

REVISION OF THE GENUS *VAMPIROLEPIS* SPASSKIJ, 1954
(CESTODA: HYMENOLEPIDIDAE)

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The genus Vampirolepis Spasskij, 1954 is re-defined on the basis of the original description and the first detailed redescription by Andreiko et al. (1969). A restricted definition is proposed, the main features being the arrangement of testicles on a straight line and numerous hooks of fraternoid shape. Other important characters are the strobila with numerous proglottids, the cirrus pouch of moderate size and the cirrus, smooth or armed with minute spines. Formerly included Hymenolepidid cestodes with reduced strobila, particularly long cirrus pouch and different arrangement of gonads do not belong to Vampirolepis. Members of Vampirolepis in the restricted sense show a cosmopolitan repartition and parasitize only bats. The author does not accept the synonymy of Rodentolepis Spasskij, 1954 with Vampirolepis. A tentative list of the species belonging to the genus is proposed.

Key words: *Vampirolepis* – Hymenolepididae – systematics – cestodes – bat parasites

The genus *Vampirolepis* was erected by Spasskij (1954a) for Hymenolepidid tapeworms with testes arranged in a straight line (type VI of Spasskij, 1959) and with a rostellum armed by about 50 hooks of fraternoid type. He listed 13 species to be transferred to this genus, the majority of them parasitizing chiroptera. But several of them were also found in insectivorous mammals (shrews) and one in a bird host.

This attempt to clear up the situation within the "*Hymenolepis*" with armed scolex from mammals was valuable, but was subsequently annihilated by adding more and more species not corresponding to the original strict definition of the genus. Yamaguti (1959) listed already 26 species in *Vampirolepis* and Schmidt (1986) recognized 79 species. According to this author, *Rodentolepis* Spasskij, 1954, another genus erected by Spasskij (1954b) for Hymenolepidids with armed rostellum from mammals, should be considered as a synonym of *Vampirolepis*.

In our days, a majority of authors use the generic name *Vampirolepis* when describing Hymenolepidid tapeworms parasite in bats. In previous papers on bat cestodes, we have always used the generic name *Hymenolepis*, even if this situation was not quite satisfactory (Vaucher, 1982, 1985, 1986a, 1986b).

RESULTS

For defining a genus we should always refer to its type species, in the present case, *Vampirolepis skrjabinariana* (Skarbilovitch, 1946). The type species is known from a short description and a good illustration of the anatomy of the mature proglottid. Some years later, Andreiko et al. (1969), collected other specimens and published a redescription with more details, particularly illustrating the hooks' shape and giving more informations about the variability of the arrangement of testicles and about the gravid uterus.

From these descriptions, the following features are to be emphasized:

a. *Size of the gravid specimens*: length 40 mm according to Skarbilovitch (1946), 25-80 mm according to Andreiko et al. (1969), width up to 0,952 mm. Numerous proglottids, up to 215 (Skarbilovitch, 1946), 120-440 (Andreiko et al., 1969).

b. *Hooks' shape*: the fraternoid type is clearly illustrated in Andreiko's et al. paper: handle long and thin, blade curved and thin, guard strong and about the same length as the blade. Their number is 45 according to Skarbilovitch, 1946 and 44-50 according to Andreiko et al. (1969).

c. *Anatomy of the mature proglottids*: in both papers, the type VI of Spasskij (1959) has been considered as typical (Fig. 7). But Andreiko et al. (1969) show that variation exists and have illustrated one segment with a triangular arrangement and another with a supplementary testicle, all four on one line. It's also important to dwell on the disposition of the ovary emplacement. It occupies an anterior position, in front of the testicles and does not divide the testicle line into a antiporal group separated from the poral one. The vitelline gland, entire to distinctly lobated, is situated ventrally, in front of the middle testicle.

d. *Cirrus pouch and terminal genital ducts*: the cirrus pouch is piriform, it extends beyond the level of the most internal loops of the excretory system. No spines have been observed on the cirrus. Vagina and genital atrium do not possess particular structures. The genital ducts pass dorsally to the excretory canals.

e. *Uterus*: Skarbilovitch (1946) states that the uterus is transversally elongated, with a network structure. Andreiko et al. (1969) drew a lobulated, transverse gravid uterus.

DISCUSSION

The most important character concerns the testicle arrangement. Andreiko et al. (1969) have shown that this disposition present variations. But this does not exclude, to our opinion, a certain utility of testicle arrangement in Hymenolepidid systematics and should not be an argument to synonymize genera showing different fundamental testes disposition.

Spasskij (1959) established 15 types of gonad disposition. But in practice, they are relatively schematic and many authors, when describing testicle arrangement in Hymenolepidids, refer to several Spasskij categories in one species. Consequently, they are difficult to use in the practice. In the case of bat Hymenolepidid tapeworms agreeing with *Vampirolepis* testes arrangement, we have observed, like other authors, that the fundamental arrangement on a straight line shows exceptions. But this somewhat variable arrangement is correlated with the anterior position of ovary, which does not separate the testicles in two groups (Fig. 8-12). The immature proglottids already show the typical gonad arrangement (Fig. 11). In the genus *Rodentolepis* Spasskij, 1954, with its type species *R.*

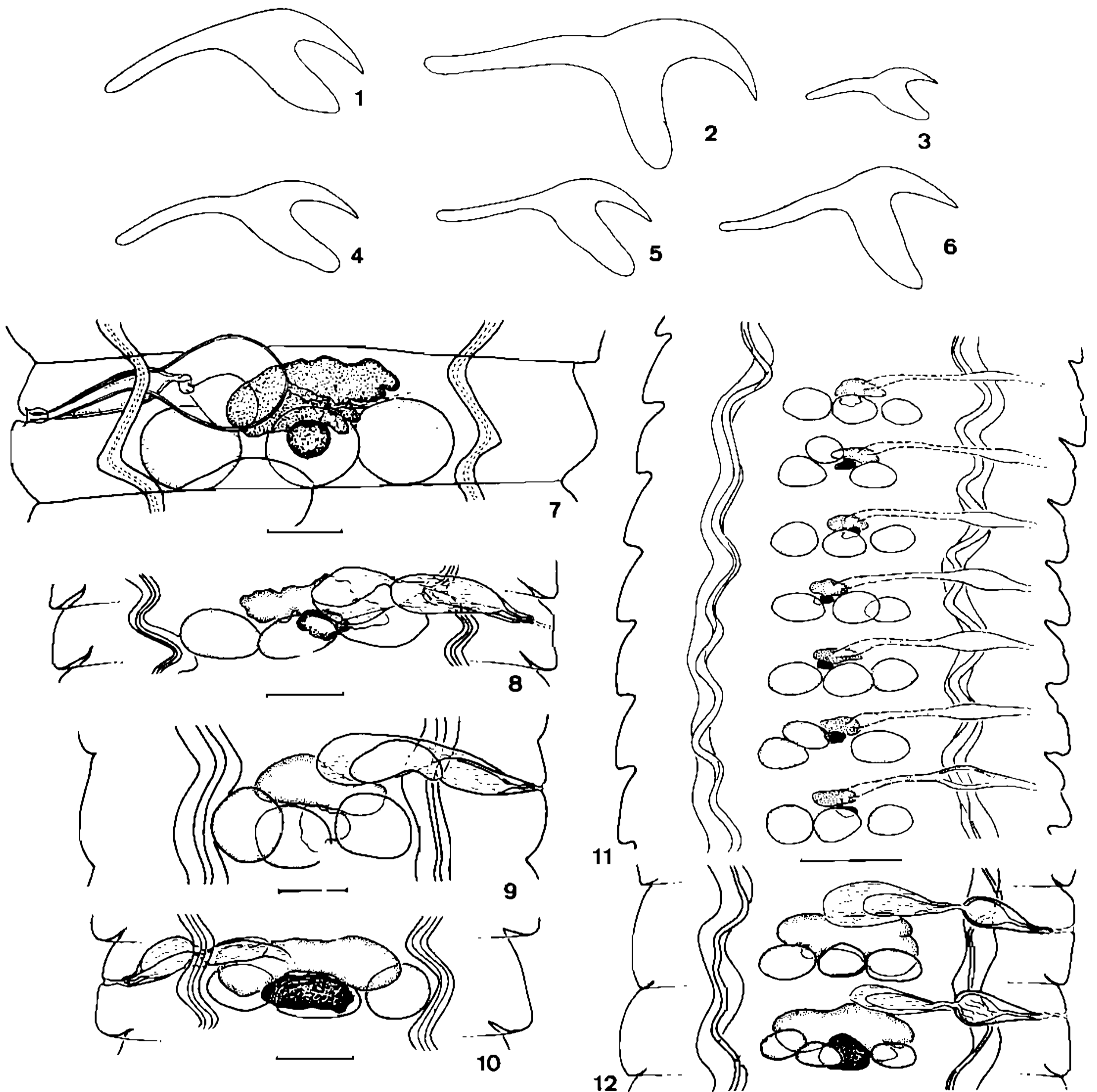
straminea (Goeze, 1782) (= *H. microstoma* Dujardin, 1845), the ovary and vitellaria separate the testicles in two fields (see Baer et Tenora, 1970, p. 11; Wahl 1967, fig 5). This particularity is also found in numerous Hymenolepidid tapeworms from small mammals, for instance *R. asymmetrica* (Janicki, 1904, *R. johnsoni* (Schiller, 1952) (see Baer et Tenora, 1970; Schiller, 1952). Therefore we cannot accept the synonymy proposed by Schmidt (1986) and we do not consider that *Rodentolepis* is identical with *Vampirolepis*.

The hook's shape shows a real homogeneity in all species which can be included in *Vampirolepis* in the sense of our revision (Figs 1-6). We met only two exceptions: *H. miniopteri* Sandars, 1957 and *V. bidentatus* Zdzitowiecki and Rutkowska, 1980. The guard of the hooks of Sandars' species have an accessory lateral flange and the handle is shorter than usual. The guard is bifurcated in the hooks of *V. bidentatus*. Both species share the other features of *Vampirolepis* (Sandars, 1957; Zdzitowiecki & Rutkowska, 1980).

Several quite particular species has been added to *Vampirolepis*. As pointed out by Rybicka (1959), *Hymenolepis stefanskii* Zarnowski, 1954, has been wrongly included into this genus by Zarnowski (1955): it differs by having a short strobila with less than 20 proglottids; the 15-17 hooks are of different shape. Furthermore, the cirrus pouch is particularly long, reaches the antiporal excretory canals and possesses a very long and armed cirrus.

Among other cases, let us consider now the one of *Hymenolepis virilis* Voge, 1955, placed by Schmidt (1986) into *Vampirolepis*. This species has not to be included in this genus: its testicles are arranged in a triangle, the cirrus pouch is rather big and almost reaching the antiporal excretory canals and finally, the cirrus is armed with a few, 12-16 μm long spines.

Recently, Jones & Anderson (1990), following Schmidt's emendation of *Vampirolepis*, place several Hymenolepidid cestodes of marsupials into *Vampirolepis*. Due to our results, we do not quite agree with them because the hook's shape of these worms is really different from the "fraternoid" shape of *Vampirolepis*. The concerned hooks have a long and curved blade, a long and slender handle contrasting



Rostellar hooks (Figs 1-6, all at the same magnification) and anatomy (Figs 7-12) of members of *Vamprolepis* Spasskij, 1954. Fig. 1: *V. skrjabinariana* Skarbilovitch, 1946, re-drawn from Andreiko et al. (1969). Fig. 2: *V. guarany* (Rego, 1961), from *Eumops bonariensis beckeri*, Paraguay. Fig. 3: *V. elongatus* Rego, 1962, from *Artibeus lituratus*, Paraguay. Fig. 4: *V. acuta*, from *Eptesicus serotinus*, France, coll. Joyeux. Fig. 5: *V. christensoni* (Macy, 1931), from *Myotis lucifugus*, U. S. A., coll. R. L. Rausch. Fig. 6: *V. temmincki* (Vaucher, 1986), from *Molossops temmincki*, Paraguay. Fig. 7: mature proglottid of *V. skrjabinariana* Skarbilovitch, 1946, re-drawn from Skarbilovitch (1946). Fig. 8: mature proglottid of *V. acuta*, from *Eptesicus serotinus*, Hungary, leg. E. Murai. Fig. 9: mature proglottid of *V. christensoni* (Macy, 1931), from *Myotis lucifugus*, U. S. A., coll. R. L. Rausch. Fig. 10: mature proglottid of *V. temmincki* (Vaucher, 1986), from *Molossops temmincki*, Paraguay. Fig. 11: portion of immature strobila of *V. elongatus* Rego, 1962, from *Artibeus lituratus*, Paraguay. Fig. 12: mature proglottids of *V. elongatus* Rego, 1962, from *Artibeus lituratus*, Paraguay. Scale bar = 100 μ m.

with a short, blunt guard. They are also much bigger, from 56 μ m up to 190 μ m in the stronger species (*V. peroryctis* Jones & Anderson, 1990). The anatomies of mature proglottids are more closely related to members of *Rodentolepis*. These Hymenolepidids could be eventually placed into a particular genus.

The uterus is shortly described in the original description and in Andreiko's and al. paper. We have already described the uterus development in three species (*guarany*, *temmincki*, *decipiens*) in a previous paper (Vaucher, 1986b) and pointed out the two-winged fundamental structure, both wings be-

ing more or less divided by labyrinthic or reticulate walls which can last in the gravid proglottids. When the eggs fill the uterus, the appearance in dorsal view is often the one of two joined sacs (see Rausch, 1975, figs 3, 7, 14), but the common isthmus is visible in ventral view. However, this type of uterine development and of shape of gravid uterus is probably not unique in Hymenolepidid cestodes.

Neither cirrus ornamentation or particular structure of the terminal genital canals have been described by Skarbilovitch (1946) and Andreiko et al. (1969). We have observed a discrete spiny ornamentation of cirrus in a few species, that could be easily overlooked (Vaucher, 1986b). The most prominent cirrus ornamentation is the one of *V. guarany* Rego, 1961.

Vampirolepis Spasskij, 1954, redefined

– armed rostellum with numerous hooks of fraternoid type: with long and thin handle, shorter blade and thicker guard, about as long as the blade or longer; exceptionnaly with bifurcated guard or lateral accessory flange; number of hooks: from 18 to more than 50;

– testicles arranged typically in a straight line, with possible variations up to a triangular arrangement in a few proglottids in the same strobila; sometimes two or four testes in the same strobila;

– testicles not clearly separated in two groups by the female organs;

– ovary anterior to testicles, with some degree of overlap at its posterior margin;

– vitellaria central, overlapping usually the median testicle;

– uterus firstly as a labyrinthic or reticulated two-winged structure, growing into a two-winged sac and finally occupying the whole proglottid between the excretory ducts; original labyrinthic structure sometimes still visible in the gravid segments;

– cirrus pouch piriform with well developed internal seminal vesicle, not reaching, reaching or extending slightly beyond the level of the excretory ducts;

– cirrus smooth or with minute spines;

– eggs oval, sometimes with thick external envelope.

After revision of all species placed in *Vampirolepis* by Yamaguti (1959), Schmidt (1986) and in numerous recent papers, we are

able to propose, on the basis of the original descriptions and of several careful redescrptions, a tentative list of the valid species of this genus even if several cases must remain uncertain: see Jensen & Howell (1983), Joyeux & Baer (1934), Lopez-Neyra (1941), Macy (1931, 1947), Macy & Rausch (1946), Murai (1976), Peres Viguera (1941), Rausch (1975), Rysavy (1971), Sawada (1966, 1967a, 1967b, 1967c, 1970, 1974, 1975, 1978, 1980, 1984a, 1984b, 1986, 1987, 1988, 1989), Sawada & Harada (1986), Sawada et al. (1984), Sawada & Mohammad (1989), Sawada & Molan (1988), Tenora & Barus (1960), Vaucher (1982, 1985, 1986a, 1986b), Zdzitowiecki & Rutkowska (1980). The species described as *Vampirolepis* or placed in this genus that have to be placed in others ones have been excluded of the list without further explanations and are neither cited in the references nor discussed herein.

Tentative list of the species belonging to *Vampirolepis*

The species of which we have studied type or voucher material are designated by an*. Some questionable species are designated by a ? The validity of the described species has not been investigated and therefore no synonyms are proposed herein.

Type species:

skrjabinariana (Skarbilovitch, 1946)

Other species:

acuta (Rudolphi, (1819)

artibei Zdzitowiecki and Rutkowska, 1980

balsaci (Joyeux and Baer, 1934)*

bidentatus Zdzitowiecki and Rutkowska, 1980

brevihamata Sawada, 1988

chiropterophila (Viguera, 1941)

christensoni (Macy, 1931)*

copihamata Sawada, Harada & Kobayashi, 1984?

crassihamata Sawada et Harada, 1986*

dasipteri (Vaucher, 1985)*

decipiens (Diesing, 1850)*

elongatus Rego, 1962*

fujiensis Sawada, 1978

gertschi (Macy, 1947)*

guarany Rego, 1961*

haradai Sawada, Harada & Kobayashi, 1984?

hidaensis Sawada, 1967
ikesakii Sawada, 1988?
isensis Sawada, 1986
iwatensis Sawada, 1975
kaguyae Sawada, 1987
kawasakiensis Sawada, 1986
lasionycteridis (Rausch, 1975)*
longisaccata Sawada et Harada, 1986*
macrostrobiloides Sawada, 1984?
macrotesticulatus Sawada, 1970
mazanensis (Vaucher, 1986)
mesopotamiana Sawada et Mohammad, 1989?
miniopteri (Sandars, 1957)
molani Sawada & Molan, 1988
multihamatus Sawada, 1967?
novadomensis Rysavi, 1971
ogaensis Sawada, 1974
ozensis Sawada, 1980?
pandoensis Sawada et Harada, 1986*
pipistrelli (Lopez-Neyra, 1941)
phyllostomi (Vaucher, 1982)*?
promopsis (Vaucher, 1986)*
rikuchuensis Sawada, 1987
roudabushi (Macy and Rausch, 1946)*
rysavyi Tenora and Barus, 1960
santacruzensis Sawada et Harada, 1986
schmidti Jensen and Howell, 1983
stenocephala Sawada, 1988
tanegashimensis Sawada, 1984?
taruiensis Sawada, 1967
temmincki (Vaucher, 1986)*
tookokuensis Sawada, 1988
uchimakiensis Sawada, 1988?
urawaensis Sawada, 1989
wakasensis Sawada, 1984?
yoshiyukiae Sawada, 1980

CONCLUSION

According to this restricted definition, based on the re-study of the type species designated by Spasskij (1954a), all species of the genus parasitize bats. Although only one species has been recorded from the Ethiopian region, a cosmopolitan distribution of the genus can be assumed. The worldwide repartition is certainly related to that of several host genera, which have also a wide repartition (*Eptesicus*, *Miniopterus*, *Myotis*, *Pipistrellus*, *Rhinolophus*, *Tadarida*, etc.) and to their ability to migrate or to make long way displacements. These remarks reinforce our morpho-anatomical observations and tend to prove that we have restricted *Vampirolepis* to a natural and homogeneous genus.

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