

LIFE CYCLE OF *ORYCTEROXENUS GALEMYS* SP. NOV. (ASTIGMATA: GLYCYPHAGIDAE)

F. S. Lukoschus¹, T. Woeltjes¹, E. A. Juckwer², A. Fain³

----- ABSTRACT—*Orycteroxenus galemys* sp. nov. from *Galemys pyrenaicus* is described and figured in all life stages. Hypopi of European species of genus are compared.

INTRODUCTION

Heteromorphic deutonymphs (hypopi) are common associates of small mammals throughout the world. They are attached to hairs, in hair follicles, under the skin, or embedded in ear-wax. Fain (1969a) listed 106 species in a review of the group. Since then many new taxa have been described. Most species are known only from the hypopial stage while adults and other developmental stages are undescribed, free-living nest inhabitants. The life cycle and morphology of the adults and other stages are known only in a few species (Fain and Lukoschus, 1974). During behavior studies of the Pyrenean Desman, *Galemys pyrenaicus*, (Insectivora: Talpidae) one of us (EAJ) observed adults and developmental stages of a Labidophorinae species in the artificial nest of test animals. *Desmanopus desmanae* (Zachvatkin, 1941) was described from the Russian Desman, *Desmana moschata*, but it was redescribed (Lukoschus et al., 1976) because of the brief description and the loss of the type and paratypes. Because of the host specificity of this group of mites, the presence of hypopi on a second Desmaninae host suggested a second *Desmanopus* species. However, close examination revealed that the hypopi belonged in the genus *Orycteroxenus* Zachvatkin, 1941. Also, they were not conspecific with any of the 14 species mentioned in the most recent study of that genus (Lukoschus et al., 1977) and were intermediate in many characteristics between *O. soricis* (Oudemans, 1915) and *O. dispar* (Michael, 1886). In the genus *Orycteroxenus*, adults and tritonymphs are known only in *O. dispar* (Fain, 1969). The new species description and diagnosis is given below. All measurements are in micrometers.

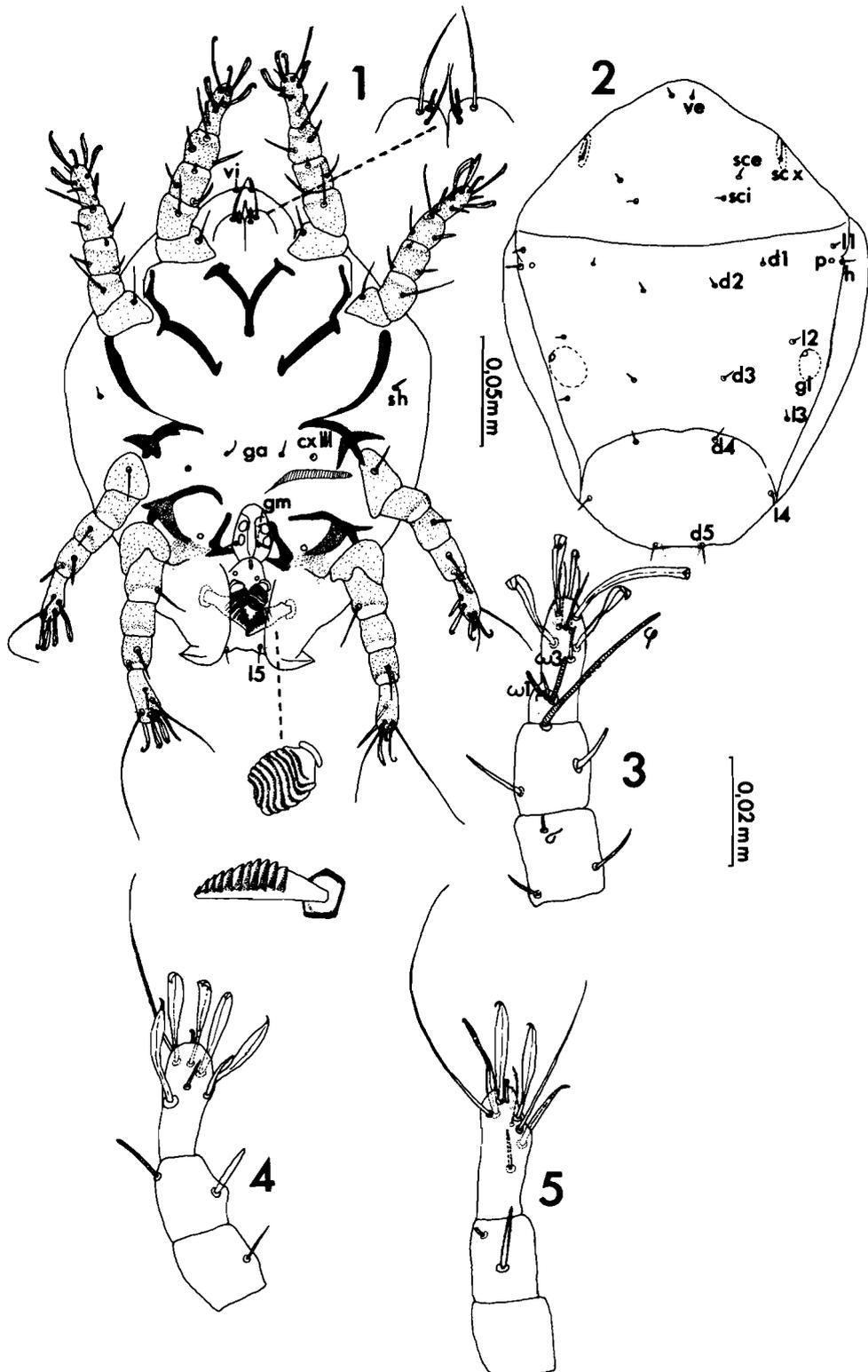
MATERIALS AND METHODS

The Pyrenean desman, from which typical series of *Orycteroxenus galemys* were found, was kept in captivity as a part of a behavioral study by one of us (A.E.J.). The observational study gave valuable information as to the rearing and living conditions of *Orycteroxenus galemys*. The desman was a female, kept in captivity from 8 July 1971 until 23 July 1972. A terrarium was filled with sand, gravel and rocks, such that a pool of water remained (50 x 50 x 15 cm). The water was changed twice a day. The terrarium was connected with two nesting-boxes by a gallery that consisted of small wire netting. The nesting-boxes were 30 x 30 x 15 cm, built of wood, split into three partitions, and covered with glass which was again covered with wood. The front compartment of the nesting-box arrangement was moist but never soaking. For nesting material the desman was supplied with hay and dry *Fagus sylvatica* foliage, she made an approximate spherical nest. The desman often changed the nest from one box to another, by which she transported the nest materials through the water and used it again. On the glass-cover of the nest there were constant condensation drops, an indication that there was a high relative humidity. When the nesting materials were soaking wet, the desman would dry them and use them again or replace them with fresh materials when necessary. The prey was never taken into the nest but always to the front compartment. Excrements were always dropped outside the nesting box.

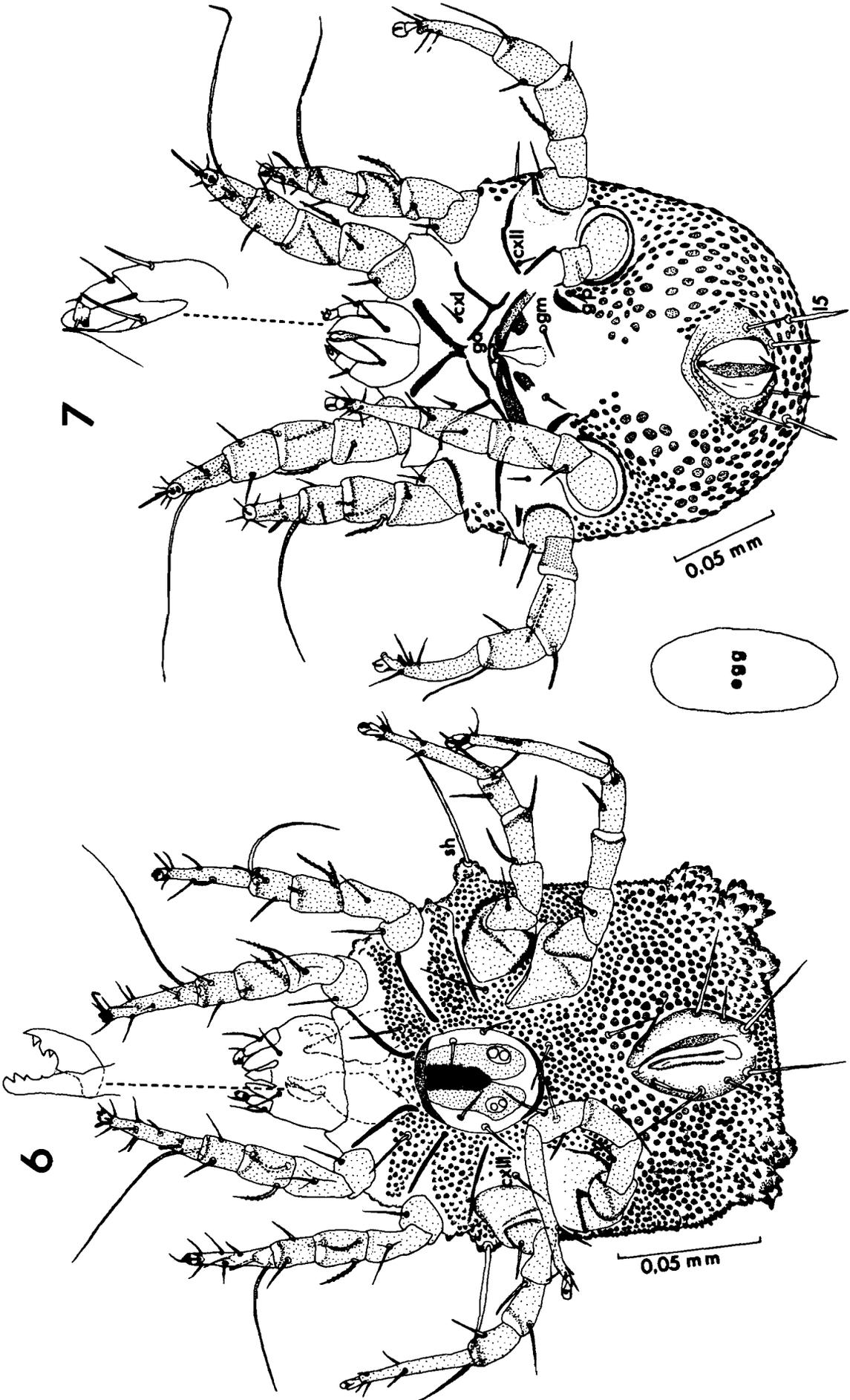
1. Department of Zoology, Catholic University of Nijmegen, The Netherlands.

2. Zoologisches Forschungsinstitut und Museum Koenig, Bonn, Germany.

3. Institut de Médecine Tropicale Prince Léopold, Antwerpen, Belgium.



Figs. 1-5: *Orycteroxenus galemys* sp. nov. (hypopus: holotype)-1, venter; 2, dorsum; 3, tarsus to genu of leg I; 4, leg III; 5, leg IV.



Figs. 6, 7: *Orycteroxenus galemys* sp. nov. -6, venter of female; 7, venter of male.

The terrarium was placed in an unheated room—in winter no frost with normal daylight.

The normal behavior of the desman didn't change under these conditions. There were three periods of activity observed. When swimming the lanceolated tips of the hairs cover the dense woolly underfur, thus forming a good closed layer, which prevents the loss of air stored between the woolly hairs.

Adults, eggs, proto- and tritonymphs were first seen in spring at the glass cover and after that in the nest too.

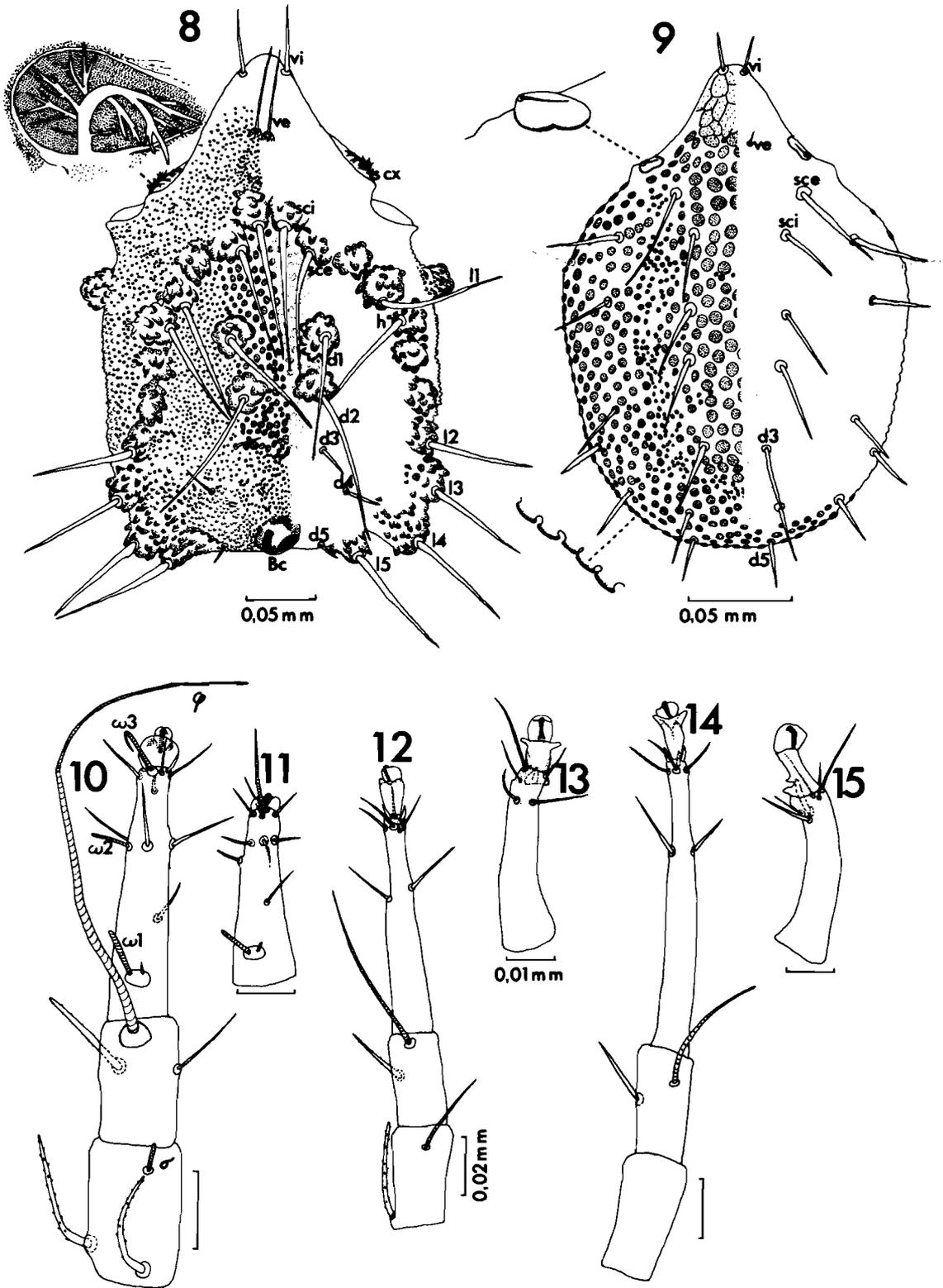
Family Glycyphagidae Berlese, 1887
Subfamily Labidophorinae Zachvatkin, 1941
Genus *Orycteroxenus* Zachvatkin, 1941

Orycteroxenus galemys sp. nov.

HYPOPUS —(holotype) with the characteristics of hypopi of the genus *Orycteroxenus* Zachvatkin, 1941, in sensu Fain (1969), with short oval shape and poorly sclerotized white to pale yellow cuticle. Length 218, 10 paratypes averaged 196 (range, 177-218), width 162, paratypes 158 (145-174).

VENTER (Fig. 1)—Epimera I fused in a Y-shape, II-IV free. Epimerites I fused to epimera II. Epimera and epimerites IV form an almost closed coxal field IV. Bilobed palposoma with two pairs of setae of different length (12, 18) and short (2) solenidia alpha. Pilicolous organ broad and well developed, surpassing posterior border. Pilicolous valves with distinct postero-lateral hooks and rounded, indistinct antero-lateral recesses. Inner clasper (12) with 9 ridges, outer clasper (25) with 11 ridges. Genital region between epimerites IV with two pairs of oval-shaped suckers. Anal pore behind genital region with the rings of vestigial setae. Idiosomal setae on venter: *vi* (7), *sh* (5), *ga* (6), *gm* (5), coxal III in form of rings, lateral 5 (8). Legs (Figs. 3-5) of primitive, unmodified shape (without protrusions or anchoring hooks), and of about the same length and strength. Length of tarsi I-IV (23-18-21-22), more equal than in other species of the genus. Chaetotaxy: tarsi 8-8-8-8, tibiae 2-2-1-1, genua 2-2-1-0, femora 1-1-0-1, trochanters 1-1-1-0. Claws on forelegs longer and stronger than on hindlegs (11-11-6-5). Tarsal setae flattened or setiform. The indistinct pectination of the tibial and genual setae and the short, thick setae on the tibiae are different from all known species of the genus. Solenidiotaxy: tarsi 2-1-0-0, tibiae 1-1-1-1, genua 1-1-0-0. Famulus present. Omega 3 near omega 1 on basal part of tarsus I. Dorsum (Fig. 2): Sejugal and posterior furrow distinct. All setae short and setiform (5-7), *sc e* in front of *sc i*, dorsal glands (gl) between laterals 2 and 3, pores (P) near humerals. Measurements in Table 1.

FEMALE (Figs. 6, 8, 10, 12, 14, 22-25)—Small pale yellow mite with typical U-shaped body with well elevated borders, bearing scapular, humeral, and lateral setae. Figure 22 gives an impression of shape in dorso-lateral view. Cuticle of idiosoma nodular to papillary. Length of figured specimen 376, in six nongravid females 370-438; in gravid females with 7 and 2 well developed eggs 518 and 470; width 268 (217-400). Venter (Fig. 6): All epimera free, not connected to a ring around the genital region. Longitudinal genital opening between legs II and III with two large valves, two pairs of oval shaped genital suckers on a common base, three pairs of genital setae, sickle-shaped epigynium and similar sclerotization opposite of epigynium. Long anal slit surrounded by heavier sclerotized smooth region and 5 pairs of anal setae. Posterior end of idiosoma blunt, in some paratypes slightly concave. Gnathosoma of normal shape with functional toothed chelicerae. Legs slender with long tarsi; stalked empodium with small claw, not surpassing border of empodium. Chaetotaxy: tarsi 10-10-8-8, tibiae 2-2-1-1, genua 2-2-1-0, femora 1-1-0-0, trochanters 1-1-1-0, coxae 1-0-1-0. Solenidiotaxy: tarsi 3-1-0-0, tibiae 1-1-1-1, genua 1-1-1-0. Famulus present. All tarsi with three short apical spines. Only tibial and genual setae with very short pectinations. Dorsum (Fig. 8) without sejugal and posterior furrow; in an inverted U-shaped bow which is well elevated with groups of large tubercles, many bearing



Figs. 8-15: *Orycteroxenus galemys* sp. nov. -8, dorsum of female; 9, dorsum of male; 10,12,14, tarsus, tibia & genu of female-10, leg I; 12, leg III; 14, leg IV; 11,13,15, tarsus of male-11, leg I; 13, leg III; 15, leg IV.

fairly thick setae. All dorsal setae simple with rough surfaces. Greater magnification of dorsal seta 2 (Fig. 24) shows slight pectinations on setal surfaces and the verrucose surface of the dorsum with groups of large tubercles around setal bases and the irregular papillary form of the lateral regions. Median part between scapular setae and dorsals 3 (Fig. 25) with rounded nodules of more regular shape and lower elevation. Pores paramedian behind *d* 1. Setae *ve* close together behind *vi*. Dorsals 3-5 much smaller than other idiosomal setae. Bursa copulatrix (Bc) opens on a dorso-posterior tubercle without an extended copulatory tube. Supracoxal fossa well marked by a supracoxal seta of only one main branch with few but thick pectinations (Fig. 23). Grandjean's organ absent. Measurements in Table 1.

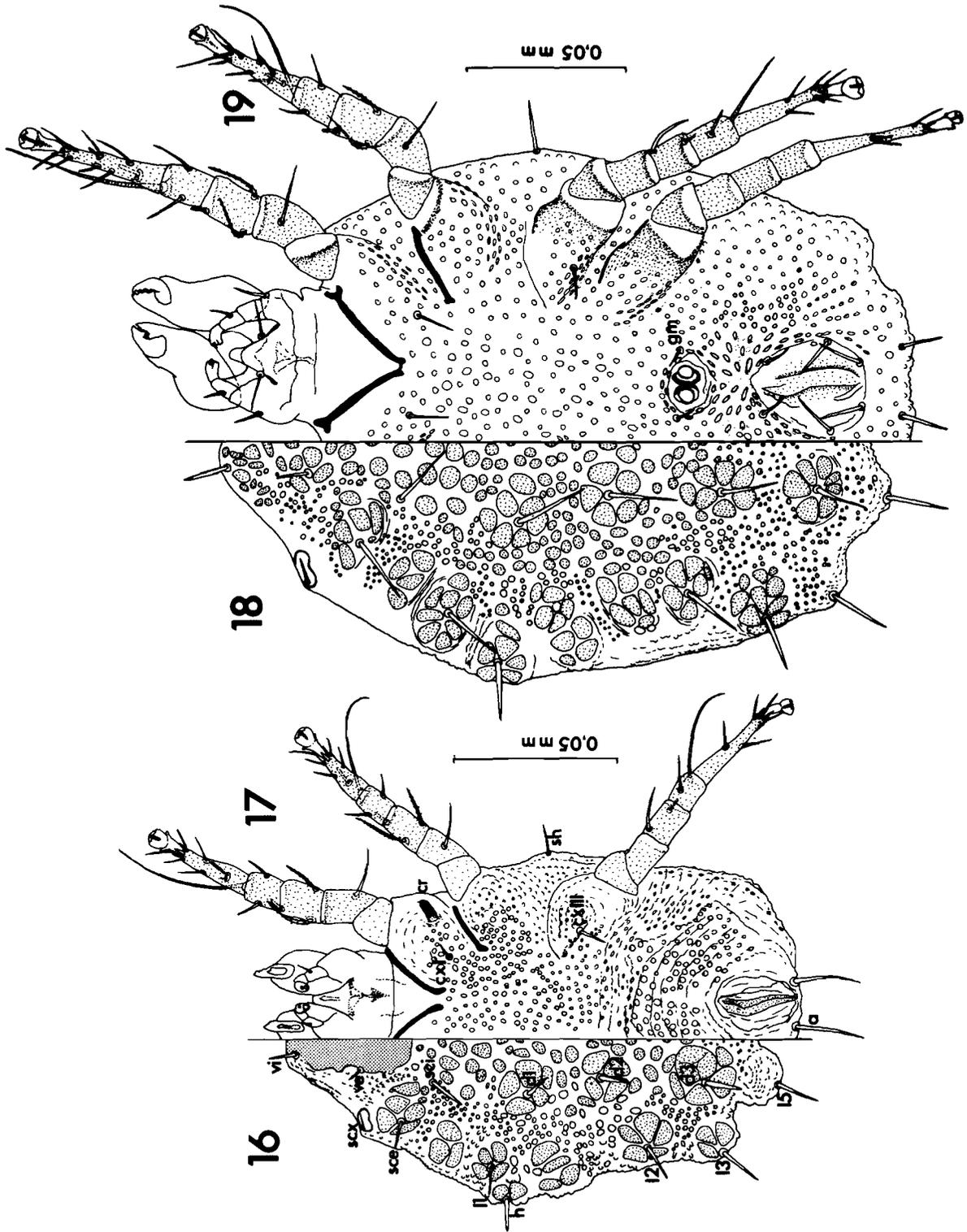
MALE—(Figs. 7, 9, 11, 13, 15) of yellow color, oval shape, and quite dissimilar from female in body shape, size, surface of cuticle, and shape of legs. Length of figured specimen 226, in 7 paratypes 228 (217-241); width 165, paratypes 171 (161-177). Structure of the cuticle like median parts of female. Venter (Fig. 7): Genital region between Legs III. Epimera I-IV almost fused, forming a lower level of the elevated genital region, which has a well sclerotized anterior border, short aedeagus, and two pairs of elongated suckers. First pair of genital setae short and near the genital opening in the fold of the body surface, difficult to observe in some specimens. Anal region with only two pairs of setae. Legs strong, with very short tarsi. Legs III and IV bowed forward in all specimens. Chaeto- and solenidiotaxy as in the female with the exception of the absence of the two lateral apical spines on the tarsi. Dorsum (Fig. 9) with heavier sclerotization than the female. Tubercles of the cuticle of regular shape and low elevation (see border). Setae *ve* short, all other setae of the dorsum subequal. Supracoxal fossa distinct, supracoxal seta simple. Setae *sci* behind the level of the *sc e* unlike the female.

LARVA—(Figs. 16, 17) of oval shape and dirty white color. Length of figured specimen 174, in 7 paratypes 181 (171-193); width 107, paratypes 108 (99-116). Venter (Fig. 16): Cuticle slightly verrucose, epimera free, Claparede organ in the form of a thick, apically rounded root. Gnathosoma with functional, toothed chelicerae. Legs long, slender as in the female. Chaetotaxy: tarsi 8-8-8, tibiae 2-2-1, genua 2-2-1, femora 1-1-0, trochanters 0-0-0, coxae 1-0-1. Solenidiotaxy: tarsi 1-1-0, tibiae 1-1-1, genua 1-1-1. Famulus present. Dorsum with distinct prodorsal shield. Cuticle soft, with tubercles of low elevation. Groups of larger tubercles present in four rows around the setae as in the female but, groups also present between these rows. Chaetotaxy of the idiosoma: *vi*, *ve*, *sci*, *sc e*, *h*, *sh*, dorsals 1-3, laterals 1-3, 15 and one pair of anals.

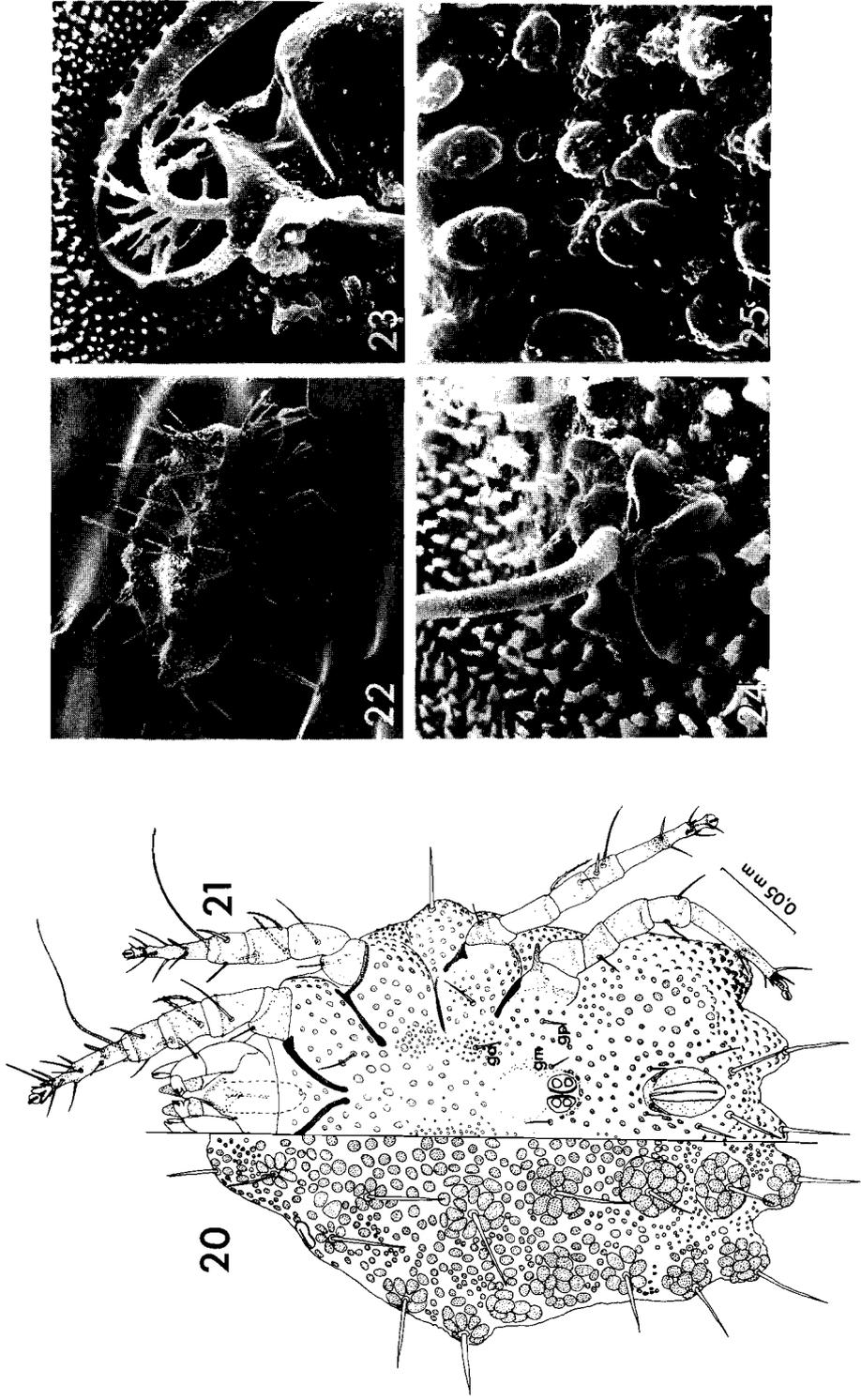
PROTONYMPH (Figs. 18, 19)—Generally like larva in shape, color, and form of cuticle. Length of figured specimen 223, 10 paratypes 219 (200-247); width 145, paratypes 133 (122-145). In addition to the chaetotaxy of the larva *d* 4, *d* 5, *l* 4, two pairs of anal, and one pair of genital setae present. Venter with epimera I fused into a V-shape, genital region with one pair of round suckers beneath small valves at the level of coxae IV. Dorsum without prodorsal shield, with distinct supracoxal fossa and simple supracoxal seta. Chaetotaxy of the legs: tarsi 10-10-8-5, tibiae 2-2-1-0, genua 2-2-1-0, femora 1-1-0-0, trochanters 0-0-0-0, coxae 1-0-1-0. Solenidiotaxy: tarsi 2-1-0-0, tibiae 1-1-1-0, genua 1-1-1-0. Famulus present.

TRITONYMPH—(Figs. 20, 21) much like protonymph. In addition to the idiosomal setae of the protonymph the 4th pair of anal setae, *ga*, and *gm* present. Chaetotaxy of the legs: tarsi 10-10-8-8, tibiae 2-2-1-1, genua 2-2-1-0, femora 1-1-0-1, trochanters 1-1-1-0, coxae 1-0-1-0. Solenidiotaxy: tarsi 3-1-0-0, tibiae 1-1-1-1, genua 1-1-1-0. Unlike the protonymph, epimera I free. Groups of large tubercles around setal insertions present near *ve*, *sci*, and laterals 4 and 5.

DIAGNOSIS—*Galemys pyrenaicus* and *Desmana moschata* are the only recent representatives of the subfamily Desmaninae and one might expect their parasites to be closely related. Hypopi of *Desmanopus desmanae* (Zachvatkin, 1941) and *Orycteroxenus galemys* sp. nov. share the characteristics of short, broad, tibial setae. Pectination of the tibial and genual setae is less pronounced in *O. galemys* sp. nov. than in all other species of the genus. *Orycteroxenus*



Figs. 16-19: *Orycterovenus galemys* sp. nov. -16, dorsum (larva); 17, venter (larva); 18, dorsum (protonymph); 19, venter (protonymph).



Figs. 20-25: *Orycteroxenus galemys* sp. nov. -20, dorsum (tritonymph); 21, venter (tritonymph); 22-25, scanning electron microscope micrographs of the female-22, dorso-lateral view; 23, supracoxal fossa with supracoxal seta; 24, structure of cuticle around second dorsal seta; 25, structure of cuticle between first dorsal setae.

galemys sp. nov. is near *D. desmanae*, in which these setae lack pectination. However, the undivided palposoma with only one pair of setae and the closed coxal fields IV separate the hypopi from the Russian Desman into a separate genus. Zachvatkin's (1941) description of the female is brief and lacks the necessary details. We were unable to compare adults because Zachvatkin's types and paratypes were lost. Hypopi of *O. galemys* sp. nov. seem to be intermediate between *O. dispar* (Michael, 1886) and *O. soricis* (Oudemans, 1915). Major characteristics are compared in Table 2. *Orycteroxenus galemys* sp. nov. is more similar to *O. dispar* from *Talpa europaea* (type host; Talpidae) than to *O. soricis* from different hosts of the family Soricidae (Insectivora).

DISCUSSION—The first entire life cycle of an *Orycteroxenus* species reported herein gives some indication of the systematic position of the genus in the subfamily Labidophorinae. The morphology of the adults is similar to *O. dispar*, confirming the genus definition for the adults in sensu Fain (1969). Although hypopi of the genus *Orycteroxenus* are very similar morphologically, females show great differences. *Orycteroxenus* may be compared with hypopi and adults of *Lophioglyphus* species (Lukoschus et al., 1977). The prodorsal shield of the larvae (absent in other stages) can be regarded as ontogenetic atavism. In this genus, the fusion of the epimera and epimerites, the number of anal setae, and the position of the vertical and scapular setae, seem to have less systematic value since they change during development.

HOST AND LOCALITY—The type series was collected from the Pyrenean Desman, *Galemys pyrenaicus*, E. Geoffroy Saint-Hilaire, Villaslada, Spain, 8 July 1971. Hypopi were attached to the base of hairs, mainly around the base of the tail, and other stages were in the artificial nest of the host.

DEPOSITION OF TYPES—Holotype and figured specimens at the United States National Museum of Natural History, Washington, D. C. Paratypes in the Rijksmuseum van Natuurlijke Historie, Leiden; Museum National d'Histoire Naturelle, Paris; British Museum of Natural History, London; Zoologisches Institut und Zoologisches Museum, Hamburg; Institute of Parasitology, Academy of Sciences, Prague; Bernice P. Bishop Museum, Honolulu; Field Museum of Natural History, Chicago; Acarology Laboratory, Columbus, Ohio; Museum Alexander König, Bonn; Institut de Médecine Tropicale Prince Léopold, Antwerpen; and Zoologisch Laboratorium, Katholieke Universiteit, Nijmegen. USNM catalogue number for holotype 3847.

TABLE 1. Measurements of *Orycteroxenus galemys* sp. nov.

	larva	protonymph	hypopus	tritonymph	female	male	egg
length	171-193	200-247	177-218	243-308	370-518	217-241	131-136
width	99-116	122-151	145-165	145-182	217-400	162-177	61-64
<i>vi, ve</i>	9.6	15.11	7.6	27.26	47.67	18.7	
<i>sc i, sc e</i>	14.15	33.21	5.5	40.38	106.87	38.51	
<i>h, sh</i>	12.10	18.18	6.5	28.37	81.84	27.17	
dorsals: 1, 2,	15.13,	21.21,	6.6	41.39	91.113,	39.39,	
3, 4, 5	12.-,-	18.17, 20	5, 5, 4	25, 25, 28	24, 24, 26	31, 27, 27	
laterals: 1, 2	12.12,	21.18,	6, 5,	38, 28,	81, 78,	37, 26,	
3, 4, 5	13.-, 14	19, 18, 12	5, 6, 8	30, 30, 34	84, 87, 90	21, 24, 25	
tarsi: I, II	18.17,	33.24	23.18,	45, 40,	65, 60,	30, 24	
III, IV	27. -	30, 37	21, 22	44, 57	78, 106	37, 41	
claws: I-IV	4, 3, 3, -	5, 5, 5, 4	11, 11, 6, 5	6, 5, 5, 4	6, 6, 6, 6	5, 5, 5, 5	
omega: 1, 2, 3	7, -, -	7, 3, -	11, 5, -	8, 4, 18	13, 9, 20	9, 6, 18	
phi: I, II	60, 40,	73, 45	21, 23,	75, 51,	145, 104	107, 70	
III, IV	32, -	33, -	11, 2	48, 15	52, 33	33, 20	
sigma: I, II, III	3, 4, 3	4, 6, 7	2, 2, -	5, 6, 8	8, 11, 32	5, 7, 18	

TABLE 2. Comparison of hypopi of European *Orycteroxenus* species.

	<i>dispar</i>	<i>galemys</i>	<i>soricis</i>
length	159-190	177-208	192-220
width	124-140	145-165	150-170
epimera I	free	long-Y-shape	V-short Y-shape
arrangement of scapular setae
number setae on tarsus I and II	6	8	8
internal palposomal setae	15-18	12-14	7-8
external palposomal setae	20-25	18-22	13-18
number of ridges of external clasper	8-9	10-11	15-18
phi II	12-15	20-25	12-14
phi III	9-11	10-11	18-20
tibial setae IV	14-18	10-11	21-24
hooks on trochanters III and IV	absent	absent	present

ACKNOWLEDGMENTS

We wish to thank Mr. A. W. Dicke (Dept. Botany, Catholic Univ. Nijmegen) for the SEM micrographs and Dr. E. J. Spicka (Dept. Biology, State Univ. New York, Geneseo) for correction of the English text.

LITERATURE CITED

- Fain, A. (1969 a). Morphologie et cycle evolutif des Glycyphagidae commensaux de la Taupe *Talpa europaea* (Sarcoptiformes). *Acarologia*, 11: 750-795.
- _____. (1969b). Les deutonymphes hypopiales vivant en association phoretique sur les mammifères (Acarina: Sarcoptiformes). *Bull. Inst. r. Sci. nat. Belg.*, 45 (33): 1-262.
- _____, and F. Lukoschus. (1974). Observations sur le développement postembryonnaire des acariciens de la famille Glycyphagidae à hypopes pilicoles ou endofolliculaires (Acarina: Astigmata). *Bull. Acad. r. Belg. Soc.*, Ser. 5, 60: 1137-1159.
- Lukoschus, F. S., P. H. Gerrits, and A. Fain. (1976). Description of *Desmanopus desmanae* n. comb. (*Labidophorus desmanae*, Zachvatkin, 1941) (Sarcoptiformes: Glycyphagidae), designation of a neotype for this species. *Intl. J. Acar.*, 2: 17-22.
- _____, A. Kroos, and K. Uchikawa. (1977). *Lophioglyphus japonensis* sp. nov. (Acarina: Glycyphagidae) from *Apodemus speciosus* (Rodentia, Muridae). *Bull. Natn. Sci. Mus.*, Ser. A. (Zool.), 3 (2): 9-17.
- _____, P. H. Gerrits, and A. Fain. (1977). Three new species of genus *Orycteroxenus* Zachvatkin, 1941 (Acarina: Sarcoptiformes: Glycyphagidae). *Senckenbergiana biol.*, 58: 83-91.
- Zachvatkin, A. A. (1941). Fauna of U.S.S.R. Arachnoidea. Vol. VI, no. 1. Tyroglyphoidea (Acari). *Zool. Inst. Acad. Sci. U.S.S.R. new Ser.* 28 (English translation, 1959), pp. 1-573.