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TICKS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION 1909-1915, WITH NOTES ON THE PARA- SITES AND PREDACIOUS ENEMIES OF THESE ARTHROPODS¹

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The present paper lists, in addition to the ticks obtained in the Belgian Congo by Messrs. H. Lang and J. P. Chapin from 1909 to 1915, a few specimens collected by Dr. J. P. Chapin during his more recent expedition of 1927. The ticks of the Lang-Chapin Expedition were sent several years ago to Dr. S. Hadwen, but he returned them to the Museum without completing their study and without writing a report.

I have preceded the enumeration of the species with a brief review of what is known of the parasites and predacious enemies of ticks, a subject of much biological interest as well as of some practical importance. The paper concludes with a list of the ticks known at present from the Belgian Congo.

PARASITES AND PREDACIOUS ENEMIES OF TICKS

Ticks are rather unusually free from the attacks of parasites and predacious enemies, perhaps because during so much of their life they are safely concealed within the fur, feathers, or scales of their hosts. It seems probable that unfavorable weather conditions (especially excessive moisture and cold) are chiefly responsible for keeping their numbers in check. Ticks are also adversely affected by the destruction of their potential hosts, either by hunting or through natural causes, such as epidemics. In the savannas of Africa large numbers of them are undoubtedly wiped out by the grass-fires that almost yearly sweep over the country toward the end of the dry season.

Of the few internal parasites of ticks, the best known is a minute chalcid wasp—often referred to as a “fly” in medical literature—of the family Encyrtidæ, *Ixodiphagus caucurtei* R. du Buysson (1912, Arch. de Parasitologie, XV, p. 246, Fig. 1), which in France commonly parasitizes the nymphs of *Ixodes ricinus* (Linnæus). It has also been found to

¹Scientific Results of the Congo Expedition. Entomology No. 23.

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attack the nymphs and, it would seem, occasionally the larvæ of other ticks belonging to the genera *Hæmaphysalis*, *Rhipicephalus*, and *Dermacentor*. Recently this parasite has been introduced with some success on the eastern coast of the United States and in Montana, for the purpose of controlling ticks. Two other chalcid wasps have been described from ticks: *Ixodiphagus texanus* L. O. Howard (1907, Ent. News, XVIII, p. 377, Pl. 1), bred from nymphs of *Hæmaphysalis leporis-palustris* (Packard), in Jackson Co., Texas; and *Hunterellus hookeri* L. O. Howard (1908, Canad. Entom., XL, p. 241, Fig.), bred from *Rhipicephalus sanguineus* var. *texanus* Banks, off a Mexican dog at Corpus Christi, Texas. The generic and specific differences of these three parasites are somewhat open to discussion. H. P. Wood (1911, Journ. Econ. Entom., IV, p. 426) reports that *Hunterellus hookeri* was bred from a nymph of *Rhipicephalus sanguineus*, at Lourenço Marques, by C. W. Howard. The same or similar parasites undoubtedly exist elsewhere in Africa. Cooley¹ has recently announced the discovery of chalcid parasites (probably of the species *Ixodiphagus caucurtei*) in nymphs of *Hyalomma ægyptium impressum*, near Pretoria, Transvaal. Bedford bred the same parasite from nymphs of *Rhipicephalus evertsi*. Cooley also states that this chalcid was found at Durban, Natal, in nymphs of *Hæmaphysalis leachii* and that it occurs in West Africa.

W. D. Hunter and W. A. Hooker (1907, U. S. Dept. Agric., Bur. Entom., Bull. No. 72, p. 36) mention breeding a species of Phoridæ from the eggs of the tick, *Boophilus annulatus* (Say), in Texas. But, so far as I have been able to trace, the specific identity of this parasite has not been determined.

Hunter and Hooker (1907, *loc. cit.*) have also shown experimentally that the fire-ant, *Solenopsis geminata* (Fabricius), will carry off ticks of the species *Boophilus annulatus*. Dutton and Todd (1905, Liverpool School Trop. Med., Mem. XVII, p. 17) state that *Ornithodoros moubata* (Murray), the carrier of African human recurrent fever, is not without natural enemies: "Rats eat adults with avidity, and ants carry off young ones and eggs. We have lost ticks in both ways. On one occasion over two hundred young ticks were carried off in a single night by small ants." According to A. Theiler (1911, Schweiz. Arch. f. Tierheilk., LIII, p. 65) ants destroy many of the ticks which drop off from their hosts; but he records no definite observations nor does he state which species of ant is involved. F. C. Wellman (1908, Ent. News, XIX, p. 27; see also Austen,

¹Cooley, R. A. 1929 (June). 'A Summary of Tick Parasites Studies.' South African Journ. Nat. Hist., VI, part 4, pp. 266-272 (with remarks by G. A. H. Bedford).

1906, Journ. Trop. Med. Hyg., London, IX, p. 113) reports that a reduviid bug, *Phonergates bicoloripes* Stål (locally known as "ochindundu"), in Benguella, attacks and kills the fever tick, *Ornithodoros moubata* (Murray). This reduviid, however, does not appear to be a very widespread or very active enemy of *Ornithodoros*. At any rate, during my travels in Africa I have looked in vain for it in many localities infested with the tick.¹

The most efficient predacious enemies of ticks are found among the birds. Domestic fowl will eat them when given a chance to pick them from domestic animals. McAtee has compiled some of the observations of tick-eating birds in North and Central America and the West Indies.² The most important of these is the groove-billed ani, *Crotophaga sulcirostris* Swainson, called "garrapatero" in all Spanish-American countries and "tick-bird" in the West Indies, while the generic name refers to the partiality of this bird for ticks. A. E. Wetmore (1916, Bull. 326, U. S. Dept. Agric., Prof. Paper, pp. 118-119) mentions finding engorged females of the cattle-tick, *Boophilus annulatus* (Say), in the stomach of a blackbird, *Holquiscalis brachypterus* (Cassin), in Porto Rico. Hunter and Hooker (1907, U. S. Dept. Agric., Bur. Entom., Bull. No. 72, p. 17) have recorded observations of the great-tailed grackle, *Quiscalus macrourus* Swainson, and the kingbird, *Tyrannus tyrannus* (Linnæus), picking ticks from cattle in Texas and Louisiana.

The true tick-birds or oxpeckers of the genus *Buphagus* are exclusively African, not being found even in Madagascar, and are specific enemies of ticks. Two distinct species (and two races) are found in the savannas of Africa, where they are often seen clinging to the backs and flanks of cattle, horses, asses, goats, and certain big game.³ That these birds feed to a large extent upon ticks is well known, although there seem to be few autopsies on record to substantiate the belief. Arthur Loveridge (1928, Proc. Zool. Soc. London, p. 77) found three species of ticks in the stomach of *Buphagus erythrorhynchus* (Shelley), in Tanganyika Territory: *Amblyomma* sp., *Ixodes pilosus* Koch, and *Rhipicephalus* sp. (? *punctatissimus* Gerstæcker).

Dr. James P. Chapin has contributed the following account of his stomach examinations of *Buphagus*:

B. africanus megarhynchus Grote. In two stomachs examined in the Upper Uele District, several ticks were found, also many short hairs, one small insect, and

¹Miss Chodziesner's statement, "Die Wanze *Phonergates bicoloripes* ist in Westafrika allgemein als Zeckenvernichter bekannt" (1924, Zool. Jahrb., Abt. Syst., XLVII, p. 526), is more than an exaggeration.

²McAtee, W. L. 1911. 'Bird Enemies of the Texas-fever Tick and Other Ticks.' The Auk, XXVIII, pp. 136-138.

³See Lang, H. 1924. 'The Eland and Its Bird Sentinel.' Natural History, XXIV, pp. 96-97.

some small slender seeds. These two birds had been shot near wild animals (not cattle); one was said to have been with a white rhinoceros, while the other came back to a buffalo that had been shot. The stomach of a bird shot at Uvira, near a herd of cows, contained six to eight ticks and hair from the cows.

B. africanus langi Chapin. Two stomachs, at Zambi, were both filled with ticks and short hairs. The hairs are doubtless pulled from the animals' hides, but perhaps remain in the birds' stomachs much longer than the more digestible ticks.

B. erythrorhynchus (Shelley). One bird of Embu, Kenya Colony, showed, in the stomach, four ticks and many short pieces of hair. Another, from Southern Guaso Nyiro, Kenya Colony, likewise had hairs and some ticks.

Both species of oxpeckers are accused of pecking at the borders of sores or wounds, but I think the hairs are likely to be pulled out in catching the ticks. In the stomach with the ticks there is usually some dark, red-brown ooze that looks like old blood. I believe it comes out of the ticks, rather than being blood drunk directly by the birds.

It is generally believed by Europeans in Africa that a white heron, *Bubulcus ibis* (Linnæus), which is often found in numbers near grazing cattle, cleans the animals of their ticks.¹ Stomach examinations, however, lend no support to this view. In this connection, Dr. J. P. Chapin writes:

After watching these herons stalking about among horses and cows at pasture, I have been convinced that their sole object is to secure the insects stirred up, or sometimes attracted by the beasts, whereas parasites such as ticks offer little or no temptation. Dr. Bequaert, at Nyangwe and Kasongo, twice examined stomachs of birds accompanying cattle and found therein grasshoppers, ants, and a hemipter, but no ticks. The seven stomachs I looked through were largely filled, in six cases, with grasshoppers; but other unidentified insects were numerous. One cricket was noted and, besides some maggot-like larvæ, a number of large carrion-flies. Never, however, were there any ticks.

A similar mistake is often made with regard to the feeding habits of the North American cowbird, *Molothrus ater* (Boddaert), which owes its vernacular name to its frequently observed association with cattle, horses and sheep, and formerly also with bison. The opinion has usually been held that the cattle provide the birds with food in the form of ticks, flies, or bot-fly larvæ. Stomach examinations, however, have shown that grasshoppers and leaf-hoppers are the cowbird's favorite food, these insects being stirred up as the cattle move about the pasture. No ticks were ever found in the stomachs.²

¹As a consequence, this bird is universally known as the "pique-bœuf" among the whites in the Belgian Congo, while few of them are aware of the existence of the true oxpeckers.

²Friedmann, H. 1929. 'The Cowbirds. A Study in the Biology of Social Parasitism.' (Springfield, Ill., and Baltimore, Md.), xvii + 421 pp., 29 Pls. (association with cattle and food of the North American cowbird, pp. 284-300).

APPROXIMATE LOCATION OF LOCALITIES MENTIONED

Aba, 3° 50' N., 30° 10' E.	Lubero, 0° , 29° E.
Akenge, 2° 55' N., 26° 50' E.	Medje, 2° 25' N., 27° 30' E.
Avakubi, 1° 20' N., 27° 40' E.	Niapu, 2° 20' N., 26° 45' E.
Bunyoni (Lake), 1° 20' S., 30° E.	Pawa, 2° 25' N., 27° 50' E.
Faradje, 3° 40' N., 29° 40' E.	Ra-u, western slope of Mt. Ruwenzori.
Garamba, 4° 10' N., 29° 40' E.	Zambi, 6° S., 12° 50' E.

Argantidæ***Ornithodoros moubata* (Murray)**

Argas moubati ANDR. MURRAY, 1877, 'Economic Entomology, Aptera,' I, p. 182, Fig. (Angola).

Ornithodoros savignyi var. *cæcus* NEUMANN, 1901, Mém. Soc. Zool. France, XIV, p. 256 (from many African localities).

BELGIAN CONGO.—Lubero, in native huts, at the altitude of 6,500 ft., March 12, 1927 (J. P. Chapin). This dangerous tick has been recently reported from the same locality by Flamand (1929, Rev. Zool. Afric., XVI, 4, p. [68]).

This tick, the carrier of human recurrent fever in tropical Africa, is commonly known by the natives of the eastern Congo as "kimputu."

Ixodidæ***Ixodes daveyi* Nuttall**

Ixodes daveyi NUTTALL, 1913, Parasitology, VI, p. 133, Fig. 2 (♀; off *Ruwenzorornis johnstoni* Sharpe, on the northern ridge of Mt. Ruwenzori, at the boundary between the Belgian Congo and Uganda). BEDFORD AND HEWITT, 1925, South African Journ. Nat. Hist., V, p. 260. BEDFORD, 1927, 11th and 12th Repts. Dir. Vet. Res., Union of South Africa, I, p. 728.

BELGIAN CONGO.—Pawa, one engorged female clinging to the head of a warbler, *Cisticola natalensis kapietra* Lynes, July 10, 1913 (J. P. Chapin).

This interesting tick appears to be a specific parasite of birds. It has also been found in the Transvaal on a pink-billed weaver, *Quelea sanguinrostris lathami* (A. Smith).

From the more common bird-tick, *Ixodes brunneus* Koch (also found in tropical Africa), the female of *I. daveyi* differs in having a horseshoe-shaped anal groove, with converging posterior branches. In *I. brunneus*, the posterior branches of the anal groove are parallel or slightly divergent. The males of both species are as yet unknown and should be looked for in the nests of the birds.

***Ixodes simplex* Neumann**

Ixodes simplex NEUMANN, 1906, Arch. de Parasitologie, X, p. 197 (described from one ♀ of unknown locality, one ♀ off *Rhinolophus ferrum-equinum* at Shanghai, and one ♀ off *Vespertilio* sp. in the Gaboon). NUTTALL AND WARBURTON, 1911, 'Ticks,' II, *Ixodes*, p. 207, Fig. 199 (♀).

BELGIAN CONGO.—I refer to this species one nymph found on a bat at Aba, December, 1912 (H. Lang and J. P. Chapin). It agrees remarkably well with Nuttall and Warburton's description and figure of the female. While the legs are longer than usual in *Ixodes*, they are decidedly shorter and less "spider-like" than in the more common bat-tick, *Ixodes vespertilionis* Koch. This nymph differs, moreover, from that of *I. vespertilionis* in having divergent posterior branches of the anal groove, the cervical grooves of the scutum more distinct, and the coxæ decidedly flattened.

***Amblyomma paulopunctatum* Neumann**

Amblyomma paulopunctatum NEUMANN, 1899, Mém. Soc. Zool. France, XII, p. 248 (♂; Konakry, French Guinea). ROBINSON, 1926, 'Ticks,' IV, *Amblyomma*, p. 82, Figs. 36-37, Pl. VI, fig. 2 (♂, ♀).

Amblyomma sparsum paulopunctatum NEUMANN, 1905, Arch. de Parasitologie, IX, p. 233; 1911, 'Das Tierreich,' Lief. 26, Acarina, Ixodidæ, p. 78 (♂).

Amblyomma trimaculatum NEUMANN, 1908, Notes Leyden Mus., XXX, p. 84. Figs. 5-7 (♀; Robertsport, Liberia).

BELGIAN CONGO.—Medje, numerous females and males, off black forest pig, *Hylochaerus meinertzhageni ituriensis* Matschie, June, 1914 (H. Lang and J. P. Chapin). Some specimens of this lot appear to have been sent to Robinson by Dr. S. Hadwen and were listed by Robinson in his Monograph as from "West Africa."

This tick is peculiar to the West African Subregion, being known at present from Sierra Leone, Liberia, French Guinea, the Belgian Congo, and Uganda. Its host is here recorded for the first time.

***Amblyomma tholloni* Neumann**

Amblyomma tholloni NEUMANN, 1899, Mém. Soc. Zool. France, XII, p. 242 (♂, ♀; off elephant; Congo, Upper Ubangi, and regions of Lake Nyasa and Lake Tanganyika).

BELGIAN CONGO.—Faradje, one male and two females, off elephant, *Loxodonta africana* (Blumenbach), April, 1911 (H. Lang and J. P. Chapin).

This is the most common and the most widely distributed of the ticks found on the African elephant.

Amblyomma variegatum (Fabricius)

Acarus variegatus FABRICIUS, 1798, 'Entom. Syst. Suppl.,' p. 572 (no sex; Africa).

BELGIAN CONGO.—Garamba, one male, off plain's buffalo, *Syncerus caffer* (Sparrman), July 5, 1912, and several males, off giant eland, *Taurotragus derbianus gigas* (Heuglin), March, 1912 (H. Lang and J. P. Chapin). Faradje, several males and females, off cattle (H. Lang and J. P. Chapin). Zambi, several males, off cattle, June, 1915 (H. Lang).

Amblyomma splendidum Giebel

Amblyomma splendidum GIEBEL, 1877, Zeitschr. Ges. Naturwiss., XLIX, p. 295 (♂, ♀; off buffalo, Gaboon).

BELGIAN CONGO.—Zambi, several males and females, off cattle, June, 1915 (H. Lang).

Amblyomma cuneatum Neumann

Amblyomma cuneatum NEUMANN, 1899, Mém. Soc. Zool. France, XII, p. 233 (♂; Congo).

BELGIAN CONGO.—Avakubi, several males, females, and nymphs, off *Manis tricuspis* Rafinesque, October 29, 1909 (H. Lang and J. P. Chapin). Akenge, one male, off *Hylochaerus meinertzhageni ituriensis* Matschie, October, 1913 (H. Lang and J. P. Chapin); this record has been listed by Robinson, 1926, 'Ticks,' IV, *Amblyomma*, p. 143. The ticks of *Manis* were numerous between the scales of the neck and limbs, according to Mr. H. Lang.

Aponomma exornatum (C. L. Koch)

Amblyomma exornatum C. L. KOCH, 1844, Arch. f. Naturgesch., X, 1, p. 231 (♂, ♀; Christmas Bay, South Africa).

BELGIAN CONGO.—Aba, several males and females, supposedly "off bats," December, 1912 (H. Lang and J. P. Chapin).

This tick is a common ectoparasite of reptiles, especially of monitors. Specimens which I obtained off *Varanus niloticus* (Linnæus), at Bukama, were fixed in the armpits of the fore legs. J. Schwetz has recorded it from a crocodile at Mateba, in the estuary of the Congo River. Its occurrence on bats, if confirmed, would be of unusual interest.

Rhipicephalus sanguineus (Latreille)

Izodes sanguineus LATREILLE, 1806, 'Gen. Crust. Ins.,' I, p. 157 (no sex; France).

BELGIAN CONGO.—Faradje, one engorged female, clinging to the head of a hawk, *Butastur rufipennis* (Sundevall), February 1, 1913 (J. P. Chapin).

This is the common tick of domestic dogs, found often on other animals also, and there have been several previous records from birds.

***Rhipicephalus simus* C. L. Koch**

Rhipicephalus simus C. L. KOCH, 1844, Arch. f. Naturgesch., X, 1, p. 238 (♂; South Africa).

BELGIAN CONGO.—Medje, two females, without host, January 22, 1910 (H. Lang and J. P. Chapin).

***Rhipicephalus simus* var. *shipleyi* Neumann**

Rhipicephalus shipleyi NEUMANN, 1902, Arch. de Parasitologie, VI, p. 112 (♂, ♀; off hyena, Sudan).

BELGIAN CONGO.—Garamba, several males and females, off plain's buffalo, *Syncerus caffer* (Sparrman), and off giant eland, *Taurotragus derbianus gigas* (Heuglin), March, 1912 (H. Lang and J. P. Chapin).

***Rhipicephalus aurantiacus* Neumann**

Rhipicephalus aurantiacus NEUMANN, 1907, Notes Leyden Mus., XXIX, p. 90, Figs. 3-4 (♂, ♀; off *Syncerus brachyceros*, Liberia).

BELGIAN CONGO.—Medje, off forest buffalo, *Syncerus planiceros* (Blyth), May 7, 1910 (H. Lang and J. P. Chapin).

This tick has been known thus far only from Liberia.

***Rhipicephalus longus* Neumann**

Rhipicephalus longus NEUMANN, 1907, Ann. Trop. Med. Paras., I, p. 117, Figs. 24-25 (♂; off cattle, Kasongo, Belgian Congo).

Rhipicephalus falcatus NEUMANN, 1908, Notes Leyden Mus., XXX, p. 77, Fig. 4 (♂, ♀; north of Lake Nyasa and Liberia). WARBURTON, 1912, Parasitology, V, p. 20.

BELGIAN CONGO.—Medje, off forest buffalo, *Syncerus planiceros* (Blyth), May 7, 1910 (H. Lang and J. P. Chapin). Garamba, off plain's buffalo, *Syncerus caffer* (Sparrman), July 5, 1912, and off giant eland, *Taurotragus derbianus gigas* (Heuglin), March, 1912 (H. Lang and J. P. Chapin).

As Warburton (1912) has shown, *R. longus* was based upon a rather ill-characterized male of *R. falcatus*. The species must nevertheless be known under the name *R. longus*, which has priority.

***Rhipicephalus supertritus* Neumann**

Rhipicephalus supertritus NEUMANN, 1907, Arch. de Parasitologie, XI, p. 216, Figs. 2-3 (♂; off horse, shores of the Lualaba River, Belgian Congo); 1908, Notes Leyden Mus., XXX, p. 79 (♂, ♀); 1911, 'Das Tierreich,' Lief. 26, Acarina, Ixodidæ, p. 39 (♂, ♀). WARBURTON, 1912, Parasitology, V, p. 20.

Rhipicephalus coriaceus NUTTALL AND WARBURTON, 1908, Proc. Cambridge Phil. Soc., XIV, 4, p. 402, Figs. 17-20 (♂, ♀; Nyasaland and Benguela).

BELGIAN CONGO.—Garamba, one male, off giant eland, *Taurotragus derbianus gigas* (Heuglin), March, 1912 (H. Lang and J. P. Chapin).

This specimen, found among a lot of *R. longus* and *R. simus* var. *shipleyi*, agrees in every respect with the descriptions of both *R. supertritus* and *R. coriaceus*, as well as with a series off eland, from Nyasaland, named "*R. coriaceus*" by Warburton.

***Rhipicephalus dux* Dönitz**

Rhipicephalus dux DÖNITZ, 1910, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 275, Figs. 1-3 (♂, ♀; off an unknown host, possibly elephant, Upper Congo).

Rhipicephalus schwetzi LARROUSSE, 1927, Rev. Zool. Afric., XV, part 2, p. 214, Fig. (♂, ♀; off *Hylochaerus meinertzhageni ituriensis*, Koteli, on the Itimbiri, Belgian Congo).

BELGIAN CONGO.—Medje, three males and ten females, off forest buffalo, *Syncerus planiceros* (Blyth), May 7, 1910 (H. Lang and J. P. Chapin). Avakubi, three males and two females, off a red river-hog, *Potamochoerus porcus* (Linnaeus), October 26, 1909 (H. Lang and J. P. Chapin).

This remarkable species is quite distinct from *R. pulchellus* (Gerstæcker) and *R. maculatus* Neumann, the only other members of the genus with an ornate scutum. Of the males in these lots, one is marked as described and figured by Dönitz for his *R. dux*, while the others have the pattern of Larrousse's *R. schwetzi*. There is no doubt that Larrousse re-described *R. dux*, the description of which he seems to have overlooked, since he does not mention it in discussing the affinities of his *R. schwetzi*. Engorged females of this species may reach a total length of 15 mm.

***Boophilus decoloratus* (C. L. Koch)**

Rhipicephalus decoloratus C. L. KOCH, 1844, Arch. f. Naturgesch., X, part 1, p. 239 (♀; South Africa).

BELGIAN CONGO.—Zambi, several engorged females off cattle, June, 1915 (H. Lang). Faradje, several engorged females, off a cow, December 25, 1912 (H. Lang and J. P. Chapin). Niapu, two engorged females, off a sitatunga, *Limnotragus spekei gratus* Sclater, January, 1914 (H. Lang and J. P. Chapin).

***Dermacentor rhinocerinus* (Denny)**

Ixodes rhinocerinus DENNY, 1843, Ann. Mag. Nat. Hist., XII, p. 313, Pl. xvii, fig. 3 (♂; off *Rhinoceros bicornis*, South Africa).

Dermacentor rhinocerinus DÖNITZ, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 483, Pl. xv, fig. 8 and Pl. xvii, fig. 14 (♂, ♀).

Dermacentor rhinocerotis NEUMANN, 1897, Mém. Soc. Zool. France, X, p. 370, Figs. 25-26 (♂, ♀). (Not *Acarus rhinocerotis* de Geer.)

Dönitz has pointed out that de Geer's *Acarus rhinocerotis* (1778, Mém. pour servir à l'Hist. des Ins., VII, p. 160, Pl. xxxviii, figs. 5-6; off rhinoceros, Cape of Good Hope) was a tick with long palpi and therefore probably an *Amblyomma*, a genus of which several species have been found on rhinoceros. Perhaps it was *A. marmoreum* Koch.

BELGIAN CONGO.—Faradje, numerous males and females in four lots, off white rhinoceros, *Ceratotherium simum cottoni* Lydekker, March and April, 1911 (H. Lang and J. P. Chapin).

This tick is the most common parasite in East and South Africa of both the white and the black rhinoceros, which appear to be its only true hosts. The specimens obtained by the Lang and Chapin Expedition belong to the typical form. There is, however, some variation in the extent and shape of the markings of the scutum, especially in the male; in that sex, the pale, somewhat metallic spots of the anterior half may be either completely separated, or partly or almost entirely fused so as to simulate a female scutum (forming a so-called pseudoscutum, which, according to P. Schulze, corresponds morphologically to the true scutum of the female). In view of these facts, I doubt the validity of the subspecies *permaculatus* Neumann (1907, in Sjöstedt, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' III, Abt. 20, p. 23; ♂; Kibonoto, Kilimanjaro), which was probably based upon an individual variation. There is also considerable difference in size, males in the same lot measuring from 4 to 8 mm. in total length.

***Dermacentor circumguttatus* Neumann**

Dermacentor circumguttatus NEUMANN, 1897, Mém. Soc. Zool. France, X, p. 374, Fig. 27 (♂, ♀; Congo and Upper Ubangi).

BELGIAN CONGO.—Faradje, off elephant, *Loxodonta africana* (Blumenbach), April, 1911 (H. Lang and J. P. Chapin). These specimens were named by Dr. S. Hadwen. I have not seen them.

***Haemaphysalis leachii* (Audouin)**

Ixodes leachii AUDOUIN, 1827, in Savigny, 'Descr. de l'Egypte,' 2nd Ed., XXII, Zool., p. 428 (♂; Egypt); [1826, Atlas, Pl. ix, fig. 9; without name].

BELGIAN CONGO.—Medje, without host, January 22, 1910 (H. Lang and J. P. Chapin). Niapu, several males inside the ears of an otter, *Aonyx capensis* (Schinz), January, 1914 (H. Lang and J. P. Chapin).

Faradje, several males, off *Herpestes icheumon funestus* (Osgood), January 16, 1912 (H. Lang and J. P. Chapin). Ra-u, on the western slope of Mt. Ruwenzori, 6,000 ft., many males off *Civettictis civetta orientalis* (Matschie), January 12, 1927 (J. P. Chapin).

UGANDA.—Lake Bunyoni, one female off a clawed otter, *Lutra maculicollis* Lichtenstein, April 8, 1927 (J. P. Chapin).

TICKS KNOWN FROM THE BELGIAN CONGO

The following list is based upon a critical study of published records, as well as upon an examination of several large collections of African ticks. Asterisks mark the names of the forms of which I have seen specimens from the Belgian Congo. It may be noticed that, of the 50 forms (45 species and 5 varieties) listed, only six are as yet unknown to me from the territory here under consideration.

ARGANTIDÆ

Argas persicus (Oken)

**Ornithodoros moubata* (Murray)

IXODIDÆ

**Ixodes cavipalpus* Nuttall and Warburton

* " *daveyi* Nuttall

* " *rasmus* Neumann

* " *rubicundus* Neumann var. *limbatus* Neumann

* " *simplex* Neumann

* " *ugandanus* Neumann

**Amblyomma coherens* Dönitz

* " *cuneatum* Neumann

* " *eburneum* Gerstæcker

* " *marmoreum* C. L. Koch

* " *nuttallii* Dönitz

* " *paulopunctatum* Neumann

* " *petersii* Karsch

* " *pomposum* Dönitz

* " *splendidum* Giebel

* " *tholloni* Neumann

* " *variegatum* (Fabricius)

**Aponomma exornatum* (C. L. Koch)

* " *læve* Neumann

**Hyalomma ægyptium* var. *albiparmatum* P. Schulze

**Rhipicephalus appendiculatus* Neumann

* " *aurantiacus* Neumann

* " *bursa* Canestrini and Fanjago

- **Rhipicephalus capensis* C. L. Koch
- * " " var. *compositus* Neumann
- * " *complanatus* Neumann
- * " *delloideus* Neumann
- * " *duttoni* Neumann
- * " *dux* Dönitz
- * " *evertsi* Neumann
- * " " var. *mimeticus* Dönitz
- * " *longus* Neumann
- * " *neavei* Warburton
- * " *sanguineus* (Latreille)
- * " " var. *punctatissimus* Gerstäcker
- * " *simpsoni* Nuttall
- * " *simus* C. L. Koch
- * " " var. *lunulatus* Neumann
- * " " var. *shipleyi* Neumann
- * " *sulcatus* Neumann
- * " *supertritus* Neumann
- * " *tricuspis* Dönitz
- **Boophilus decoloratus* (C. L. Koch)
- **Dermacentor circumguttatus* Neumann
- * " *rhinocerinus* (Denny)
- **Rhipicentor gladiger* (Neumann)
- **Hæmaphysalis leachii* (Audouin)
- * " *parmata* Neumann.