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TRANSLATION FROM RUSSIAN. FILIPPOVA, N. A. 1963. On ticks of the genus Ornithodoros Koch parasitizing birds. Zool. Inst. Akad. Nauk USSR, 21(16):16-27.

Ticks of the genus Ornithodoros Koch /Subgenus Alectorobius (Pocock, 1907) Posp.-Str. (1950)/ that parasitize birds deserve special attention owing to their possible role in the transmission of spirochetosis (Theodor, 1933; Chagin and Lyatlov, 1960).

In Russian literature, these parasites have been recorded under various names: O. coniceps Can. (majority of authors), O. talaje Guer.-Men. (Isaakyan, 1926), and O. capensis Neum. (questionable, Pospelova-Shtrom, 1959). Since descriptions of nomenclature and distinct diagnoses of these species are absent in the literature (see page 24) it is naturally difficult to judge precisely which form authors used when recording these parasites in the USSR fauna. The aim of the present article is to establish the representative species of the subgenus Alectorobius and to provide diagnoses of all their active life cycle stages.

Ticks were investigated in the following areas: Crimea, Tarkhankut and Kazantip peninsula (collections of the author, 1960), two specimens from Tarkhankut peninsula collected by E. N. Vshivkov); Uzbekistan, and the islands of the Aral sea (collections of G. S. Pervomaisky); Tadzhikistan, and "Tigrovaya Balka" reservation (our collections, 1959). In order to study morphology, larvae, nymphs, and partly adult ticks were reared in the laboratory. They were found to belong to two species - O. coniceps Can., 1890 and O. capensis Neum., 1901.

Diagnosis of the subgenus Alectorobius (Pocock, 1907) Post.-Str.1950

Sexually mature ticks. Arrangement of the discs reminds one of a figure eight, discs are also present inside the anterior and posterior parts of the figure eight. Dorsoventral groove is absent. Median postanal groove does not extend beyond transverse postanal groove; the latter is removed caudad and lacks fissures at the juncture with the median postanal. Capitulum is bent perpendicularly ventrad. Cheeks are entire. Only tarsus I has an apical dorsal hump, other dorsal protuberances on tarsus I are absent. Setae of capitulum and legs are pointed, with the exception of a few next to the Haller's organ. Integument of

capitulum and legs is coarse, covered with small protuberances. Dorsal cheliceral protuberance with intermediate denticle.

Nymphal subgeneric criteria are the same as those of adult ticks, except that in the first nymphal instar some of the features have not developed.

In the larva of the subgenus Alectorobius, the presence of a dorsal disc (as in Argasidae) is inherent, (as well as) 15 pairs of dorsal setae, 4 pairs of ventral setae, an unpaired postanal seta, 2 pairs of rudimentary coxal glands, a long hypostome of the argasidae type, and the dorsal cheliceral protuberance lacks an intermediate denticle.

Ornithodoros coniceps Can., 1890

Adult ticks. The body (idiosoma) is relatively wide and short (fig. 1), sometimes widened posteriorly; its apical angle is blunt, and the anterior edge protrudes slightly forward; from dorsal view lateral protuberances protrude slightly or are not visible, from ventral view they form small tubercles. Dorsal protuberances of the integument are very high, large, ribbed, and of irregular form; in the posterior portion of the body they are larger than in the anterior, usually arranged in transverse chains, spaces are approximately equal to the surface of the protuberance (fig. 1 and 3); the number of protuberances in the anterior portion of the body is usually less than in the following species. Protuberances of the lateral and ventral areas which lie caudad from the transverse postanal groove are large and high. Peritreme in the form of a regular narrow crescent; the greatest width of the crescent is less than the longitudinal diameter of the macula, which is situated approximately in the center of the crescent; the longitudinal diameter of the macula is less than 2 times the length of the crescent (figs. 5. 1, 2; 6. 6). The peritreme and the macula are convex (fig. 5. 3). The entire stigma is rounded or oval, smaller than the anal valve, and approximately equal in size to the nearest protuberances of the integument. The free surface of the cheeks is angular, basal angle is smooth. Hypostome short with an indentation at the apex. Tarsus I relatively short, correlation of its greatest width and length 1 : 3.5 - 4 (fig. 7. 1). Legs usually stumpy, shorter than in the following species. Color of living ticks dark-gray, without reddish tinge.

Nymphal stage. Anterior end of body blunt and short. The dorsal protuberances of the integument large and high; in older stages they are larger in the posterior portion of the body than in the anterior, and are arranged with spaces. Peritreme in the form of a narrow crescent (fig. 6. 7). Tarsus I relatively short.

Larva. Dorsal setae long, plumose (fig. 8. 1). Posteroventral setae vary slightly in size, sometimes there are 2 postanal setae

(fig. 8. 2 to 4). Outline of dorsal discs varies (fig. 8. 5 to 9). Flaps of anal valve vary in form (fig. 9. 10 and 11). Form of basis capitulum on the ventral side also varies in form (fig. 8. 12 and 13). Palpi long. Hypostome long, slender, with lateral sides parallel (fig. 8. 13) or slightly diverging caudad (fig. 8. 12), and with a more pointed apex in comparison with the following species. Denticles of hypostome arranged in 4/4 files, 2 pairs of median files are present only in its anterior portion. Tarsus I is relatively shorter, its average greatest length without the claw 0.23 mm, ranging from 0.20 to 0.24 mm, chaetotaxy of the Haller's organ as in fig. 8. 14.

Distribution, habitat, and hosts. Crimea, coast of the Azov sea, Kazantip peninsula, nests of rock doves (Columbia livia Gm.); Tadzhikistan, "Tigrovaya Balka" reservation, nest of ruddy sheldrake (Tadorna ferruginea Pall.).

Ornithodoros capensis Neum., 1901

Adult ticks. The body (idiosoma) is relatively narrower and longer (fig. 2), particularly in females which have sucked blood. Its apical edge, as a rule, is pointed, and protrudes greatly forward; lateral protuberances noticeably protrude in dorsal view. In ventral view they have the form of distinct tubercles; sometimes the lateral protuberances are not well developed in males. Dorsal protuberances of the integument are lower, smaller, and more rounded than in O. coniceps; approaching semispherical shape, ribs are not easily seen. In the posterior portion of the body the protuberances are arranged close to each other or (after consuming blood) with small spaces between them; but the surface of the latter is smaller than the surface of a protuberance (fig. 2 and 4). The number of dorsal protuberances in the posterior portion of the body is generally more than in O. coniceps. Protuberances of the lateral and ventral areas, which lie caudad from the transverse postanal groove, are relatively lower and smaller than in O. coniceps. Peritreme in the form of an irregular wide crescent; the greatest width of the crescent exceeds approximately 1.5 times the longitudinal diameter of macula, which is situated posteriorly from the center of the crescent; the longitudinal diameter of macula is more than 2 times the length of the crescent (fig. 5. 4; 6. 5). Peritreme and macula are convex (fig. 5. 6). Stigma is chiefly rounded or oval, not smaller than the anal valve and larger than the adjacent protuberance of the integument. The free margin of the cheeks more or less regular, the basal angle frequently has the form of a denticle. Hypostome short, with an indentation at the apex. Tarsus I relatively long, correlation of its greatest width to length 1 : 4.5 - 5 (fig. 7. 2). Legs slender and longer than in O. coniceps. Color of living ticks is lighter, with a reddish tinge.

Nymphal stage. The anterior edge of the body more pointed and longer. The dorsal protuberances of the integument are smaller and lower than in

O. coniceps; in older instars the protuberances are larger and arranged compactly or with small interspaces in the posterior portion of the body. Peritreme has the same form as in adult ticks (fig. 6. 1 to 4). Tarsus I slightly longer than in the following species.

First instar. Setae 1/1 on collar, and 2/2 on flaps of the anal valve. The number of ventral pairs of setae on tarsus I is $2 - 4/_{2-4}$, and on tarsus IV - $2 - 4/^{2-4}$. Capitulum and cheeks absent. Along the lateral margin of the body are depressions in dorsoventral direction behind peritreme. Dorsal protuberances of the integument are of equal size on the entire surface of the body.

Second instar. Setae 2/3 on collar, and 2/2 anal. The number of ventral pairs of setae on tarsi I and IV most frequently 5/5, but there may be also 3 or 4 pairs. Capitulum and cheeks present. Setae absent on ventral surface of capitulum. There are no depressions behind peritremes. Dorsal protuberances of the integument are of equal size.

Third instar. Setae on collar 3/3, anal setae $2-3/_{2-3}$. The number of ventral setae on tarsus I is from 5 to 7 pairs, and on tarsus IV from 6 to 7 pairs. Capitulum and cheeks present. Setae present on the ventral surface of capitulum. Dorsal protuberances of the integument are usually of equal size, rarely the posterior are larger than the anterior.

Fourth instar. Setae on collar 4/4, rarely asymmetrically 3/4. On the flaps of the anal valve $2-4/_{4-2}$ pairs of setae. On tarsus I from 5 to 9 pairs of ventral setae, more frequently 8 pairs; on tarsus IV from 6 to 9 pairs, more frequently 8 or 9 pairs of setae. Setae are present on ventral surface of capitulum and cheeks. Dorsal protuberances in the posterior portion of the body are larger than in the anterior.

As may be seen, each instar of the nymphal stage differs by the number of collar setae, and the first instar from older instars by absence of capitulum and cheeks and presence of depressions posteriad of peritremes, the second instar from older by absence of setae on the ventral surface of capitulum. Some criteria - the number of angular setae, and anal setae, which allow to distinguish instars in other ornithodorinae species (Pospelova-Shtrom, Rabenko, Parshina, Dineva, 1956; Filippova, 1961), are similar in successive instars. The number of ventral setae on tarsi I and IV varies greatly within the range of each instar, beginning from the first, and thus cannot be employed for diagnosis.

The diagnostic criteria of nymphs are presented in Table I. In Table 2 are also presented sizes of certain organs of nymphal instars, which characterize them well. The description of I-IV nymphal instars were made from ticks reared in the laboratory from adults from Tarkhankut peninsula.

Larva. Much resembles that of O. coniceps. Many structures are variable, for instance the dorsal disc (fig. 5. 1 to 7). Hypostome

parallel-sided or slightly narrowed toward basis, apex blunt in comparison to O. coniceps (fig. 9. 8 to 10). Tarsus I longer than in O. coniceps (fig. 9 11). Its average greatest length without the claw 0.26 mm, ranging from 0.24 to 0.28 mm.

Distribution, habitat, and hosts. Crimea, the coast of the Black sea, and Tarkhankut peninsula, nest of a shag (Phalacrocorax aristotelis L.); Uzbekistan, and Aral sea peninsula, nest of common cormorant (Phalacrocorax carbo L.), pelican, and great black-headed gull (Larus ichthyaëtus Pall.).

Crimean ticks, in comparison with ticks from the Aral sea, have longer body, more pointed angle, lateral protuberances in the first species are greatly developed, and the dorsal protuberances of the integument are larger and lower. Tarsus I in Crimean ticks is longer than in those from Kazakhstan, and legs are generally more slender.

Differential diagnosis. Adult O. coniceps and O. capensis distinctly differ from each other by form of the body (the female better so) (figs. 1. and 2), by structure of the integument - size, number, and topography of protuberances (figs. 3 and 4), and by structure of stigma - form and size of the peritreme and macula (fig. 5. 1 to 6; 6. to 7). Corresponding nymphal instars differ well by structure of the peritreme, and larva by structure of hypostome.

Comments on systematics and nomenclature

Species of the subgenus Alectorobius have been established by foreign authors. The difficulties of making a diagnosis of these species is caused first of all by insufficiency of species descriptions. In particular the structure of stigma is not described in them, and only O. Theodor, 1933 indicates that the stigma is Palestinean O. coniceps is "bean-shaped..., the greatest width approximately 0.18 mm". However the stigma is generally bean-shaped in all known species of this subgenus, and its size differs in adult ticks which have passed various number of nymphal instars. Therefore the data of Theodor do not in practice reveal anything. Structure of the dorsal integument is also very poorly described, degree of density of the protuberances, and their size and number are not taken into consideration. Meanwhile these two criteria - the stigma and dorsal integument - are the most descriptive criteria for diagnosis of O. coniceps and O. capensis.

The difficulties of diagnoses are also bound with the fact that such incomplete descriptionsand redescriptions of ticks from various geographical localities are accompanied by contradictory data on their species relationships.

G. Canestrini (1890) described O. coniceps, from a pigeon, with a very schematic drawing of the body form and legs, which reminds one of

our O. coniceps, and by the integument which resembles our O. capensis. In 1896, L. Neumann referred O. coniceps to the variety O. talaje var. coniceps, and in 1901, he described a new variety from penguin nests near the South African shores - O. talaje var. capensis, which " more resembles coniceps than the type[1], and is distinguished from coniceps chiefly by its more slender legs". Nuttall and others (Nuttall, Warburton, Cooper and Robinson, 1908) doubted the existence of O. coniceps as an independent species but acknowledged O. talaje var. capensis Neum. and gave a brief description and differences from the typical O. talaje. Our O. capensis is the same as this variety, judging from the photograph of the body form and character of the integument that is presented in the monograph of these authors.

Many authors have states that O. talaje coniceps and capensis are widely distributed, and given them the taxonomic rank of varieties of O. talaje (Neumann, 1907; Colas-Belcour, 1929; Senevet, 1937) or of independent species (Larrousse, 1932; Theodor, 1933; Roman and Malin, 1948; Brumpt, 1949; Ieeson, 1953, 1956; Hoogstraal, 1954; Kohls, 1957; Starkoff, 1958; Dumbleton, 1958). There are records of collections of ticks of the "talaje" group from birds and difficulties of diagnosing them (Hobard and Whalley, 1954, and others).

According to the mentioned sources, O. coniceps is a parasite chiefly of pigeons, less frequently of poultry and bats, and inhabits continental maritime territories. O. capensis is a parasite of various sea birds, also recorded from maritime territories.

O. Theodor gives the morphological characteristics of ticks with which he worked (Palestine, from chicken coops), referring them to O. coniceps. He compared Palestinean ticks with specimens from France (E. Brumpt collection), and found that they were identical. E. Brumpt (1922, 1949) regarded O. coniceps and O. capensis as independent species, without confirming this with sufficient descriptions, and refers French ticks to the first species. Also Warburton, to whom O. Theodor sent Palestinean ticks, determined them as O. talaje var. capensis. Such reference, on the authority of Warburton, only confuses the matter, because he had at his disposal for comparison ticks from Kapsk Oblast, which he diagnosed as O. talaje var. capensis in coauthorship with Nuttall and others. Comparison of our O. coniceps with photographs and drawings of Palestinean O. coniceps by Theodor shows their complete resemblance in body form, structure of female integument, and larval hypostome.

O. Starkoff (1958) presented data on O. coniceps in Italy in his monograph. He did not redescribe the species, but presented the diagnosis from Canestrini (1890), and an original photograph of a male, with which our O. coniceps is similar in body form and integumental structure.

Descriptions and drawings of some details of O. capensis collected from sea birds in New Zealand, cited by L. Dumbleton (1958), bear a resemblance to our O. capensis (integument of females, hypostome, and Haller's organ of larvae).

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[1] We have in view the typical form O. talaje - parasite of mammals of South and Central America.

Comparison of both our species with O. coniceps[2] and O. capensis[3], received from collections in the British Museum, showed identity of corresponding species.

There are repeated indications in Russian literature of findings of O. "coniceps" in various geographical localities. In Crimea, this species was recorded under the name O. capensis, collected from shag (Phalacrocorax aristotelis L.) (F. Ushivkov, 1959). In Transcaucasia, apparently, O. coniceps was recorded as O. talajei (Isaakyan, 1926; Popov, 1955). For Kazakhstan under the name "coniceps", possibly both species are indicated - O. coniceps and O. capensis. The first finding was recorded (Birulya, 1890) in Priaral Oblast, collected from an unknown host; later the tick was recorded in Syr-Darinskiy Oblast (Tartakovsky, 1913; Busalayeva, 1957), and Kyzyl-Orda (Galuzo, 1957). I. Galuzo gives a brief description and a drawing, which resembles the Crimean O. coniceps. Mass tick foci*, associated with nests of waterfowls, were described from Aral sea peninsulas (Pervomaisky, Chagin and Boldyrev, 1956; Pervomaisky, Chagin and Dyatlov, 1958; Boldyrev, 1959). Pospelova-Shtrom (1953, 1955), presente literature data on distribution of O. coniceps, and referred all the findings to this species, except mass collections from waterfowls on Aral sea peninsulas, described by G. S. Pervomaisky in coauthorship with other authors. The latter she refers to as questionably O. capensis.

We consider ticks from the Aral sea peninsulas, collected by G. S. Pervomaisky, along with the Crimean ticks collected from the nests of shags on the Tarkhankut peninsula, to be O. capensis, based on the data mentioned above. Taking into account the wide distribution of O. capensis, intraspecific modifications are to be expected.

As mentioned above, ticks from the Aral sea peninsulas and Crimean ticks have certain morphological differences. However, owing to scantiness of material and to poor literature data, it is impossible for the time being to contemplate groupings within this species.

Summary (Original in English)

In the Soviet Union, 2 species of the subgenus Alectorobius, Ornithodoros coniceps Can. and O. capensis Neum., have been found out. Diagnoses of these species on the adult, nymphal and larval phases are adduced. The adult ticks differ well in the structure of stigmata and dorsal integument, in the shape of the body, and other characters. The characters which enable us to diagnose the stages of the nymphal phase of O. capensis are described.

The distribution, habitat, hosts of the ticks which were available to the author; O. coniceps - the Crimea, the coast of the sea of Azov,

[2] One male from Palestine, April 1930, coll. Mitchell, det. Loomstraal.

[3] Two males from North Wales, June 1954, coll. Lobart, det. Evans.

* Great density of ticks (M.I.)

Kazantip peninsula, nests of the culver; reservation "Tigrovaja Balka", nest of the scopter (Oidemia nigra); O. capensis - the Crimea, the coast of the Black sea, Tarkhankut peninsula, nests of the shag (Phalacrocorax aristotelis), Uzbekistan, the islands of the Aral sea, nests of the waterfowl.

Fig. 1 Ornithodoros coniceps Can. female.
Fig. 2 Ornithodoros capensis Neum. female.
Fig. 3 Ornithodoros coniceps Can. Dorsal integument of posterior portion of body of a female (microscopic preparation).
Fig. 4 Ornithodoros capensis Neum. Dorsal integument of posterior portion of body of a female (microscopic preparation).
Fig. 5 Stigmata of adult ticks. 1 to 3 O. coniceps Can.; 4 to 6 O. capensis Neum., a - anterior edge, v - ventral, xx - cross section axis, corresponding to diagrams 3 and 6; P - peritreme; m - macula, os - ostium.
Fig. 6 Stigmata (in microscopic preparations). 1 to 5 - O. capensis Neum: first instar nymph, 2 - second instar nymph, 3 - third instar nymph, 4 - fourth instar nymph, 5 - a female; 6 - O. coniceps Can., a female; 7 - O. coniceps Can., fourth instar nymph.
Fig. 7 Tarsi of females. 1 - Ornithodoros coniceps Can.; 2 - O.capensis Neum.
Fig. 8 Ornithodoros coniceps Can. larva. 1 - dorsal view; 2 to 4 - variation of postanal seta; 5 to 9 - variation of the dorsal disc; 10 and 11 - variation of the flaps of anal valve; 12 and 13 - ventral view of basis capitulum; 14 - tarsus I.
Fig. 9 Ornithodoros capensis Neum. larva. 1 to 7 - variation of the dorsal disc; 8 - ventral view of basis capitulum; 9 and 10 - hypostome; 11 - tarsus I.

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Table I.

Diagnostic criteria of Ornithodoros capensis Neum. nymphal instars.

Criteria	Instar I	Instar II	Instar III	Instar IV
Number of collar setae	1-1	2-2, exceptionally 1-1	3-3	4-4 rarely asymmetrically 3-4
Number of angular setae on segment I of tarsi.....	1-1	1-1	1-1	1-1
Number of anal setae.....	2-2	2-2	2-3/3-2	2-4/4-2
Number of ventral pairs on tarsi I.....	2-4 pairs	3-5 pairs, frequently 5 pairs	5-7 pairs	5-9 pairs, frequently 8 pairs
Number of ventral setae on tarsi IV.....	2-4 pairs	4-5 pairs, frequently 5 pairs	5-7 pairs	6-9 pairs, frequently 8-9 pairs
Capitulum	Absent	Present	Present	Present
Ventral setae of capitulum	Absent	Absent	Present	Present
Cheeks.....	Absent	Present, small	Present	Present
Protuberances of the integument.	Of same size	Of same size	Of same size or larger in posterior portion	Posterior larger than anterior, less frequently of same size
Depression next to peritreme	Absent	Absent	Absent	Absent

Table 2.

Size of organs in Ornithodoros capensis Neum. in nymphal instars

Characters	Instar I	Instar II	Instar III	Instar IV
Length X height of tarsus I.	0.30 X 0.09	0.40 X 0.10	0.54 X 0.14	0.68 X 0.15
	0.28-0.35 X 0.07-0.1	0.38-0.43 X 0.10-0.11	0.49-0.59 X 0.13-0.15	0.59-0.77 X 0.14-0.18
Length X height of tarsus IV.	0.36 X 0.07	0.45 X 0.08	0.59 X 0.11	0.77 X 0.14
	0.32-0.42 X 0.07-0.08	0.42-0.49 X 0.08-0.10	0.56-0.63 X 0.1 -0.13	0.70-0.91 X 0.13-0.18
Length X width of basis capitulum	0.25 X 0.24	0.36 X 0.27	0.44 X 0.34	0.55 X 0.42
	0.24-0.27 X 0.21-0.25	0.31-0.39 X 0.24-0.31	0.42-0.46 X 0.31-0.36	0.52-0.63 X 0.36-0.45
Length X width of peritreme	0.06 X 0.04	0.08 X 0.07	0.12 X 0.11	0.18 X 0.15
		0.07-0.10 X 0.07	0.10-0.14 X 0.07-0.14	0.14-0.21 X 0.11-0.20