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IXODES RICINUS (L.) (ACARI, IXODIDA) PARASITIC ON LIZARDS (REPTILIA, LACERTIDAE)

Summary. From among 30 specimens of *Lacerta agilis* that were analysed in the present study, 17 were affected by *Ixodes ricinus* (56.7%) and 18 lizards *L. vivipara* of which 15 specimens were infested with the *I. ricinus* (83.3%) ticks. From among 142 specimens of *I. ricinus* found on the bodies of lizards, 70 specimens (49.30%) were in their larval stage, and 72 specimens (50.70%) were in the nymph stage. Adult specimens were lacking. More lizards infested with the *I. ricinus* ticks were observed on the research plots of the natural character (77.3%) than on anthropogenically altered areas (57.7%). The most frequent area to which ticks attached were front axils, where larvae and nymphs formed groups of a few specimens sticking closely together.

Key words: Mites, Acari, Ixodidae, *Ixodes ricinus*, *Lacerta agilis*, *Lacerta vivipara*

Introduction

Due to the difficulties in conducting direct observations of lizards and specific difficulties concerning their capture, the information on external parasites found on these reptiles is sporadic. So far, species such as *Dermacentor* (*Dermacentor*) *reticulatus* (Fabricius, 1794), *Haemaphysalis* (*Haemaphysalis*) *concinna* Koch, 1844, *Ixodes* (*Exopalpiger*) *trianguliceps* Birula, 1895, *Ixodes* (*Ixodes*) *ricinus* (L., 1758) and *Ophionyssus saurarum* (Oudemans, 1901) were most frequently reported (BREGETOVA 1956, BAUWENS et AL. 1983, HAITLINGER 1987, SIUDA 1993).

The aim of this study was to determine the role of *Lacerta agilis* and *L. vivipara* as hosts to *Ixodes ricinus* ticks, to determine the number of specimens infesting lizards' bodies, to determine the developmental stages of ticks and to investigate which location on the host's body was preferred. Moreover, the aim of the study was to determine which of the lizard species dominates as the host and whether environmental conditions are involved.

Materials and methods

After the capture of a lizard its body was thoroughly searched, with a particular attention to the parts of the body preferred by ticks such as the base of the limbs, neck, the back and the sides of the body. The collected bodies of lizards were kept in 70% ethyl alcohol. For the purpose of maceration and X-ray scanning microscope slides in lactic acid were prepared. For the purpose of figures and photograpic documentation selected specimens were prepared in the Hoyer's fluid.

The areas were selected in such a way as to represent habitats of the natural character (for instance forests, xerothermic grasslands) and habitats largely transformed due to the anthropogenic pressure (for instance, dumps). Moreover, the aim of the selection was to represent both lowlands and the mountains.

Two areas were selected in the Izery Mountains: "Hala Izerska" (50°55'N, 15°25'E) and the "Stok Izerski" (50°53'N, 15°18'E). These areas were located at the altitude of 800-1000 m a.s.l. and included the top of the Izery Mountains. The Chełmiec Massif (50°47'N, 16°13'E) is a forested area, which extends beyond 800 m a.s.l. Other areas were located in Stare Bogaczowice (50°50'N, 16°11'E), at the altitude of 500 m a.s.l., by a small storage reservoir on an embankment composed of rocky soil on a slope of a small hill and on an old dump, which was covered with a few centimeters of soil and overgrown with weeds. The last two investigation area were located at the border of two complexes of Strzeszynek and Bogdanka in the vicinity of Poznań (52°26'N, 16°51'E).

48 lizards were captured during the investigation between May 2nd and September 10th 2007 (Table 1). The determination of the gender of young, immature lizards was often impossible thus in such cases the gender determined in the table is "x". Due to the possibility of the regeneration the body length and the length of the tail were given separately. Ticks were marked with the following symbols: L – larva, N – nympha.

Table 1. The list of collected lizards and *Ixodes ricinus* ticks
Tabela 1. Wykaz zebranych jaszczurek i kleszczy *Ixodes ricinus*

No.	Species	Length of the body + the tail (cm)	Sex	The number of ticks, developmental stages	Attachment place, number of specimens	Date of collection	Geographical coordinates
1	2	3	4	5	6	7	8
1	*Lacerta vivipara*	3.0 + 3.2	×	0		2.05.2007	50°53'N, 15°18'E
2	*Lacerta vivipara*	3.8 + 3.2	×	1N	Front axil (1)	2.05.2007	50°53'N, 15°18'E
3	*Lacerta vivipara*	3.2 + 3.3	×	1N	Front leg (1)	3.05.2007	50°53'N, 15°18'E
4	*Lacerta vivipara*	3.0 + 3.0	×	0		3.05.2007	50°55'N, 15°25'E
5	*Lacerta vivipara*	7.5 + 6.0	Female	1L, 3N	Ear (1), front leg (2), rear leg (1)	3.05.2007	50°53'N, 15°18'E
6	*Lacerta vivipara*	5.0 + 5.1	Female	1L, 7N	Ear (2), front axil (6)	3.05.2007	50°55'N, 15°25'E

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7	8
7	*Lacerta vivipara*	2.6 + 2.2	×	0		3.05.2007	50°55'N, 15°25'E
8	*Lacerta agilis*	4.2 + 1.6	Female	0		13.05.2007	52°26'N, 16°51'E
9	*Lacerta vivipara*	6.5 + 3.0	Female	6L, 3N	Front leg (9)	13.05.2007	52°26'N, 16°51'E
10	*Lacerta agilis*	9.0 + 7.3	Male	2N	Front axil (2)	13.05.2007	52°26'N, 16°51'E
11	*Lacerta agilis*	9.5 + 8.0	Male	1N	Front axil (1)	13.05.2007	52°26'N, 16°51'E
12	*Lacerta agilis*	8.0 + 10.5	Male	4N	Front axil (4)	13.05.2007	52°26'N, 16°51'E
13	*Lacerta agilis*	3.5 + 3.0	×	0		13.05.2007	52°26'N, 16°51'E
14	*Lacerta agilis*	9.0 + 11.0	Male	2L, 4N	Collar (1), front axil (5)	10.06.2007	52°26'N, 16°51'E
15	*Lacerta agilis*	7.5 + 10.0	Male	7N	Ear (1), front axil (5), body side (1)	10.06.2007	52°26'N, 16°51'E
16	*Lacerta agilis*	9.0 + 7.0	Female	2L	Front axil (2)	21.06.2007	50°50'N, 16°11'E
17	*Lacerta agilis*	7.5 + 6.0	Female	0		29.07.2007	50°50'N, 16°11'E
18	*Lacerta agilis*	11.0 + 5.0	Female	0		29.07.2007	50°50'N, 16°11'E
19	*Lacerta agilis*	8.0 + 11.0	Male	0		29.07.2007	50°50'N, 16°11'E
20	*Lacerta agilis*	7.5 + 6.0	Male	0		30.07.2007	50°50'N, 16°11'E
21	*Lacerta agilis*	7.0 + 9.1	Female	3L	Front axil (3)	2.08.2007	50°50'N, 16°11'E
22	*Lacerta vivipara*	5.5 + 5.0	Male	7L, 4N	Front axil (9), body side (1), rear leg (1)	2.08.2007	50°49'N, 16°10'E
23	*Lacerta vivipara*	5.7 + 8.3	Female	12L, 4N	Front axil (12), front leg (2), body side (2)	3.08.2007	50°49'N, 16°10'E
24	*Lacerta agilis*	7.5 + 9.5	Female	2L	Front axil (2)	3.08.2007	50°49'N, 16°10'E
25	*Lacerta vivipara*	5.3 + 5.0	Male	2L	Front leg (2)	5.08.2007	50°47'N, 16°13'E
26	*Lacerta vivipara*	6.2 + 7.5	Male	9L, 4N	Front axil (1), front leg (12)	5.08.2007	50°47'N, 16°13'E
27	*Lacerta vivipara*	4.5 + 6.0	Male	2N	Body side (2)	8.08.2007	50°50'N, 16°11'E
28	*Lacerta vivipara*	5.7 + 6.0	Male	3L, 1N	Front leg (4)	8.08.2007	50°50'N, 16°11'E
29	*Lacerta agilis*	8.3 + 10.0	Male	3L, 1N	Collar (1), front axil (3)	8.08.2007	50°50'N, 16°11'E
30	*Lacerta agilis*	9.5 + 8.0	Female	0		9.08.2007	50°50'N, 16°11'E
31	*Lacerta agilis*	8.4 + 9.2	Female	1N	Front leg (1)	9.08.2007	50°50'N, 16°11'E
32	*Lacerta vivipara*	5.0 + 6.5	Male	3L, 4N	Front axil (4), body side (2), rear leg (1)	9.08.2007	50°50'N, 16°11'E
33	*Lacerta agilis*	8.0 + 10.4	Male	1N	Front axil (1)	15.08.2007	50°50'N, 16°11'E
34	*Lacerta agilis*	8.5 + 9.3	Female	2N	Rear leg (2)	15.08.2007	50°50'N, 16°11'E
35	*Lacerta agilis*	5.2 + 7.0	Male	0		15.08.2007	50°50'N, 16°11'E
36	*Lacerta agilis*	4.0 + 5.7	Male	0		15.08.2007	50°50'N, 16°11'E

Table 1 – cont. / Tabela 1 – cd.

1	2	3	4	5	6	7	8
37	*Lacerta agilis*	5.2 + 5.7	Male	2L, 3N	Collar (1), front axil (4)	15.08.2007	50°50'N, 16°11'E
38	*Lacerta agilis*	8.3 + 12.0	Male	2L	Front axil (2)	15.08.2007	50°50'N, 16°11'E
39	*Lacerta vivipara*	4.5 + 6.0	Male	5L, 3N	Front axil (5), body side (2), rear leg (1)	15.08.2007	50°47'N, 16°13'E
40	*Lacerta vivipara*	6.3 + 4.5	Female	3L	Front axil (3)	25.08.2007	50°47'N, 16°13'E
41	*Lacerta agilis*	7.6 + 4.5	Female	0		25.08.2007	50°47'N, 16°13'E
42	*Lacerta vivipara*	6.4 + 7.5	Male	2N	Body side (2)	25.08.2007	50°47'N, 16°13'E
43	*Lacerta agilis*	8.6 + 8.0	Male	0		2.09.2007	52°26'N, 16°51'E
44	*Lacerta agilis*	7.3 + 7.4	Male	3N	Ear (1), front axil (2)	2.09.2007	52°26'N, 16°51'E
45	*Lacerta agilis*	6.5 + 7.1	Male	1N	Rear leg (1)	2.09.2007	52°26'N, 16°51'E
46	*Lacerta agilis*	10.3 + 6.4	Male	0		10.09.2007	52°26'N, 16°51'E
47	*Lacerta agilis*	8.2 + 5.0	Female	0		10.09.2007	52°26'N, 16°51'E
48	*Lacerta agilis*	9.2 + 8.3	Female	2L, 3N	Front axil (3), body size (2)	10.09.2007	52°26'N, 16°51'E

Results and discussion

The greatest activity of *I. ricinus* and other ticks is in the evening hours (SIUDA 1993), when the humidity is high. Lizards are heterothermic animals and their activity at that time is the lowest, they return to their hideouts and they fall asleep. The activity of ticks does not correspond to that of reptiles. However, out of 48 captured lizards as many as 32 had (66.7%) *I. ricinus* on them. 30 specimens of *L. agilis* were captured, of which 17 were hosts to *I. ricinus* (56.7%) and out of 18 lizards *L. vivipara* 15 specimens were infested with the *I. ricinus* (83.3%) ticks. The results obtained from the study were significantly higher than those obtained by other authors, as for instance KURCZEWSKI (2000) reported 22.2% of infested lizards and BAUWENS et AL. (1983) found 46.8% infested lizards.

The greatest number of parasites was 16 individuals on one viviparous lizard, although as many as 12 specimens were in their larva stage and they were located in the axil area. However, other authors reported larger numbers of parasites on one lizard, as HAITLINGER (1987) reported 26 specimens of ticks, KURCZEWSKI (2000) 35 specimens, and BAUWENS et AL. (1983) as many as 42 specimens.

From among 142 specimens of *I. ricinus* reported on the bodies of lizards, 70 specimens (49.30%) were in their larval stage, and 72 specimens (50.70%) were nymphs. Adult specimens were not reported. *Lacerta vivipara* was definitely the main host as 91 ticks were reported on 15 specimens, including 52 (57.1%) larvae and 39 (42.90%) nymphs. 51 ticks were found on 17 specimens of *L. agilis*, including 18 specimens (35.3%) in the larva stage and 33 (64.7%) in the nymph stage.

More lizards infested with the *I. ricinus* were found in areas of the natural character than on anthropogenically altered areas. From among 22 specimens of lizards captured in areas of the natural character as many as 17 (77.3%) were infested with the *I. ricinus*. On the other hand, in areas altered due to human activity out of 26 specimens 15 (57.7%) were infested.

The selection of the place of attachment of parasitic mites is typical of particular species, developmental stages, and it also depends on the species and the age of the host. They are usually located in blood-supplied areas, where body covers are delicate, the thermal and moisture conditions are slightly changeable and the removal by the host is difficult (SIUDA 1991).

The larvae and nymphs of *I. ricinus* exhibited a tendency to form groups composed of a few specimens. When a tick finds a convenient place to feed it secrets attachment and aggregation pheromones encouraging other specimens of its species to feed on its victim, which explains the phenomenon of groups of ticks sticking together.

The main place of attachment of ticks on lizards' bodies was demonstrated in Table 2. The most preferred areas were those of the front limbs, mainly axils where at times several specimens sticking together were found. Individual specimens were found on limbs, sides of the body, the areas of ear openings and under the collare. No mites in nose openings and in the area of the cloaca were reported in this study.

Table 2. The place of the attachment of *Ixodes ricinus* ticks
Tabela 2. Miejsce przyczepienia kleszcza *Ixodes ricinus*

The location of parasites on the host's body	The number and percentage of parasites	The number and percentage of hosts
Front limbs area	113 (79%)	29 (62%)
Ear openings	5 (4%)	3 (6%)
Sides of the body	14 (10%)	6 (13%)
Rear limbs	7 (5%)	6 (13%)
Collar (*collare*)	3 (2%)	3 (6%)
Total	142 (100%)	47 (100%)

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KLESZCZ *IXODES RICINUS* (L.) (ACARI, IXODIDA) PASOŻYTUJĄCY NA JASZCZURKACH (REPTILIA, LACERTIDAE)

Streszczenie. W niniejszej pracy analizowano 30 osobników *Lacerta agilis*, z czego 17 było żywicielami *Ixodes ricinus* (56,7%), oraz 18 jaszczurek *L. vivipara*, z których na 15 osobnikach stwierdzono kleszcza *I. ricinus* (83,3%). Spośród 142 osobników *I. ricinus* wykazanych na ciele jaszczurek 70 (49,30%) znajdowało się w stadium larwy, a 72 osobniki (50,70%) – w stadium nimfy. Nie odnotowano osobników dorosłych. Większy udział jaszczurek zaatakowanych przez kleszcza *I. ricinus* zaobserwowano na powierzchniach o charakterze naturalnym (77,3%) niż na powierzchniach antropogenicznie przeobrażonych (57,7%). Najczęstszym miejscem przyczepu kleszczy okazały się pachwiny przednie, gdzie larwy i nimfy tworzyły grupy po kilka osobników przyczepionych blisko siebie.

Słowa kluczowe: roztocze, Acari, Ixodidae, *Ixodes ricinus*, *Lacerta agilis*, *Lacerta vivipara*

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