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# *NEOHILGERTIA VENUSTI* GEN. N. SP. N. (NEMATODA: OXYURIDAE) FROM *THYLAMYS VENUSTUS CINDERELLUS* (THOMAS) REIG, KIRSCH & MARSHALL, 1985 (MARSUPIALIA: DIDELPHIDAE) IN BURRUYACU, TUCUMAN, ARGENTINA – SYSTEMATIC POSITION AND POSSIBLE EVOLUTION

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Neohilgertia *gen. n. proposed for Oxyuridae nematodes from* Thylamys venustus cinderellus *(Marsupialia: Didelphidae) is described. The hypothesis about the possibility of a secondary parasitism for marsupials and the origin of the genus in the African Sciuridae parasite ancestors is discussed.*

Key words: parasites – helminths – Nematoda – Oxyuridae – systematic – evolution

Burruyacu is a locality of the Las Yungas biogeographic province. It is characterized by a transition forest with strong influence of the Chaqueña province. This, extends to the South from the south of Bolivia and southwest of Paraguay reaching the provinces of Córdoba, San Juan, San Luis and Santa Fé in Argentina; from West to East it stretches from the foot of the Andes to the shores of the Paraná river (Fig. 1). The yearly rainfall ranges from 500 mm in the East to 1200 mm in the West and the mean temperature is about 20 °C to 23 °C throught the year. Plains and small mountains are characteristic of this province where the vegetation is represented mainly by "quebracho" (*Schinopsis* spp.). Among the fauna of the region, *Thylamys venustus cinderellus,* a small creeping marsupial, circumscribed to the provinces of Tucumán and Jujuy, is found (Fig. 1) (Cabrera & Willink, 1973). From its gut a new species of nematode was collected which belongs, according to the anatomical characters, to the family Oxyuridae Cobbold, 1864. However, it was impossible to include it taxonomically in any known genera of that family and thus was considered a new species and the type of a new genus, namely *Neohilgertia venusti* gen. n. sp. n. The purpose of this work is to describe it and to determine the differences and similarities with other genera of the family Oxyuridae. Besides, the consequences in the evolutionary systematic of this genus in relation with the possible origin of its host is discussed.

## MATERIALS AND METHODS

The guts of six specimens of *T. v. cinderellus* captured in Burruyacu were examined. Fifty nematodes (20 males and 30 females) were collected from the caecum of the hosts. They were fixed in alcohol 70° and clarified with lactophenol. The parasites were studied under a Wild M20 microscope and the drawings were done with the aid of a Wild drawing tube. The measurements based on 20 males and 20 females, are given in mm; the means are followed by the range between parenthesis. The taxonomic classification of the marsupial host follows Tate (1933) and Reig et al. (1985).

## RESULTS

### *Neohilgertia* gen. n. (Figs 2-11)

*Diagnosis:* Oxyuroidea. Oxyuridae. Small nematode with cephalic vesicle; caudal end truncated in the male and sharp in the female. Cuticle transversaly striated and cuticular

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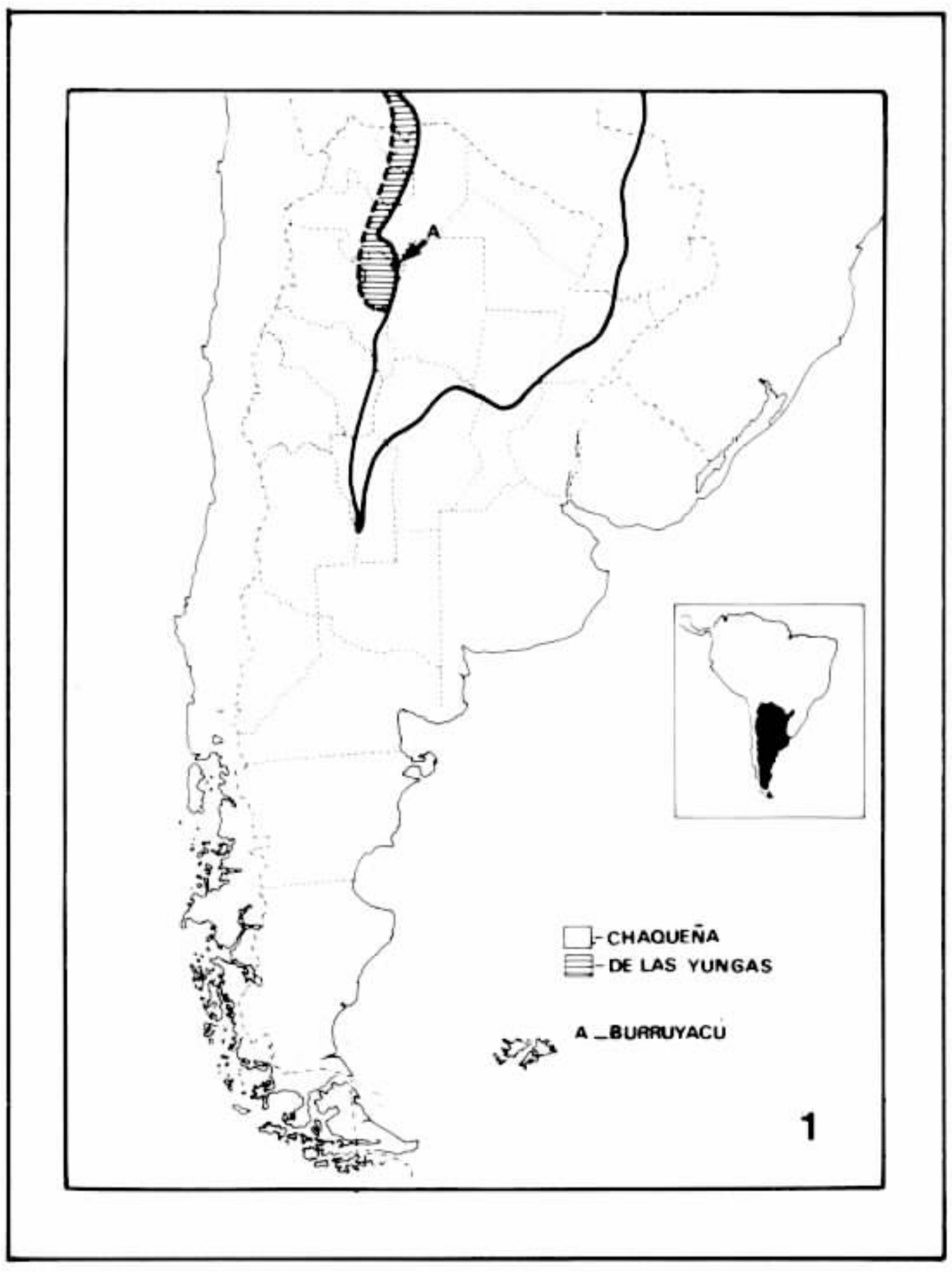



Fig. 1: map showing the Chaqueña and Las Yungas provinces and the locality of capture of *Thylamys venustus cinderellus.*

swelling along the middle-ventral surface in the male. Buccal capsule absent; buccal cavity with 4 simple pharyngeal teeth: 2 dorsal and 2 latero-ventral; oral openning sorrounded by 4 cephalic papillae arranged over the medio-lateral axis and separated from the amphids; 1 pair of amphids; 8 to 9 pairs of caudal cuticular papillae present in the ventro-lateral region of the male's body; 4 pairs of cloacal papillae: 1 sessil and 3 peduncled; spicule and gubernaculum present; accessory hook on gubernaculum absent; genital apparatus monodelphic; non protrusive vagina with muscular basis; operculated eggs.

*Type species: Neohilgertia venusti* sp. n.

*Neohilgertia venusti* sp. n.

*General description* – With the characters of the genus as defined above. *Length:* male, 1.54 (1.17 – 2.40); female, 3.70 (2.65 – 5.60). *Wide:* male (in the middle region of the body), 0.195 (0.143 – 0.280); female (in the vulvar region), 0.314 (0.198 – 0.480). Oesophagic bulb maximum diameter: male, 0.093 (0.069 – 0.190); female, 0.146 (0.113 – 0.180). Nerve ring: male, 0.103 (0.075 – 0.160); female, 0.113 (0.096 – 0.130) from anterior end respectively. Excretory pore: male, 0.180; female, 0.186 (0.160 – 0.220) from anterior end respectively.

*Male* – Cloaca 0.050 from posterior end; gubernaculum strongly sclerotized 0.058 (0.038 – 0.080) long; 0.012 (0.009 – 0.015) wide; spicule 0.148 (0.120 – 0.180) long; 0.015 wide; tail 0.050 (0.036 – 0.065) long; 0.077 (0.060 – 0.120) wide.

*Female* – Vagine opens 0.679 (0.455 – 0.960) from cephalic extremity; anus 0.646 (0.338 – 0.845) from posterior end; tail 0.646 (0.338 – 0.845) long; 0.143 (0.076 – 0.208) wide; operculated eggs 0.098 (0.084 – 0.120) long x 0.024 (0.026 – 0.040) wide.

*Host: Thylamys venustus cinderellus.*

*Location in the host:* caecum.

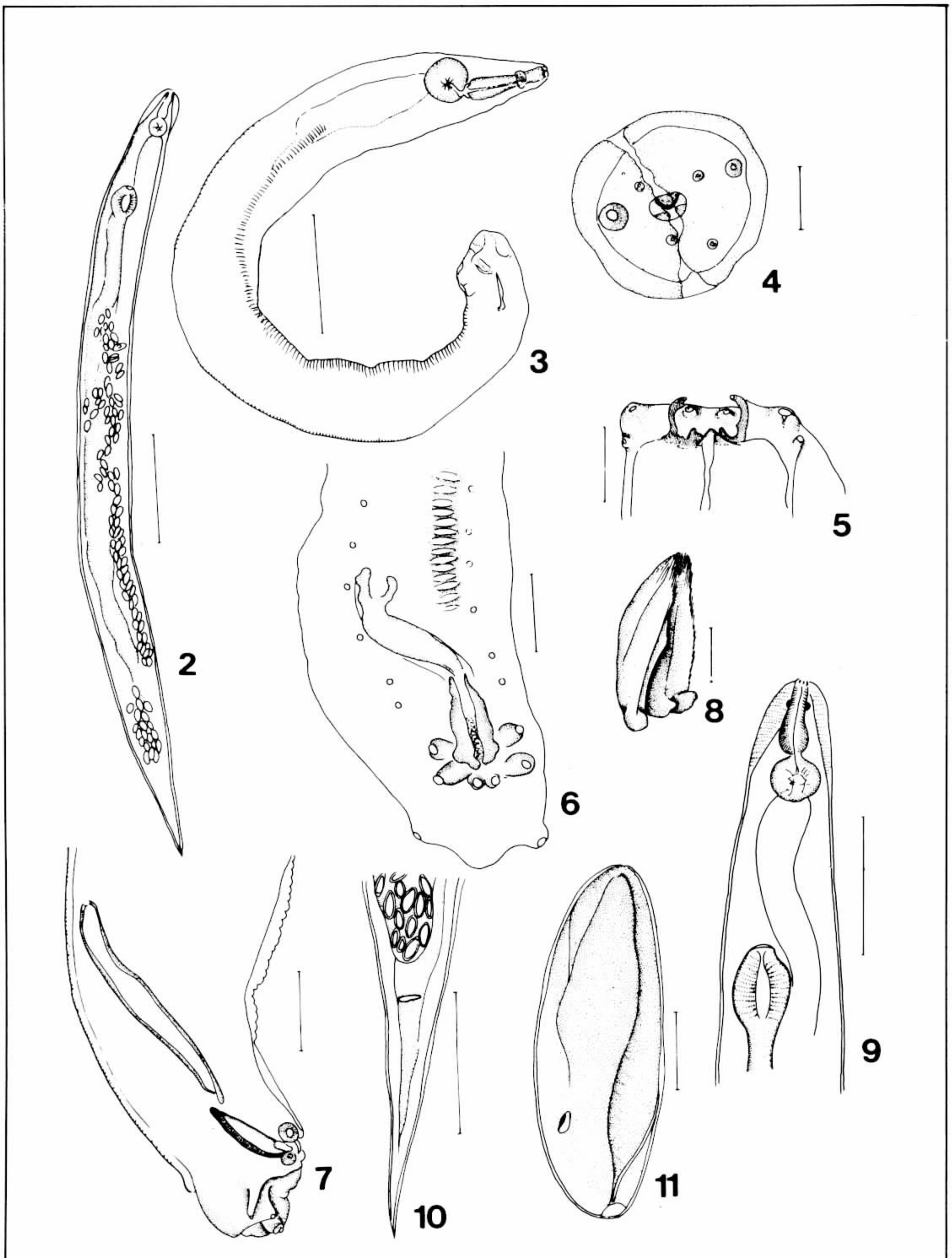
*Locality:* Burruyacu, Tucumán province, Argentina.

*Specimens studied:* 20 males and 30 females (measurements based on 20 males and 20 females).

*Material deposited:* in Argentine Museum of Natural Sciences Bernardino Rivadavia. Helminthological Collection no. 362. Host: voucher specimens are preserved in the Municipal Museum of Natural Sciences of Mar del Plata, Argentina.

## DISCUSSION

*Neohilgertia* gen. n. shares the anatomical character referred to the number of genital papillae with the genera that parasitize Australian marsupials, primates and leporids (*Paraustroxyuris* Mawson, 1964; *Macropoxyuris* Mawson, 1964; *Lemuricola* Chabaud & Peter, 1959; *Passalurus* Dujardin, 1945). The presence of a gubernaculum and the cephalic structure puts it close to the genus *Hilgertia* Quentin, 1973 that parasitizes African ctenodactylids but differs by having a non protrusive vagina, operculated eggs, a truncated caudal extremity and cuticular ornamentation along the middle ventral surface in the male. This last feature, in addition to the operculated eggs, places *Neohilgertia* gen. n. near four other species belonging to the genus *Syphacia* Seurat, 1916,




*Neohilgertia venusti* gen. n. sp. n. Fig. 2: total view of the female (scale = 1 mm). Fig. 3: total view of the male (scale = 0.3 mm). Fig. 4: apical view of the anterior end (female) (scale = 0.05 mm). Fig. 5: dorsal view of the anterior end (female) (scale = 0.02). Fig. 6: anterior end of the male showing the oesophagus and the nervous ring (scale = 0.05). Fig. 7: lateral view of the posterior end of the male showing the spicule, the gubernaculum and the cuticular swelling (scale = 0.05). Fig. 8: lateral view of the gubernaculum (scale = 0.02 mm). Fig. 9: ventral view of the female showing the nervous ring and the vulva (scale = 0.5 mm). Fig. 10: ventral view of the posterior end of the female showing the anus (scale = 0.5). Fig. 11: egg (scale = 0.02 mm).

subgenus *Syphatineria* Chabaud & Biocca, 1955 (*S. s. funambuli* Johnston, 1965; *S. s. paraxeri* Sanground, 1933; *S. s. pearsi* Baylis, 1928; *S. s. sciuri* Mirza & Singh, 1934) parasites of Asiatic and African sciurids. Nevertheless, in these species, the ventral cuticular ornamentation in the male consists of only two cuticular swellings; this, allows their separation from *Neohilgertia* gen. n.

Quentin (1971) assessed the evolution of *Syphacia* starting from the state related to the cephalic structure, ventral cuticular ornamentation and genital apparatous in the male. The author considered plesiomorphic characters: 1) the cephalic structure with circular extremity and four cephalic papillae arranged over the middle ventral axis and separated from the amphids; 2) the reduced number of cuticular swellings; 3) the hookless gubernaculum; 4) the spicular length under 100 μm. The evolution of these characters conforms a continuous series in the species parasitizing sciurids (Quentin, 1971). On the other hand, Quentin (1973) pointed out that the evolution of the Oxyuridae is represented by the reduction in number of the genital papillae and the acquisition of a gubernaculum. Besides, he indicated the existence of seven evolutionary lines within the oxyurids, of which those represented by the genera that parasitize Australian marsupials and primates are the most primitive. The genus *Hilgertia* probably occupies the basis of a common evolutionary trunk of oxyurids found in African rodents (sciurids and lagomorphs) (Hugot, 1982).

The remarks mentioned hitherto suggest that some anatomical characters of *Neohilgertia* gen. n. are apomorphics when compared with those corresponding to the genera from Australian marsupials, primates and leporids. Besides, it represents an intermediate form between the genera *Hilgertia* and *Syphacia* from Asiatic and African rodents belonging to the family Sciuridae Gray, 1821. The purpose of inquire about the possible origin of the genus *Neohilgertia* gave a reason to make some reconsiderations about the different hypotheses that deal with the origin of marsupials.

After rejecting Simpson's hypothesis (1969) about the origin of marsupials in the Cretaceus of North America and their migration following two independent routes (one straight to South America and the other through Asia down to Australia) there are no doubts about the South American origin of the Australian fauna (Reig, 1981). In fact, there are fossil records which prove that South American marsupials colonized Australia via Antarctica (Case et al., 1988). However, the primary origin of those animals still needs to be elucidated. In this respect, some authors (Clemens, 1968; Simpson, 1969; Patterson & Pascual, 1972) have postulated that this event took place in North America while for others (Cox, 1970; Hofstetter, 1970; Sige, 1971, 1973; Savage, 1974) the origin was in South America. The autoctonist hypothesis stated by Fooden (1972) and Croizat et al. (1974) support the idea that the biotas followed the drift of the plates after the fracture of the continents and Reig (1981) postulated the South American Gondwanic origin of marsupials. However, the evidence available for a North American Asiatic origin of Methateria is much better documented than that for a South American origin. Then, this group of mammals except the Xenarthra should be considered as late Cretaceus immigrants from North America (Bonaparte, 1986).

The above mentioned data allows us to state two alternative hypotheses on the possible origin of *Neohilgertia*.

1) *Neohilgertia* is a typical genus of South American marsupials. Similarly, *Austroxyuris* and *Protoxyuris* are characteristic of Australian marsupials and *Hilgertia* of African ctenodactylids and leporids. This leads to the consideration that the above genera underwent a process of differentiation together with their hosts.

2) *Neohilgertia* gen. n. differentiated secondarily in South America from *Hilgertia* or its ancestors, being a secondary parasites of marsupials.

The ctenodactylids, hosts of nematodes of the genus *Hilgertia* constitute an isolated group of Eastern Africa rodents. Besides, the Sciuridae of South America had their origin in an ancestor of North America. Nevertheless, the genus *Sciurillus* Thomas, represents an exception because it is related with some Oriental and African species and it is distributed in Guiana and in the lower basin of the Amazon (Cabrera & Yepes, 1960; Hershkovitz, 1972). This suggests that the sciuromorphs may be the route of transmission of the parasites to the marsupials in which *Neohilgertia* gen. n.

could have differentiated. It must be taken into account that in northwest of Argentina *Sciurus ignitus* Thomas is also present and its distribution area partially overlaps with that of *T. v. cinderellus*.

The studies made up to now indicate that the marsupials have their own and stable parasitic fauna and, because of this, it is surprising that *Neohilgertia* gen. n. was only found in *T. v. cinderellus*. In fact, our current researchs show that up to now, *Neohilgertia* gen. n. does not parasitize *L. crassicaudata* Desmarest that inhabits the same locality. However, other nematodes (i. e. species belonging to the genus *Travassostrongylus* Orloff, 1933) parasitize both: *T. v. cinderellus* and *L. crassicaudata* but not the last species of marsupial from other biogeographic provinces. The reason why *Neohilgertia* gen. n. is circumscribed to the locality of Burruyacu and was found in only one species of marsupial indicates that: 1) the transmission of the parasite is closely related with the ecology of the host considering that *T. v. cinderellus* is a creeping marsupial; 2) the species *T. v. cinderellus* whose distribution area is circumscribed to the provinces of Tucumán and Jujuy represents an isolated population with particular features, for example, its own parasitic fauna and 3) this parasitism is relatively recent. This suggests that the second hypothesis seems more pausible. This would be the case of *Neohilgertia* gen. n. parasitizing sciurids from the northwest of Argentina. Thus, it would be a secondary parasitism for marsupials and the origin of the genus could arise from its African Sciuridae parasite ancestors.

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