ONCHOCERCA SUZUKII N. SP. AND O. SKRJABINI (= O. TARSICOLA) FROM A RELICT BOVID, CAPRICORNIS CRISPUS, IN JAPAN

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Summary :

Two *Onchocerca* species are described from the relict bovid *Capricornis crispus* (Rupicaprinae), in Japan.

The species from the tendons and sub-cutaneous tissue of the tarsal and carpal joints is identified as *O. skrjabini* Rukhlyadev, 1964 (this taxon, which was poorly defined and badly restored, is used instead of *O. tarsicola* to avoid dispute). *O. skrjabini* belongs to an homogeneous group of four species parasitic in Palearctic cervids, which seems to have evolved relatively recently. The morphological characteristics of the parasite of *Capricornis* are not sufficient to warrant the creation of a new taxon. The species from the subcutaneous tissue of the body is named *O. suzukii* n. sp. It belongs to a group comprising three species, parasites of antilocaprids and cervids from the Holarctic region and tropical domestic bovines, which seem to have evolved before the *skrjabini* group. The Japanese species does not present the hypertelic characters of the other species of the group. The microfilaria of *O. suzukii* is unknown. Thus it is not possible to say if this species is the same as one found in bovines (and, perhaps, in humans) in the Oita region of Kyushu Island.

KEY WORDS : *Onchocerca*. *O. suzukii* n. sp. Bovidae. Cervidae. taxonomy. zoonosis. Japan.

MOTS CLÉS : *onchocercue*. Bovidae. *O. suzukii* n. sp. Cervidae. taxonomie. zoonose. Japon.

Résumé : *ONCHOCERCA SUZUKII* N. SP. ET *O. SKRJABINI* (= *O. TARSICOLA*) PARASITES D'UN BOVIDÉ RELIQUÉ DU JAPON, *CAPRICORNIS CRISPUS*

Deux onchocercues ont été découvertes au Japon chez le Bovidé reliqué *Capricornis crispus* (Rupicaprinae).

L'une, localisée dans les tendons et tissus sous-cutanés des articulations carpales et tarsales, est assimilée à *Onchocerca skrjabini* (ce taxon, qui était mal défini et a été malheureusement ressuscité, est employé à la place de *O. tarsicola* pour éviter toute polémique). *O. skrjabini* fait partie d'un groupe homogène de quatre espèces parasites de Cervidés paléarctiques paraissant avoir évolué assez récemment. Les particularités morphologiques des parasites de *Capricornis* sont trop faibles pour nécessiter la création d'un nouveau taxon.

L'autre espèce, localisée dans le tissu sous-cutané du corps, est décrite sous le nom de *O. suzukii* n. sp. Elle fait partie d'un groupe comprenant déjà trois espèces, parasites d'Antilocapridés et de Cervidés en région holarctique et de bovins domestiques tropicaux, qui paraissent d'évolution plus ancienne que le groupe *skrjabini*. L'espèce japonaise n'a pas les caractères hypertéliques des autres espèces du groupe.

La microfilare de *O. suzukii* reste inconnue. On ne peut donc pas savoir si cette espèce correspond à celle qui est signalée chez les bovins (et peut être chez l'homme) dans l'île de Kyushu (région d'Oita).

INTRODUCTION

At the moment, the *Onchocerca* species identified in Japan are only those imported with the domestic animals : *O. cervicalis* Railliet et Henry, 1910, from horses, *O. gutturosa* Neumann, 1910 and *O. lienalis* Stiles, 1892, from cattle (Sato *et al.*, 1954; Takaoka *et al.*, 1989; Takaoka and Bain, 1990).

In addition to these three cosmopolitan species, an unidentified species from the cattle on Kyushu island, which seems also able to infect humans (Hashimoto *et al.*, 1990) is known only by its microfilaria, which has a peculiar helicoidal posterior region, and by its infective larva (Takaoka and Bain, 1990; Takaoka,

1990). Two other species were reported from the Japanese serow, *Capricornis crispus*, a relict Bovidae Rupicaprinae, by Suzuki *et al.* (1982). These two species have been studied, in the hope that one would be identified as the unknown species of cattle, and perhaps man, on Kyushu island. However, one was found to resemble a parasite of European Cervidae, *O. skrjabini*, and the other one represents a new species of which, unfortunately, the microfilaria remains unknown. The question of the *Onchocerca* species from Kyushu cattle therefore remains unsolved. In the present paper, a description is given of *O. suzukii* n. sp. and of the Japanese specimens of *O. skrjabini* Rukhlyadev.

MATERIAL AND METHOD

The Japanese serow *Capricornis* (*Capricornulus*) *crispus* (Temminck) is the sole representative of the bovid subfamily

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Fig. 1. — *O. suzukii* n. sp., female; A : anterior region, left lateral view; B and C : head, lateral and median view; D : oesophago-intestinal junction; E : cuticular ornamentation at midbody, lateral view (half width); F : idem, detail; G : lateral chord; H : transversal section, at midbody; I and J : tail, ventral and lateral views; K and L : caudal extremity, ventral and lateral view (scales : A, 300 µm; B and C, 30 µm; D, E, F, G, K, L, 50 µm; H, I, 200 µm; J, 100 µm).

Rupricaprinae in Japan. This subfamily comprises six genera distributed from Southern Europe to North America (Frechkop et Lavocat, *in* Grassé, 1955). The Japanese representative inhabits mountain ranges higher than 1,000 m in Honshu, Shikoku and Kyushu.

Thirty-nine animals captured in Gifu prefecture, Honshu Island in the winter of 1980-81 were examined parasitologically for adult worms. Two *Onchocerca* species were found respectively in 28 and 26 animals. Parasites were fixed in 10 % formalin and treated with lactophenol solution for microscopic examination. They are deposited in the Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University and in the Museum National d'Histoire Naturelle, Paris.

ONCHOCERCA SUZUKII N. SP.

Material

This parasite corresponds to *Onchocerca* sp. 1 of Suzuki *et al.* (1982) which is free in the subcutaneous tissue of the body, mainly in the thoracic area and pelvic limbs. The study is based on five males (four complete and one posterior body) and eight complete females, without microfilariae. The female holotype and the male allotype have the collection number 41 FK.

Description

The morphology is shown in figs. 1 and 2. Body uncoiled. Slight ventral swelling at level of excretory pore. Glandular oesophagus well differentiated in both sexes. Structure of the cuticle similar in both sexes : one thick layer without salient transversal ridges but with transversal striae interrupted on the lateral line; cuticle thicker on the lateral sides, with a slight longitudinal groove.

Female : labial papillae arranged according to rectangle stretched ventro-dorsally and cephalic papillae according to rectangle stretched laterally. Muscular cells well developed and lateral chords rather narrow with five longitudinal lines of nuclei. Vulva pre-oesophageal: distance of vulva to anterior extremity = two to three times that of nerve ring to anterior extremity. Tail elongate and lateral chords slightly twisted spirally (fig. 1J), extremity rounded with an internal conical point; phasmids anterior to a small conical point.

Male : labial papillae as in female and cephalic papillae arranged according to a square. One precloacal papilla and two groups of caudal pairs : group near the anus basically composed of pairs 1 to 6 of which five pairs lateral and one pair sub-ventral (sometimes one of these pairs was vestigial); the terminal group

composed of the pairs 7 to 10 (sometimes the pair 7 was doubled) with the subterminal 9th pair pointed and cuticular and phasmids located at its bases. Left spicule with handle shorter than lamina, the distal extremity membranous and bifid. Right spicule stout with dorsal subterminal hook.

Measurements :

Female holotype and, in brackets, range of paratypes. Body length 180 mm (118-222). Width 350 µm (228-430). Cuticle 20-30 µm thick. Length of oesophagus 1660 µm (1710-1910) with muscular part 400 µm long (490-680). Nerve ring and vulva respectively 350 µm (295-400) and 780 µm (730-970) from anterior extremity. Ovejector 4650 µm long. Tail length 400 µm (373-582).

Male allotype and, in brackets, ranges of paratypes. Body length 69 mm (69-82). Width 180 µm (180-212). Length of oesophagus 1370 µm (1350-1620) with muscular part 500 µm long (477-535). Nerve ring 300 µm (165-345) from anterior extremity. Length of tail 235 µm (185-210). Left spicule 375 µm (340-430) with handle 100 µm, and right spicule 135 µm (123-160).

Discussion

Twenty-eight species are known in the genus *Onchocerca* (cf. Bain, Wahl and Renz, 1993).

According to the phyletic classification of Bain (1981), the material from *C. crispus* has similarities with several non nodular species and differs from the *Onchocerca* species of the nodular line which have atrophied muscles and hypertrophied lateral chords in the female.

The medium-sized oesophagus with glandular part well differentiated in both sexes, anterior vulva, cloacal and terminal groups of caudal papillae well separated, with pairs 7 to 10 present relate this material to *Onchocerca* species from forest African bovids, namely *O. sonini*, *O. beaveri*, *O. lerouxi* described by Bain *et al.*, 1978, and to *O. fasciata* Railliet et Henry, 1910 from the camel. But these species have transverse ridges on the female cuticle, and the spicules are different (left spicule with blade and shaft equal in length; right spicule with medium spatula).

Only three species seem to be related to our material : – *O. cervipedis* Wehr et Dikmans, 1935, a parasite of Cervidae (Elaphoidea) and Antilocapridae (Tauroidea) in North America (Hibler, 1965). Like our specimens, the female cuticle is striated, without ridges, and the anterior body is thick (see figure 3 original drawings of specimens collected from *Odocoileus columbianus* n° 27756, USNM collection). The distinctive characters of *O. cervipedis* are numerous : undivided and shorter oesophagus; female cuticle composed of three layers with complex "striae"

Fig. 2. – *O. suzukii* n. sp., male; A and B : head, lateral and median view; C : oesophago-intestinal junction; D : head, apical view; E : cuticular ornamentation at midbody, median and lateral view (respectively E1 and E2); F and G : tail, ventral and lateral views; H : caudal extremity, lateral view; I : left sicule, right lateral view; J and K : idem, distal extremity, lateral and ventral view; L : right spicule, right lateral view (scales : A, B, D, H, J, K, L, 30 µm; C, 200 µm; E, F, G, I, 100 µm).

Fig. 3. – *O. cervipedis* Wehr et Dickmans, 1935, from *Odocoileus colombianus*; A to F, female; A and B : two anterior regions, lateral and submedian view; C and D : head, lateral and median view; E : cuticular ornamentation at midbody; F : tail, lateral view; G to I, male; G : tail and right spicule, right side; H : tail, left side of the same male; I : left spicule, lateral view; J : right spicule, distal extremity, lateral view (scales : A, B, 250 µm; C, D, E, F, G, H, I, 100 µm; F, 150 µm; J, 20 µm).

Fig. 4. – *O. skrjabini* Ruklyadev, 1964 (= *O. tarsicola* Bain and Schulz-Key, 1974) from *Capricornis crispus*; A to C, female; A : anterior region, lateral view; B : caudal extremity, ventral view; C : transversal section, at midbody; D and E : two male tails, ventral view (scales : A, 300 µm; B, D, E, 50 µm; C, 100 µm).

which prefigures the ridges of the evolved *Onchocerca* species; left spicule with handle and lamina equal in length, distal extremity of the right spicule membranous and attenuated, without salient dorsal hook; caudal papillae arranged according to an evolved type, i. e. two rows alongside the tail.

– *O. armillata* Railliet et Henry, 1909 from domestic bovines in Asia and Africa, redescribed by Chodnik (1957) and Bain (1975). The morphology of the spicules of this species resembles that of our specimens : left spicule with a short handle and a conspicuous bifid distal extremity; right spicule with a developed spatula and a conspicuous dorsal hook. However *O. armillata* is distinct by several characters : oesophagus longer; female cuticle more complex (intermediary layer present and striated,

external layer with ridges), dorsal hook of the right spicule round; caudal papillae arranged in two longitudinal rows.

– *O. flexuosa* (Wedl, 1856), a parasite of *Cervus elaphus* in Europe, redescribed by Bain and Schulz-Key (1974). Although this species presented also the same type of spicules it differed from our material by several characters : oesophagus much longer; female cuticle more complex (intermediary layer present and striated, external layer with undulations); caudal papillae reduced in number and all situated posterior to the cloacal aperture; tail longer; spicules larger with the dorsal hook of the right spicule very prominent; female body coiled.

In conclusion, the specimens from *Capricornis (Capricornulus) crispus* represents a new species,

which is named *Onchocerca suzukii* n. sp., in honour to Pr Y. Suzuki.

ONCHOCERCA SKRJABINI RUKLYADEV, 1964,
(= *tarsicola* Bain et Schulz-Key, 1974)

Nomenclature

Onchocerca skrjabini is a taxon which appeared in 1964 in a book which is difficult to obtain. It was created for a parasite of deer from Caucasia of which the description is not sufficient, not correctly illustrated and the microfilaria was undescribed. Sonin (1975), in his monograph, placed the taxon among the synonyms of *O. lienalis*.

Unfortunately the taxon reappeared in 1988 (Sonin in Hovorka *et al.*, 1988) after Bain and Schulz-Key (1974) had described *O. tarsicola* from *Cervus elaphus*, in Germany. *O. tarsicola* has been reported in numerous communications (about twenty) because it is widespread in the Scandinavian and Central European countries, not only in the deer but also in the reindeer, *Rangifer tarandus*.

Barus and Koubek (1993) redescribed the parasite from deer in the Czech Republic (of course identical to the parasite from Germany) and they preferred to use the name *O. skrjabini* and to place *O. tarsicola* in synonymy. There are divergencies with the material from Caucasia (in which the author described six pairs of precloacal papillae and one postcloacal pair) but these are very likely errors of description and, as the taxon *O. skrjabini* was restored, it seems advisable to use it to name the parasite of *Cervus elaphus* because it is probably the only species localized near the carpal and tarsal joints and the flexor tendons.

Material

It corresponds to *Onchocerca* sp. 2 of Suzuki *et al.*, 1982. Worms were found in the tendons, ligaments and subcutaneous tissue of the carpal and tarsal joints. The study is based on three males (one complete, two posterior and one anterior body) and 12 females (seven anterior, three posterior and two mid body) (n°45 FK).

Description

Several drawings are presented in figure 4 but a detailed description does not appear useful because the morphology corresponds to that of *O. skrjabini* (= *O. tarsicola*) published by Bain and Schulz-Key (1974).

Dimensions : Female: body length unknown, width 340 µm; interval of transversal ridges and internal striae 50-89 µm and 9-16 µm respectively; oesophagus 1260-2000 µm; nerve ring and vulva from anterior extremity 270-350 µm and 760-1000 µm; tail 125-205 µm.

Male : body length 33,7 mm, width 105 µm; oesophagus 1260-1300 µm; nerve ring from anterior extremity 243-305 µm; tail 93-98 µm; left spicule 255-298 µm; right spicule 109-111 µm.

Microfilariae (extracted from the anterior region of the uteri) : 372-423 µm in length, 10-14 µm in width.

Discussion

The shape and the large size of the microfilaria, the female cuticle (transversal ridges on the external layer, striae on the intermediary layer, four striae between two ridges), the general dimensions and the morphology of the spicules of the Japanese specimens are similar to those of *O. skrjabini*.

However, although no single character distinguishes the material from *C. crispus* and that from European cervids, a comparative study shows slight differences. The Japanese material presented :

- an oesophagus often longer with a glandular part differentiated in the female;
- a vulva often more anterior;
- the terminal group of caudal papillae complete (pairs 7 to 10 present) or hardly atrophied. This terminal group was said to be atrophied in the original description from *C. elaphus*, but is not in *Rangifer tarandus* (Bain, Reh binder et Petit, 1979). The study of three males from a new batch collected in *C. elaphus* from Germany (n° 1023 NJ, collection MNHN, Paris) showed a morphology identical to the Japanese specimens with two pairs, 8 and 9, transformed into cuticular points.

Thus, none of the slight differences presented by the Japanese material has a specific value. Nevertheless it is interesting to note that these three characters show the same evolutionary tendency, i.e. the Japanese specimens appearing slightly more primitive than those from *Cervus* or *Rangifer*.

CONCLUSION

The presence of two *Onchocerca* species in the relict bovid from Japan, *Capricornis crispus*, poses a difficult problem. There is no record of this genus from the endemic cervid, *Sika nippon*, and it seems inconceivable that the studied *Onchocerca* species were recently introduced by humans.

O. skrjabini (= *O. tarsicola*) belongs to a homogeneous group of evolved species (*O. jakutensis* Gubanov, 1964; *O. garmsi* Bain et Schulz-Key, 1976; *O. alcis* Bain et Reh binder, 1986) which are parasites of Palearctic Cervidae. Its presence in a Japanese bovid shows that the geographical distribution is

more important than the zoological position of the host, as it is frequently observed in nematodes parasite of vertebrates (Chabaud, 1981). Perhaps, *O. skrjabini* was present in bovids and cervids before Japan was separated from the mainland of Asia.

O. suzukii n. sp. seems to belong to another small group which also has representatives in Elaphoidea and Tauroidea (*O. flexuosa* from Palearctic Cervidae, *O. cervipedis* from Nearctic Cervidae and Antilocapridae, *O. armillata* from tropical domestic bovines) which possess primitive characters associated with specialized ones. The Japanese species, isolated in a relict animal in an insular region, seems to have evolved less than its counterparts from the continent.

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