Ectoparasite of lizards and possible vector: the mammal hard tick *Haemaphysalis concinna* KOCH, 1844

During a herpetological excursion to the Croatian island of Krk in the middle of May 2002, ten tick-infested lizards [*Algyroides nigropunctatus* (DUMÉRIL & BIBRON, 1839), *Podarcis melisellensis* (BRAUN, 1877), *P. muralis* (LAURENTI, 1768), *Lacerta bilineata* DAUDIN, 1802], and a tick-infested snake [*Elaphe longissima* (LAURENTI, 1768)] were detected. The reptilian hosts originating from two localities (44°58,943 N / 14°27,79 E; 47 m a.s.l.; 45°06,088 N / 14°20,99 E; 120 m a.s.l.; description of the flora and herpetofauna see SEHNAL 1999 and RATHBAUER 2002) were freed from their pests on site. The ticks were killed and fixed in 70% ethanol. Blood drops emerging on this occasion were smeared on glass slides and air dried for later staining according to Giemsa.

Altogether 46 ticks were collected (table 1), 35 could be determined to species level and, according to the key of BABOS (1964), turned out to be unfed nymphs of *Haemaphysalis concinna* KOCH, 1844 (Ixodidae, Acari) as is undoubtedly demon-

Table 1: Number of tick nymphs found attached to eleven specimens of reptiles on the island of Krk (Croatia). * - blood parasites detected.

Reptile taxon	n (reptiles)	n (nymphs)
Podarcis muralis	2	8 / 3*
Podarcis melisellensis	6	6*/5/4*/3/1*/1*
Lacerta bilineata	1	11
Algyroides nigropunctatus	1	1
Elaphe longissima	1	3
Σ	11	46

strated by the shape of the scutum and the palps (fig. 1). Unfortunately, the number of hosts was too low to generate epidemiological data.

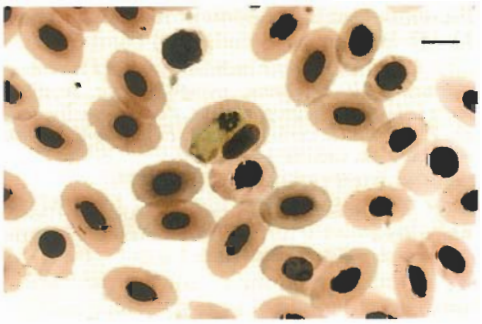
Nymphs of *Haemaphysalis sulcata* (CANESTRINI & FANZAGO, 1877) are long known reptilian parasites in Asia (HOOGSTRAAL et al. 1981), but this species has never been found in Central Europe; and Central European lizards have never been found infested with *H. concinna* (e.g., REHACEK et al. 1961). *Haemaphysalis concinna* is a triannual, three-host species with minor host preference. Common hosts are larger mammals like cattle, sheep and goat, red deer and deer, and sometimes even man (MERDIVENCI 1969). The most frequent tick parasitizing lizards in Europe, *Ixodes ricinus* (LINNEUS, 1758) (JANSEN 2002), is a species which is able to suck blood from its reptilian victims without perceptible harm, even if they do so in very high numbers (MALKMUS 1995). Nothing is known about the pathogenic potential of *Haemaphysalis* spp. to reptiles; yet the presence of unfed ticks only may be interpreted as a hint for the existence of a poor adaptation of this tick species to the reptilian hosts. Nevertheless, except for the unusual host spectrum, all other ecological parameters of our tick finding, like activity season, species distribution area, and microclimate, were within the typical range (NOSEK et al. 1967). The area of tick infestation on the lizards' bodies was restricted to the trunk close to the insertion of the anterior limbs. This may be due to the ability of lizards to detach ticks by feeding and by scratching with the limbs.

The killing of ticks by feeding on them is the main infection route of lizards with blood parasites of the genus *Hepatozoon* (Adeleina, Apicomplexa). *Haemaphysalis* ticks are known vectors or intermediate, maybe even final hosts of this blood parasite. Thus, we looked for infections of the reptiles with this intraerythrocytic parasites by screening stained blood smears. Five cases of *Hepatozoon* infections were detected (table 1, fig. 2). Unfortunately, without knowing the vegetative stages within the reptile's organs, usually the liver, a species determination of this parasite is impossible.

Our observations of *H. concinna* ticks being attached to reptiles are remarkable for two reasons: (i) Not one fully engorged tick has been found, only more or less unfed

Fig. 1: Nymph of *Haemaphysalis concinna* from a lizard. The picture combines a photo taken in visual light, an auto-fluorescence photo (scutum), and a line drawing. Note the shape of the palps, of the scutum, and the festoons. Tick length: 1.4 mm.

Fig. 2: Blood smear, Giemsa stained, from *Podarcis muralis* showing an intraerythrocytic parasite, most probably a gametocyte of a tick transmitted *Hepatozoon* species. Bar represents 10 µm.



nymphs. Thus, reptile hosts may be inexpedient for this tick species. Most probably the availability of the common host, sheep at Krk, may have decreased dramatically in the year of investigation. For its development, this tick species needs one blood donation per year and stage (HOOGSTRAAL et al. 1981), so the ticks may have tried to escape starvation by a 'panic behaviour'. (ii) If this is true, the *Hepatozoon* species found is either not a true reptilian parasite, because this parasite may be passed transstadially by these ticks, but not vertically between different host individuals within one year, or this *Hepatozoon* species is a true reptilian parasite but uses another mite or tick as a vector.

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