprising 72 forms) were examined for ticks at various localities along the Mediterranean coast of Egypt while *en route* from Asia and eastern Europe to tropical Africa (Hoogstraal et al., 1963). During this period in 1962, 11 036 birds were examined, all in the area of Burg El Arab, on the Mediterranean coast west of Alexandria (for map, see Fig. 1 in Hoogstraal et al., 1963). In previous years, 1040 birds (consisting of 40 forms, 3.31% of the tick-infested bird forms examined) were infested. In 1962, 881 birds (consisting of 24 forms, 8.30% of the tick-infested birds forms examined) were infested (Table 1). The previous birds yielded 1761 ticks (1.69) ticks per host); the 1962 birds yielded 1442 ticks (1.63 ticks per host). Thus, the 1962 prevalence of infestation was considerably higher than in previous years, although the number of ticks per host remained the same.

This difference in prevalence of infestation was not caused by a difference in species composition of the birds examined. Methods of trapping were the same as in previous years, and the major tick hosts of 1959-61 were found in approximately the same relative abundance in 1962. Increases in the rates of infestation of important hosts (*Coturnix coturnix*, *Phoenicurus phoenicurus*, *Luscinia luscinia*, *Sylvia communis*, *Sylvia curruca*, *Phylloscopus trochilus*, *Muscicapa striata* and *Anthus trivialis*) are all highly significant statistically, and reflect a real increase in the number of ticks. The cause of this increase is not known, but presumably reflects a greater availability of ticks on the birds' breeding-grounds or along the routes of migration. It would be interesting to know if the summer of 1962 was noteworthy for tick abundance in Europe and the USSR.

In 1962 five bird species were added to the earlier host list. These were *Porzana porzana*, *Crex crex*, *Oenanthe pleschanka*, *Monticola s. solitarius*, and *Acrocephalus palustris*. Therefore, 45 tick-infested bird forms are now known to pass through Egypt during the fall migration. Forty forms of fall migrants, represented by 424 specimens, yielded no ticks in 1962. Of these 40 forms, 12 had previously provided ticks during the fall migration, though in no instance in large numbers.

Of the *Ixodes* ticks taken in 1962, most were identified merely as *Ixodes* sp. and turned over to the NAMRU-3 Virology Department for virological studies. The species composition in this genus is therefore not comparable with that of earlier years. However, it is noteworthy that among the 34 *Ixodes* specimens that were preserved and identified by

Dr Carleton Clifford of the Rocky Mountain Laboratory, four from quail proved to be *Ixodes redikorzevi*, an Asiatic species not previously found on fall migrants in Egypt. Very small numbers of *I. redikorzevi* have been dug from rodent burrows in the Nile Delta (Hoogstraal & Kaiser, 1958). Earlier, we had surmised that these rodent burrow parasites might represent a relict population, but the possibility that they were progeny of ticks introduced by migratory birds should be considered.

In the genus *Haemaphysalis*, *H. punctata* provided approximately 26% of the total number of ticks taken during 1962; in previous years this average was 28%. Most of these were from quail. An unexpected finding was that of six *H. inermis* from a quail, warblers and flycatchers. Records of this Asiatic-European tick, and especially of its immature stages, are indeed rare.

As usual, *Hyalomma* ticks represented the bulk of the ticks from fall migrants and *H. m. marginatum* (33.7%) was the most common form taken. The average of earlier collections was approximately 39%. The 1962 collections of this tick from quail and redstarts were similar to those of previous years in that these birds provided many specimens, but the numbers from warblers were lower in 1962 and certain other birds were more heavily infested. The prevalence of *H. aegyptium* on all birds in 1962 (4.4%) was similar to that recorded earlier (4.26%) but the host relationships of this species differed somewhat. Four immature specimens reared to adults of *H. a. anatolicum*, *H. anatolicum excavatum*, and *H. dromedarii* in 1962 represent new records for fall migrants in Egypt. It is impossible to determine whether these four infestations were acquired by their hosts in Asia or whether these cursorial ticks attached themselves to their hosts before removal from nets in Egypt.

SPRING MIGRATION

During the spring of 1962, 1774 birds (representing 44 species) were examined for ticks at Burg El Arab, while *en route* from tropical Africa to their breeding-grounds in Europe and eastern Asia. Of these birds, 56 specimens, belonging to 13 species with a total of 867 individuals, were found to harbour ticks (Table 2). This is a prevalence of infestation of 6.46% for those species that were tick hosts. In 1960, the only previous year for which comparable data are available (Hoogstraal et al., 1961), these figures were 959 birds of 29 species, of which 128, belonging to 13 species represented by 786 individuals, were tick hosts. The prevalence of infestation of those species that were tick hosts was 16.3%. Birds examined in 1960 were taken in the vicinity of Cairo rather than at Burg El Arab. In 1962, seven species were found to be tick hosts for the first time on spring migration: *Otus scops*, *Upupa epops*, *Luscinia luscinia*, *Sylvia communis*, *Sylvia atricapilla*, *Sylvia cantillans*, and *Anthus cervinus*.

Although the prevalence of infestation was markedly lower in the spring of 1962 than in 1960 (6.46% compared with 16.3%), little significance can be attached to this difference owing to considerable variation in species composition of the two collections. The most abundant species taken at Cairo in 1960 were *Falco tinnunculus* (42), *Alauda arvensis* (81), *Oenanthe oenanthe* (270), *Oenanthe isabellina* (158), *Oenanthe hispanica* (81), *Phoenicurus phoenicurus* (53), and *Erythropygia galactotes* (56). In 1962 the most abundant were *Oenanthe oenanthe* (273), *Phoenicurus phoenicurus* (112), *Luscinia luscinia* (64), *Sylvia communis* (186), *Sylvia curruca* (436), *Sylvia ruppelli* (193), *Sylvia cantillans* (53), and *Ficedula albicollis* (81). This variation is a function of the shift of locality from Cairo to Burg El Arab as well as of different trapping methods. The Cairo birds were taken primarily in grub-baited traps, supplemented by mist nets, while those at Burg El Arab were taken either in mist nets or in Arab quail nets.

Only four species were taken in sufficient numbers in both years to supply comparable data regarding prevalence of infestation. Two of these (*Oenanthe hispanica* and *Phoenicurus phoenicurus*) had lower prevalences in 1962, but the differences are not statistically significant. The other two, however, (*Falco tinnunculus* and *Oenanthe oenanthe*) show significant decreases in the prevalence of infestation, from 28.6% to 0 and from 17.8% to 10.3% respectively. These differences may reflect either different points of origin of the birds or actual different infestation rates throughout the areas from which these birds come.

Of the 186 ticks taken on spring migrants in 1962, 166 (89.25%) were larvae and nymphs of *Hyalomma marginatum rufipes*. This result is comparable with those obtained earlier, when, however, all unreared larvae and nymphs were reported as *Hyalomma* sp. Subsequent studies showed that these were *H. marginatum rufipes*.

Twenty other ticks were found on spring migrants in 1962. One of these, a nymph, was reared to an adult of *Amblyomma variegatum*, a common tick

of tropical Africa (Hoogstraal, 1956). The host was *Anthus cervinus*. An apparently new species, closely related to *Ixodes arboricola*, was represented by 19 specimens. One immature specimen was infesting *Sylvia c. communis* and 15 immature and three female specimens were on *Motacilla a. alba*. These ticks will be described by Dr Carleton Clifford of the Rocky Mountain Laboratory, Hamilton, Montana, USA, who kindly studied all the preserved *Ixodes* ticks mentioned in the present report.

RÉSUMÉ

Poursuivant leurs études sur le rôle des oiseaux migrateurs dans la propagation des maladies transmises par les tiques, les auteurs ont, lors des deux migrations (printemps et automne) de l'année 1962, capturé et examiné des milliers d'oiseaux.

Au cours de l'automne 1962, les tiques ont été recherchées sur 11 036 oiseaux migrant en direction du sud et traversant l'Egypte. Une infestation a été mise en évidence sur 881 oiseaux appartenant à 24 espèces ou sous-espèces; on a trouvé sur eux 1442 tiques. Le nombre total d'oiseaux infestés ou non, appartenant à ces espèces, était de 10 612. Un certain nombre d'oiseaux examinés (424) appartenaient à 40 espèces ou sous-espèces non infestées. Les rapports tiques/hôtes étaient analogues à ceux des années précédentes; cependant en 1962 la prévalence de l'infestation a presque toujours été plus élevée que la moyenne des anneés 1959-1961. Cinq espèces d'oiseaux ont été ajoutées à la liste antérieure des 40 formes infestées. L'on a également été frappé par la découverte, chez 4 cailles, de *Ixodes redikorzevi*, espèce asiatique, jamais encore trouvée en Egypte, sur des oiseaux migrant en automne. On avait trouvé ces parasites, en très petit nombre, dans des terriers de rongeurs en 1958. L'on avait supposé alors que ces tiques représentaient des reliquats de populations anciennes; l'on peut maintenant penser qu'elles proviennent de tiques apportées en Egypte par des oiseaux migrateurs. En ce qui concerne le genre *Haemaphysalis*, l'on a été surpris de trouver sur une caille ainsi que sur des fauvettes et des gobe-mouches six spécimens de *H. inermis*, tique euro-asiatique, très rarement signalée. Quatre spécimens immatures de *Hyalomma aegyptium anatolicum*, *H. anatolicum excavatum* et *H. dromedarii*, ont été trouvés pour la première fois sur des oiseaux migrateurs en automne; on peut se demander si les oiseaux ont été infestés en Asie où si les tiques se sont fixées alors qu'ils étaient pris dans les filets posés en Egypte.

Au cours du printemps 1962, 1774 oiseaux migrant vers le Nord et traversant l'Egypte ont été également examinés. Sur ce chiffre, 56 appartenant à 13 espèces étaient infestés; on a trouvé sur eux 186 tiques. Le nombre total d'oiseaux infestés ou non appartenant à ces espèces, était de 867. Un nombre légèrement supérieur d'oiseaux examinés (907) appartenaient à 31 espèces ou sous-espèces non infestées. Comme les années précédentes, *Hyalomma marginatum rufipes* était le parasite le plus fréquemment observé (89,25%) chez les oiseaux migrateurs de printemps. Un seul spécimen de *Amblyomma variegatum* a été trouvé sur *Anthus cervinus* et 19 specimens de *Ixodes* (il s'agit peut-être d'une espèce nouvelle) ont été recueillis chez *Sylvia communis communis* (fauvette grisette) et *Motacilla alba alba* (bergeronnette grise).

Les auteurs ont observé une diminution considérable ou nette de l'infestation de deux espèces d'oiseaux; chez *Falco tinnunculus* (crécerelle d'Europe), cette infestation est passée de 28,6% à 0,0%, chez *Oenanthe oenanthe* (traquet motteux) de 17,8% à 10,3%. Ces différences peuvent être dues soit à la diversité d'origine des oiseaux, soit à un changement réel du taux d'infestation parasitaire dans les régions d'où ils viennent.

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