OCCURRENCES OF *ERYTHRACARUS NASUTUS* OTTO, 1999 (ANYSTOIDEA: ANYSTIDAE) IN UNDERGROUND ENVIRONMENTS IN BRAZIL

OCORRÊNCIA DE ERYTHRACARUS NASUTUS OTTO, 1999 (ANYSTOIDEA: ANYSTIDAE) EM AMBIENTES SUBTERRÂNEOS NO BRASIL

Leopoldo Ferreira de Oliveira Bernardi[I], Jeferson Luiz de Carvalho Mineiro[II], Marconi Souza-Silva[III] & Rodrigo Lopes Ferreira[IV]

(I) Pós-Graduação - Ecologia Aplicada, bolsista CAPES, UFLA, Lavras-MG.
(II) Centro Experimental do Instituto Biológico, Laboratório de Acarologia, Campinas-SP.
(III) Centro Universitário de Lavras (Unilavras), Núcleo de Estudo em Saúde e Biológicas, Lavras-MG.
(IV) Laboratório de Ecologia Subterrânea, Setor de Zoologia/Departamento de Biologia, UFLA, Lavras-MG.
Contatos: leopoldobernardi@yahoo.com.br; drops@dbi.ufla.br.

Abstract
This work presents the first occurrences of acarids of the species *Erythracarus nasutus* (Trombidiforme: Anystidae) collected in different caves in Brazil. Furthermore, some morphologic aspects are presented regarding the sexual dimorphism of the species. Differently from the females, the male naso is obtuse, not presenting an enlngated projection. The male of the species presents an obtuse naso, while the females have the elongated naso. The specimens were found in 91 caves in the states of Alagoas, Bahia, Espírito Santo, Minas Gerais, Pará and Rio Grande do Norte, besides 18 artificial underground caves in the state of Minas Gerais. The specimens were collected walking freely on the soil, in organic plant remains, such as, guano, organic plant matter, among others. The Brazilian underground caves are little explored locals that serve as refuge for a large number of invertebrate species, among them the acarids. In spite of the growing knowledge of the fauna present in these Brazilian caves, many taxonomic groups, mainly the small invertebrates, urgently need more professionals who are qualified to identify their species.

Keywords: Acari; Brazil; Cave; Artificial Cavities.

Resumo
Neste trabalho são apresentadas as primeiras ocorrências de ácaros da espécie Erythracarus nasutus (Trombidiforme: Anystidae) coletados em diferentes cavidades no Brasil. Além disso, são apresentadas algumas aspectos morfológicos referentes ao dimorfismo sexual da espécie. Diferentemente das fêmeas, o naso do macho é obtuso, não aprensentando uma projeção prolongada. O macho da espécie apresenta o naso obtuso, enquanto as fêmeas tem o naso alongado. Os exemplares foram encontrados em 91 cavernas nos estados de Alagoas, Bahia, Espírito Santo, Minas Gerais, Pará e Rio Grande do Norte, além de 18 cavidades subterrâneas artificiais no estado de Minas Gerais. Os espécimes foram coletados andando livremente no solo, em restos orgânicos vegetais, tais como, guano, matéria orgânica vegetal, dentre outros. As cavidades subterrâneas brasileiras são locais pouco explorados e que servem de refúgio para um grande número de espécies de invertebrados, dentre eles estão os ácaros. Apesar de ser crescente o conhecimento da fauna presente nestas cavernas brasileiras, muitos grupos taxonômicos, principalmente os pequenos invertebrados, necessitam urgentemente que mais profissionais sejam capacitados para identificar suas espécies.

Palavras-Chave: *Acari; Brasil; Caverna; Cavidades Artificiais.*

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1. INTRODUCTION

Caves possess peculiar characteristics, such as absence of light, shortage of food, high humidity and a relatively constant temperature, which can restrict the colonization by many vertebrate as well as invertebrate species. Moreover, the organisms that live in the underground environment can present morphological, physiological and behavioral specializations, usually linked to the physical characteristics of this environment and also to the frequent food shortage present (CULVER, 1982).

A great part of the fauna found in the Brazilian caves is made up of small troglophylic invertebrates, such as spiders, springtails, and dipterans, among others (PINTO-DA-ROCHA, 1995; FERREIRA, 2004; SOUZA-SILVA, 2008). Among them, a group that deserves prominence for presenting a large number of species and a great diversity of habits and habitats are the organisms belonging to the Subclass Acari (DUSBÁBEK, 2001; PALÁCIOS-VARGAS et al., 2001; SCHWARZ, 2001; PINTO-DA-ROCHA, 1995; BERNARDI et al., 2009). These organisms are distributed in caves throughout the world, establishing large populations, mainly associated to organic matter deposits, such as bat guano (HERRERA, 1995; FERREIRA & MARTINS, 1999; FERREIRA et al., 2007).

Currently, among mites records in Brazilian caves, 67 families are listed distributed in 17 of the 26 states of the country. Of these, 26 families belong to the order Mesostigmata, 21 belong to Trombidiforme, 18 belong to Sarcoptiforme, two belong to Ixodida and one belongs to the order Opilioacarida (LABRUNA et al., 2008; BERNARDI et al., 2009).

Among the families registered for the Brazilian caves species of the surperfamily Anystoidea were found (BERNARDI et al., 2009). This group includes the Anystidae, Teneriffiidae and Pseudocheyletidae families. Such organisms include mites that can be found in soil of the epigean environment, on plants, rocks, amid the leaf litter and in vertebrate nests, among other places, having a preference for drier locals. Anystidae are agile, considered generalist predators and important for the control of some agricultural pests (CUTHBERTSON et al., 2003). Teneriffiidae are also predators, found in intertidal areas, soil and on plants. Pseudocheyletidae, however, are little studied, and therefore very a little is known about their habits. Some species of that family have been found in soil litter, in vertebrate nests and in moss (KRANTZ & WALTER, 2009).

Recently, the Brazilian biospeleology has going through a period where the identification of standards, related to the distribution of the fauna as well as to the characterization of the resource dynamics of these systems, has become the focus of attention in the scientific community (FERREIRA, 2004; SILVA, 2008; SOUZA-SILVA, 2008). The study of Brazilian cave acarofauna has been neglected for many years and most of the works concerning the Brazilian cave fauna presented the identification of the mites only in high taxonomic levels (as orders or families), identification at the generic or specific level being rare (PINTO-DA-ROCHA, 1995; FERREIRA & MARTINS, 1999). Furthermore, even in the works where the specific identification of the mites was conducted, the data on ecological aspects and distribution in the cave environment is scarce (PINTO-DA-ROCHA, 1995).

The first work to present a review of the data specifically regarding the Brazilian underground acarofauna was published by Bernardi et al. (2009). From this perspective, the question arises: “why dedicate a study regarding the morphology and distribution of such a single tiny species?.” To really understand how the cave communities work, how they are structured, among other themes, detailed knowledge of each species is necessary, besides their morphological aspects, which can generate data to facilitate the understanding of the community as a whole.

Given the shortage of information regarding the mites in Brazilian caves, the present study had as an objective to relate the first occurrences of the genus *Erythracarus* Berlese 1903 (Anystoidea: Anystidae) besides demonstrating their distribution in other hypogean environments, as well as to present some aspects of the *Erythracarus nasutus* ecology and morphology.

2. MATERIALS AND METHODS

The specimen examined in this work came from collections conducted during the last 12 years by the team of the Underground Ecology Laboratory of the Federal University of Lavras (Biology Department/Zoology Sector), in addition, some specimens collected by other groups were included. All of the specimens are deposited in the Zoology Collection, (Underground Invertebrates) of Lavras, (ISLA) located in the Zoology Sector/Biology Department of the Federal University of Lavras.

A total of 760 caves were inventoried in the states of Alagoas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Minas Gerais, Pará, Paraná, Pernambuco, Rio Grande do Norte, Rio Grande do Sul, Rio de Janeiro, Santa Catarina, São Paulo, Sergipe and Tocantins, besides 110 artificial cavities (underground mines) in the state of Minas Gerais.

Seeking to obtain data about the ecology of these mites, the position of each specimen, when collected, was noted on a schematic outline of each cave. In this way, the number of individuals and the substrata to the which it was associated and the distribution of each population in each cave was obtained.

All of the specimens were collected with the aid of a brush, after an extensive search of the whole cave, and stored in 70% alcohol. Later, the mites of the family Anystidae were separated. Mites were cleared in Nesbitt's solution, when necessary, and mounted on slides for microscopy using Hoyer's medium (KRANTZ & WALTER, 2009). The whole procedure for the specimens identification was done using a Leica MDLS phase contrast microscope, with the aid of the identification keys and the morphological descriptions present in Otto (1999a) and Krantz & Walter (2009). The setal nomenclature of Otto (1999a) is followed.

3. RESULT AND DISCUSSION

3.1. Taxonomic accounts

According to Otto (1999a) the species belonging to *Erythracarus* Berlese, 1903, have as diagnostic characteristics: i) the presence of the seta *ve* inserted in the lateral extremity of the proximal shield on opposite side of the seta *sce*; ii) the presence of a prolonged and quite evident projection on the tibia of the palpus; iii) the presence of setae on the ventral part of the hypostome and iv) the tritonymphs and the adults always present more than 5 setae on the palpus of the tibia. *Erythracarus nasutus* has the presence of 5 setae on the telofemur I in the adult as a taxonomic trait for species diagnosis, besides a tipically characteristic naso present in the females. Such a structure, located on the dorsal portion close to the gnatosome, has a wide, rounded base, with a long extremity (OTTO, 1999a) (Figure 1b).

The males of *E. nasutus* has not been described yet. Differently from the females, the male's naso is obtuse, not presenting a prolonged projection, the base being wider and more spaced between the pairs of setae (Figure 1a). In the caves and artificial cavities surveyed the males were found sharing the same living space with females and juveniles.

Besides the above-mentioned characteristics, some morphological traits can be observed that are not used for species diagnosis, their being common to other species of the gender *Erythracarus*, but little represented in the description made by Otto (1999a). Among these stand out the sickle-shaped chelicerae, the barbed genital setae, the barbed setae in the distal part of chelicerae, four pars of setae in hypostome,and the radula with small teeths are noteworthy (Figures 2 and 3).

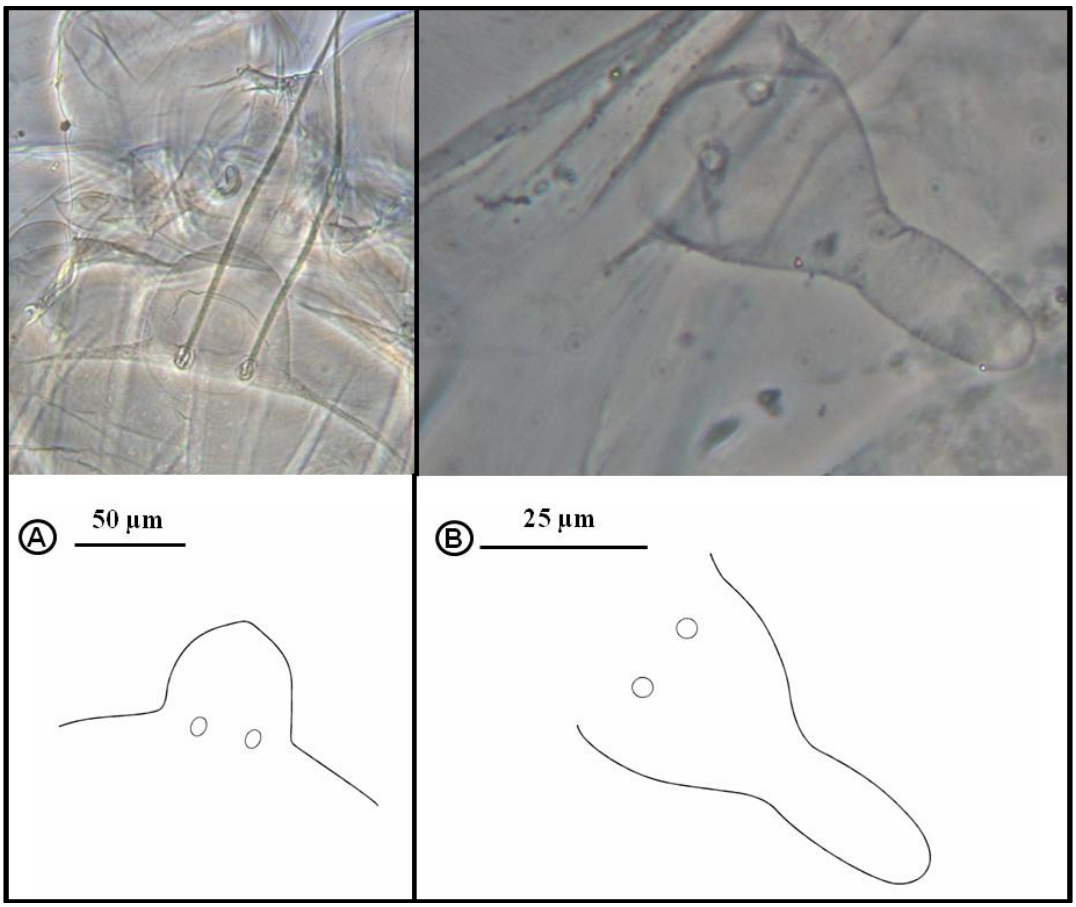

Figure 1: *Erythracarus nasutus*: A) typical naso present in the males; B) typical naso present in the females.

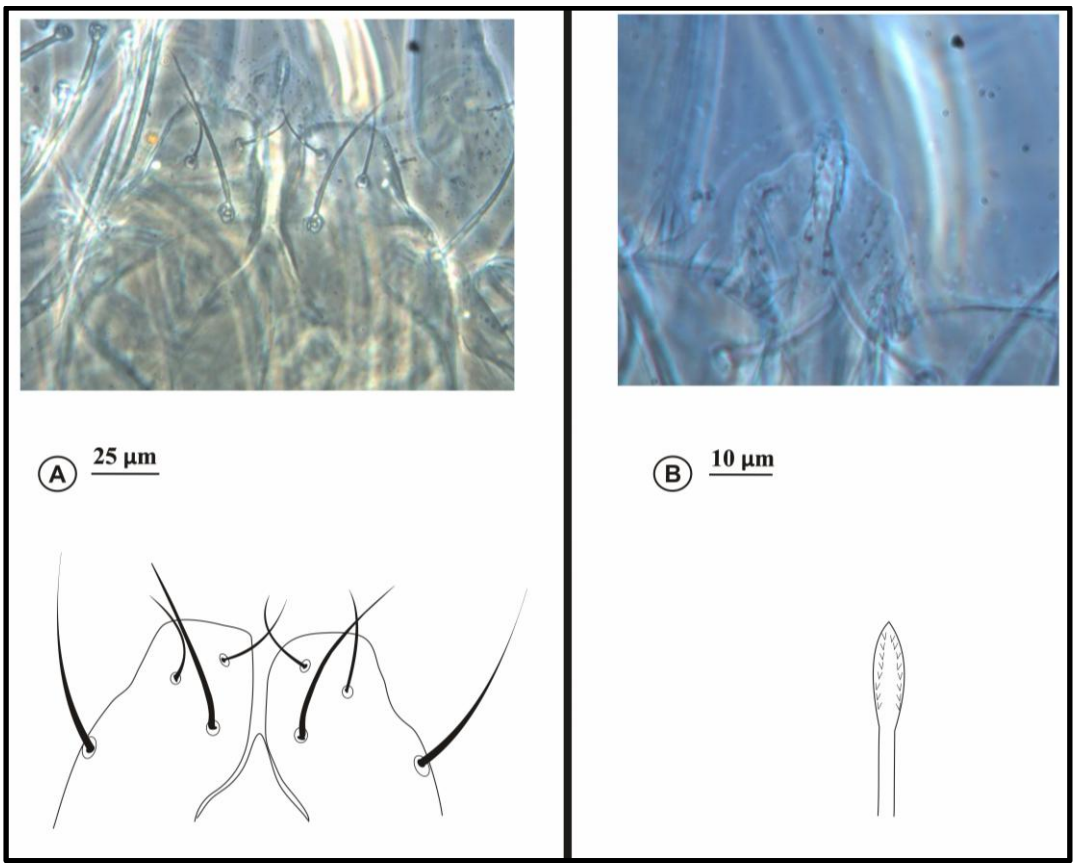

Figure 2: *Erythracarus nasutus*: A) Details of the hypostome; B) Details of the radula.

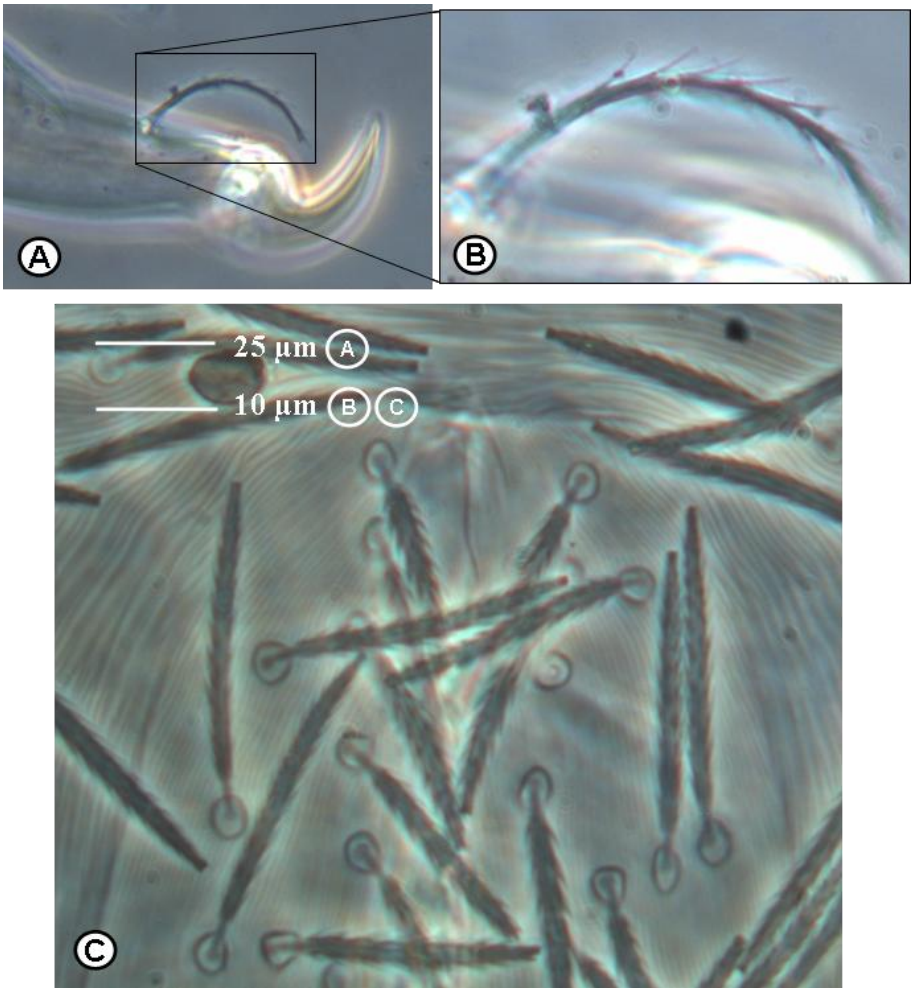

Figure 3: *Erythracarus nasutus*: A) sickle-shaped chelicerae; B) detail of the seta located near the chelicerae and C) detail of the setae in the anterior region of the genitalia.

3.2. Geographic distribution

All of the Anystidae specimens are found in 91 caves in the states of Alagoas, Bahia, Espírito Santo, Minas Gerais, Pará, Rio Grande do Norte and São Paulo, besides 18 artificial cavities in the state of Minas Gerais, belong to the subfamily Erythracarinae and the species Erythracarus nasutus Otto, 1999 (Attachment 1 and 2, Figures 5 and 6).

The occurrences of this species are concentrated mainly in the southeast region. However, such a fact is certainly due to the higher amount of caves inventoried in this area in relation to other areas of the country. The low number of records from other places, such as the North of Brazil, certainly reflects the reduced number of inventories conducted in the caves of that area.

The wide distribution of this species can be linked to the habit of the mites of the genus *Erythracarus* in the epigean environment. This group is widely found in litter (OTTO, 1999a), having a preference for shaded places, such as those found in caves. Furthermore, when the organic matter is transported by wind or water to the interior of the caves, it can also carry organisms present in the organic matter itself. The specimens conducted to the interior of the hypogean environment can colonize and establish populations in these systems.

3.3. Ecological aspects

Otto (1999a) used mainly specimens from collections in the epigean environment collected in litter. Among these samples, only collections conducted in caves were mentioned. However, in these, the specimens were always in litter close to the entrances. The present work, however, demonstrates clearly that *E. nasutus* is a gender observed with considerable frequency in the Brazilian hypogean environment, even in areas far from the entrance.

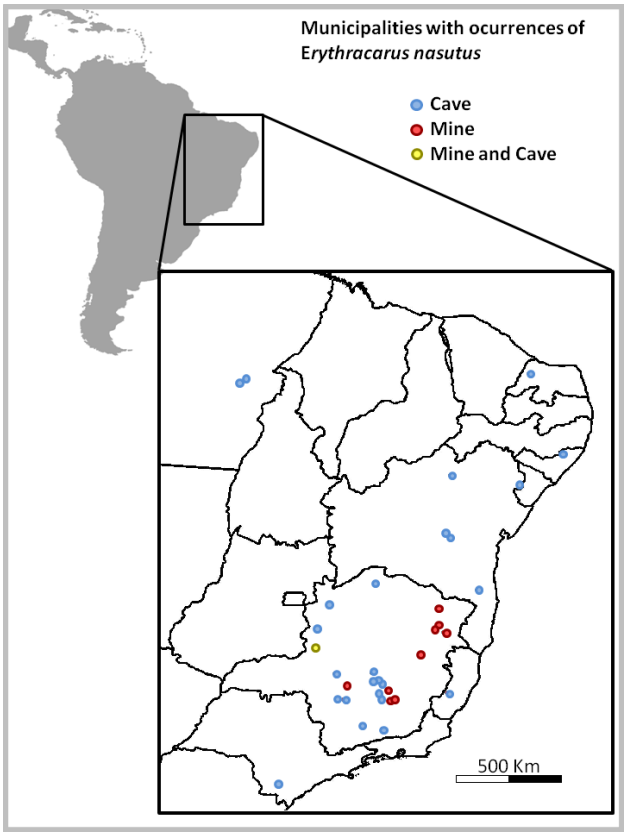

Figure 4: Indication of the municipalities and the occurrence of *Erythracarus nasutus* in underground cavities in Brazil

The specimens of *E. nasutus* were observed in different substrata present in the underground environment. Among these, were guano, litter, the interior and the surface of deteriorated wood fragments, spaces under rocks, rocky substrata, on bare soil, or on speleothems, when they were not soaked. As mentioned above, these organisms were observed near the entrance, as well as within the cave, in permanently aphotic places. As an example of the diversity of habitats occupied by *E. nasutus*, the Lapa Nova grotto can be mentioned, located in Vazante, in the northwest of the state of Minas Gerais. In this cave two collections were conducted in the period of one year, the first being on April, 07, 2009 (time of little rain), and the second on September, 17, 2009 (time of little rain). In the first collection 18 individuals were found, of which four were in an area with light incidence (close to the entrance), three freely transited on a rocky, dry substrate with little litter, very close to individuals of the family Teneriffiidae. Another individual was found between the rifts and fissures on a very dry earth floor. The remaining specimens were observed inside the cave, in aphotic areas, walking on the floor and among humid organic plant matter. On the second visit to Lapa Nova specimens were observed at the same places, two being individuals in photic areas close to the entrance and nine in more interior areas, which were completely aphotic.

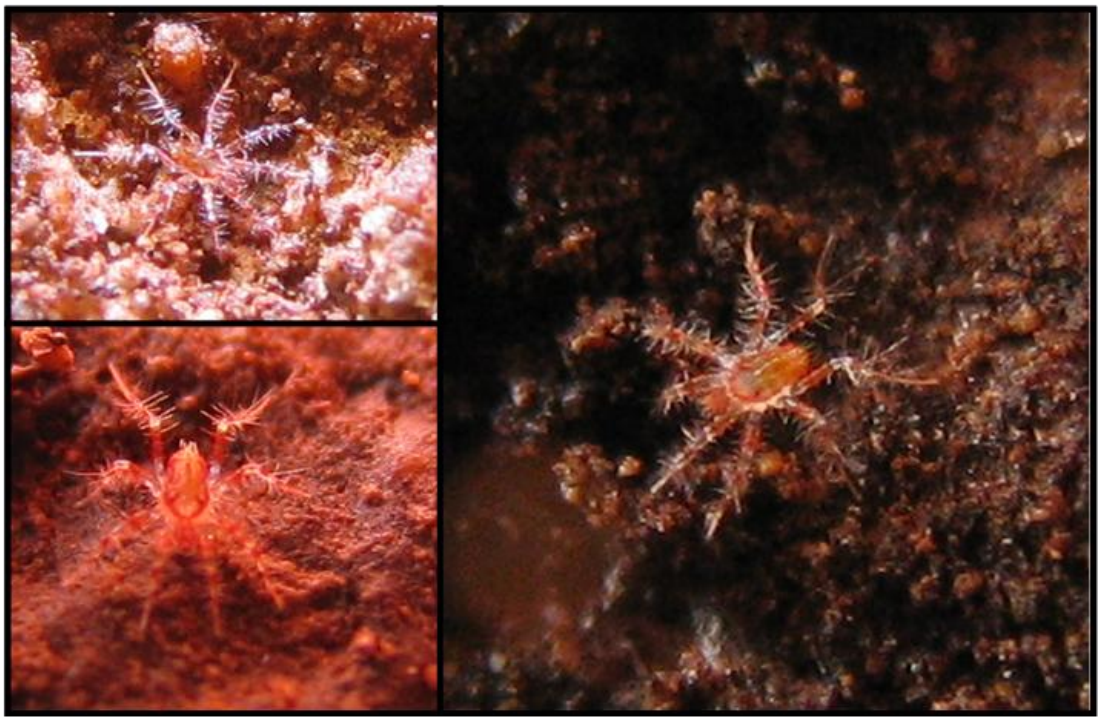

Figure 5: General aspects of *Erythracarus nasutus* in the soil of “Lapa Nova” cave, Vazante, Minas Gerais State.

In the "Furna do Fim do Morro do Parafuso" cave (Paripiranga, Bahia), individuals of *E. nasutus* were found associated to the guano of hematophagous bats, among the fissures present in a very dry portion of that substrate. Similar behavior was found at the "Gruta Morena" cave (Cordisburgo, Minas Gerais State). In this local, eight individuals were observed, among nymphs and adults, circulating on the surface portion and among fissures of a soil covered by hematophagous bat guano. In the same place a large number Collembola were also observed, that are probably potential prey of these mites.

The *E. nasutus* specimens, found inside artificial underground systems, were also observed walking on the floor and among organic plant matter, having been observed in areas close to the entrance, as well as in aphotic areas.

The Anystidae are agile predators, and some species, such as *Anystis baccarum* Lineaus, 1758, are important organisms in the control of pests in agrosystems (CUTHBERTSON et al., 2003). Based on the morphology and given the predatory nature of the species of the family, the role of *E. nasutus* in the cave communities should be studied. But unfortunately, the importance of the acarids in cave communities has been largely ignored. This occurs even with the knowledge that many species of this group, including Anystidae, are important predators of various invertebrates, and can be responsible for the structuring of communities, causing the decline of prey populations (WALTER & OLIVER, 1989; CUTHBERTSON et al., 2003; KRANTZ & WALTER, 2009).

All of the collected individuals present quite typical behavior. They are very agile and, when routed, with a touch or a light blow, they present an escape behavior with very fast movements, traveling the substrate in a random way, continually changing direction and stopping abruptly. They were immobile until the moment at which they were newly stimulated. Such behavior, called protean behavior, seemingly hinders their capture by eventual predators. The high speed with which the specimens moved hindered the collection. The specimens of the subfamily Erythracarinae are extremely fast, usually presenting all tarsi as very prolonged and flexible, besides being subdivided in false segments, which contributes to their high mobility (OTTO, 1999b) (Figure 6).

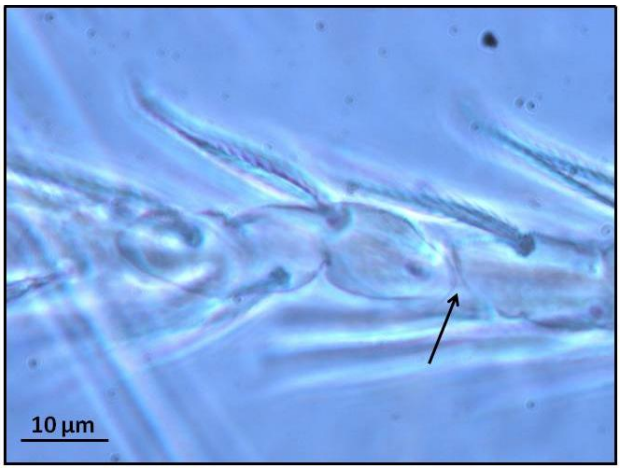

Figure 6: The arrow points to one of the pseudosegmentation present in the tarsus IV of *Erythracarus nasutus.*

4. FINAL REMARKS

The occurrence of Anystidae in Brazilian caves, until now, has been unknown. However, the diversity of substrates possibly colonizable by *E. nasutus,* besides its geographical distribution, as well as the number of species present in caves and artificial galleries should be higher than related in our work. Such situation certainly is a reflection of the low number of caves and artificial cavities studied in Brazil.

The expansion of knowledge on the groups present in underground ecosystems is decisive for the advancement of knowledge on the operation of those systems. The lack of taxonomists and inefficient collection are already being pointed to as one of the main problems for Brazilian biospeleology (FERREIRA, 2005; SOUZA-SILVA, 2008; BERNARDI et al., 2009; FERREIRA et al., 2009). Investments by government agencies in the training of professionals, can be one of the solutions for the problems generated by the lack of such professionals, but the adequate training is the responsibility of the research centers already established in the country.

Acknowledegments

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Attachment 1: Occurrence of the species *Erythracarus nasutus* Otto, 1999 (Anystoidea: Anystidae) in Brazilian caves (AL – Alagoas, BA – Bahia, ES – Espírito Santo, MG - Minas Gerais PA – Pará, RN – Rio Grande do Norte e SP – São Paulo). At: Atlântic Forest; Am: Amazon Forest; Ca: Caatinga; Ce: Cerrado.

State	Localidade	Cave	Easting	Northing	Zona	Lithology	Bioma
PA	Parauapebas	Gruta N4E-34	595999	9325006	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-63	593586	9333102	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-72	593664	9333140	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-73	593639	9333142	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-75	593977	9333300	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-78	593936	9333102	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-77	593981	9333120	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-95	593084	933231	22M	Iron Ore	Am
PA	Parauapebas	Gruta N4E-85	593281	9332956	22M	Iron Ore	Am
PA	Parauapebas	Gruta 22-S11	573571	9291252	22M	Iron Ore	Am
PA	Parauapebas	Gruta 01-S11	573571	9291252	22M	Iron Ore	Am
PA	Parauapebas	Gruta 05-S11	571889	9292438	22M	Iron Ore	Am
PA	Parauapebas	Gruta 22-S11	573571	9291252	22M	Iron Ore	Am
PA	Parauapebas	Gruta 31-S11	570610	9291455	22M	Iron Ore	Am
PA	Parauapebas	Gruta 94-S11	575044	9293118	22M	Iron Ore	Am
PA	Parauapebas	Gruta 38-S11	569601	9291110	22M	Iron Ore	Am
PA	Parauapebas	Gruta 22-S11	569745	9291837	22M	Iron Ore	Am
PA	Parauapebas	Gruta 46-S11D	575605	9290890	22M	Iron Ore	Am
PA	Carajás	Gruta N4E-81	593452	9333075	22M	Iron Ore	Am
PA	Carajás	Gruta N4E-93	593117	9332356	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-41	596149	9324982	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-41	595855	9325082	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-48	595901	9324912	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-57	595986	9324725	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-59	---	---	---	Iron Ore	Am
PA	Carajás	Gruta N5S-36	596149	9324982	22M	Iron Ore	Am
PA	Carajás	Gruta N5S-71	593683	9333148	22M	Iron Ore	Am
AL	Murici	Toca da Raposa I	179908	8978784	25L	Granite	At
BA	Campo Formoso	Toca do Morrinho	289887	8870864	24L	Dolomite	Ca
BA	Itaetê	Lapa do Bode	275894	8569218	24L	Limestone	Ca
BA	Nova Redenção	Poço Azul do Milú	266719	8586036	24L	Limestone	Ca
BA	Paripiranga	Furna do Morro do Parafuso	623890	8823540	24L	Limestone	Ca
BA	Pau Brasil	Gruta Milagrosa	420012	8296903	24L	Limestone	At
BA	Pau Brasil	Toca dos Morcegos	420638	8295919	24L	Limestone	At
BA	Santa Luzia	Lapa da Pedra do Sino	466472	8293253	24L	Limestone	At
ES	Afonso Cláudio	Gruta do Didi Vieira	284301	7780270	24K	Granite	At

MG	Arcos	Gruta Ponto 42	434335	7757367	23K	Limestone	Ce
MG	Arcos	Gruta da Bocaininha IV	436456	7755256	23K	Limestone	Ce
MG	Arcos	Gruta da Bocaininha VI	436426	7755318	23K	Limestone	Ce
MG	Arcos	Gruta Cazanga	437695	7756891	23K	Limestone	Ce
MG	Arcos	Gruta do Índio	---	----	--	Limestone	Ce
MG	Arcos	Gruta do Zé Colméia	437762	7757246	23K	Limestone	Ce
MG	Arinos	Lapa da Suindara	354162	8240098	23L	Limestone	Ce
MG	Coromandel	Caverna do João do Pó	---	---	---	Limestone	Ce
MG	Cordisburgo	Gruta da Morena	569484	7880316	23K	Limestone	Ce
MG	Curvelo	Lapa do Mosquito	561971	7940440	23K	Limestone	Ce
MG	Doresópolis	Gruta P11	414518	7754252	23K	Limestone	Ce
MG	Doresópolis	Gruta P42	410692	7756166	23K	Limestone	Ce
MG	Itabirito	Gruta da Mina do Pico XII	616173	7758696	23K	Iron Ore	Ce/At
MG	Itacarambi/Januária	Gruta do Janelão	581540	8329060	23	Limestone	Ce/At
MG	Itacarambi/Januária	Gruta do Brejal	581540	8329060	23	Limestone	Ce/At
MG	Lima Duarte	Gruta das Casas	614323	7598762	23K	Quartzite	At
MG	Luminárias	Gruta do Lobo	519845	7617685	23K	Quartzite	At
MG	Matozinhos	Gruta das Maritacas	---	---	---	Limestone	Ce
MG	Matutina	Lapa do Campo de Futebol	398585	7874853	23K	Sandstone	Ce
MG	Nova Lima	Capão Xavier I	606715	7782652	23K	Iron Ore	Ce/At
MG	Nova Lima	Gruta do Rola Moça III	603930	7783362	23K	Iron Ore	Ce/At
MG	Pains	Gruta da Divisa	430684	7745028	23K	Limestone	Ce
MG	Pains	Gruta do Capão	442094	7746071	23K	Limestone	Ce
MG	Pains	Loca D'água (Sumidouro)	427723	7741487	23K	Limestone	Ce
MG	Pains	Loca D'água (Ressurgencia)	427810	7741447	23K	Limestone	Ce
MG	Pains	Gruta Olhos D'água	428478	7753842	23K	Limestone	Ce
MG	Pains	Gruta do Zé Serafim	431977	7742570	23K	Limestone	Ce
MG	Pains	Gruta Paca	431269	7735945	23K	Limestone	Ce
MG	Pains	Gruta dos Negros (seca)	431189	7740191	23K	Limestone	Ce
MG	Pains	Gruta Ninfetas de Baixo	435779	7750970	23K	Limestone	Ce
MG	Pains	Gruta Massambará	415287	7751358	23K	Limestone	Ce
MG	Pains	Gruta Paranoá	430136	7747934	23K	Limestone	Ce
MG	Pains	Gruta do Éden	430435	7745181	23K	Limestone	Ce
MG	Pains	Gruta da Divisa	430684	7745028	23K	Limestone	Ce
MG	Pains	Gruta do Cavalinho	416815	7754877	23K	Limestone	Ce
MG	Pains	Gruta do Dimas	430963	7736724	23K	Limestone	Ce
MG	Pains	Gruta da Água Limpa	---	---	---	Limestone	Ce
MG	Pains	Gruta do Coqueiro I	430687	7744921	23K	Limestone	Ce
MG	Pains	Gruta Ninfeta de Cima	435796	7750980	23K	Limestone	Ce
MG	Pains	Buraco do Nando	437559	7746446	23K	Limestone	Ce
MG	Pains	Gruta do Trenzinho	437100	7740000	23K	Limestone	Ce
MG	Pains	Buraco do Nando	437559	7746446	23K	Limestone	Ce
MG	Pains	Gruta do Trenzinho	437100	7740000	23K	Limestone	Ce
MG	Paracatu	Lapinha de Santo Antônio	306536	8105656	23K	Limestone	Ce
MG	Paracatu	Lapinha Cava	297248	8132338	23K	Limestone	Ce
MG	Prudente de Morais	Gruta 4	---	---	---	Limestone	Ce
MG	Sete Lagoas	Gruta da Taboa	569922	7846264	23K	Limestone	Ce
MG	Sete Lagoas	Gruta do Morrote I	---	---	---	Limestone	Ce
MG	Unaí	Lapa do Sapezal	297937	8141547	23K	Limestone	Ce
MG	Vazante	Urtiga	307291	8016087	23K	Dolomite	Ce
MG	Vazante	Lapa Nova	299855	8008865	23K	Dolomite	Ce
MG	Vazante	Lapa do Guardião Severino	300039	8010088	23K	Dolomite	Ce
RN	Felipe Guerra	Gruta da Carrapateira	648022	9385241	24L	Limestone	Ca
SP	Iporanga	Gruta Minotauro	758243	7312845	22J	Limestone	At
SP	Iporanga	Gruta Morro Preto	733192	7286040	22J	Limestone	At

Attachment 2: Occurrence of the species *Erythracarus nasutus* Otto, 1999 (Anystoidea: Anystidae) in Brazilian artificial cavities (MG - Minas Gerais). At: Atlântic Forest; Ce: Cerrado.

State	Localidade	Artificial Cavities	Easting	Northing	Zona	Bioma
MG	Ataléia	Poldo Boq.	265312	8084015	24K	At
MG	Caraí	Valdivino	234098	8105187	24K	At
MG	Caraí	Dona Ana II	234299	8105562	24K	At
MG	Caeté	Morro Vermelho II	634734	7791892	23K	At
MG	Caeté	Morro Vermelho III	634637	7791898	23K	At
MG	Caeté	Matarelli	637369	7791856	23K	At
MG	Mariana	Casa	662883	7748789	23K	At
MG	Mariana	Cavalo (Canela II)	662516	7748549	23K	At
MG	Mateus Leme	Beija Flor	448037	7812775	23K	At
MG	Medina	Serra Azul I	234974	8206406	24K	At
MG	Ouro Preto	Volta do Povo Porco	655472	7745893	23K	At
MG	Padre Paraíso	Wanderley I	241368	8113845	24K	At
MG	Padre Paraíso	Wanderley II	241344	8113882	24K	At
MG	Padre Paraíso	Domingos Pastel I	239799	8114356	24K	At
MG	Padre Paraíso	Domingos Pastel VII	239796	8114494	24K	At
MG	São José da Safira	Chiá (Donizete) I	797343	7974979	23K	At
MG	São José da Safira	Chiá (Donizete) II	797374	7975411	23K	At
MG	Vazante	VMetais	305823	8016109	23K	Ce

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