

Vitzthumegistidae, fam. nov.: trigynaspid mites on terrestrial hermit crabs (Anactinotrichida: Mesostigmata: Trigynaspida)ⁱ

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ABSTRACT — A new family of cercomegistoid mesostigmatid mites, Vitzthumegistidae, including the species of *Vitzthumegistus paguroxenus* (André, 1937b) (= *Physalozzercon paguroxenus* André, 1937b); *V. latronis* (Vitzthum, 1937) (= *Cyclothorax latronis* Vitzthum, 1937); and *V. andrei* (a nomen novum for *Cyclothorax carcinicola* von Frauenfeld, 1868, sensu Vitzthum, 1928), has been proposed. This family differs from the Cercomegistidae by the following characters: a holodorsal shield, absence of presternal shield, weakly sclerotized or vestigial (neither paired nor fragmented) sternal shield in the female, a smooth anterior and lateral margin of gnathotectum, and heavily branched (polyramous) hypostomal setae 1 (*hs1*) in the adult. The Vitzthumegistidae fam. nov. become biologically a unique group within the Trigynaspida, in which the members exhibit associations with paguroid hermit crabs (Crustacea: Decapoda: Paguroidea) in the Indo-Pacific region. A key to species of the *Vitzthumegistus* is provided.

KEYWORDS — Acari; Parasitiformes; Antennophoriae; Cercomegistiae; Cercomegistoidea; nomen nudum; nomen novum; mite-host association; *Coenobita*

INTRODUCTION

The psychosemanticist will specialize in the havoc wrought by verbal artillery upon the fortress of reason. Their job will be to cope with the psychic trauma caused by linguistic meaninglessness, to prevent the language from degenerating into gibberish, and to save the sanity of persons threatened by the onset of polysyllabic monstrosities.

— James Thurber (*The New Yorker*, May 28, 1955 Issue, p.28)

In his article, Kim (2008: 34) took a taxonomic action, invalidating the family name Physalozzerconidae sensu Kethley (1977: 135) (Trigynaspida: Antennophoriae) out of the realm of the Mesostigmata. His action was based on the reasoning that the sole genus within the family, *Physalozzercon* sensu Berlese (1903), has no nominal species as the known type species, "*P. raffrayi* (Wasmann, 1902)", was

based on "*Antennophorus raffrayi*", a nomen nudum mentioned in Wasmann (1901, 1902). In the end-note #2, Kim (2008: 34) also noted that *Physalozzercon paguroxenus* André, 1937b, the only species added to the *Physalozzercon* since Berlese (1903), was transferred to the *Vitzthumegistus* sensu Kethley, 1977 (Trigynaspida: Cercomegistiae: Cercomegistidae) by Kethley (1977: 139). While the taxonomic action of Kim (2008) was a *bona fide* intention to give minimized changes and confusion to the taxonomic and classification system of the Mesostigmata by recognizing the *Vitzthumegistus* sensu Kethley (1977: 139), the normal course of action could be the recognition of André's (1937b) *P. paguroxenus* as the type species for the *Physalozzercon* by subsequent mono-

typy (ICZN, 1999: Art. 67.2.2; 69.3), and the recognition of this species at a family level. Such action, however, would certainly raise "taxonomic and nomenclatural" confusion regarding the concepts on the *Physalozерcon* since, in a clear and strict sense, the description of *Physalozерcon paguroxenus* André, 1937b was based on a misidentification, and the species cannot belong to the *Physalozерcon* sensu Berlese (1903). In fact, while the *Physalozерcon* of Berlese belongs to the infraorder Antennophoriae, the *Physalozерcon paguroxenus* André, 1937b must belong to the infraorder Cercomegistiidae. Accordingly, it is not difficult to note that recognizing the *Physalozерcon* sensu André (1937b) (non Berlese, 1903) for the *Vitzthumegistus* sensu Kethley (1977) and raising the genus to the cercomegistoid Physalozерconidae fam. nov. (non Physalozерconidae Kethley, 1977) within the Cercomegistiidae, which was previously used within the Antennophoriae with completely different family or infraordinal concept, can cause taxonomic, homonymic confusion. A further course of action to fix this problem would therefore be necessary.

When Kethley (1977) raised a new genus so-called *Vitzthumegistus* within the Cercomegistiidae (Trigynaspida: Cercomegistiidae) to accommodate three species [*i.e.*, *V. paguroxenus* (André, 1937b) (= *Physalozерcon paguroxenus* André, 1937b); *V. latronis* (Vitzthum, 1937) (= *Cyclothorax latronis* Vitzthum, 1937); and *V. andrei* sensu Kethley, 1977 (a nomen novum for *Cyclothorax carcinicola* von Frauentfeld, 1868 sensu Vitzthum, 1928), which were also under controversy for the first half of the last century by many early acarologists (*i.e.*, Vitzthum, 1928, 1937; Oudemans, 1932; André, 1937a, 1937b; Johnston, 1960)], Kethley (1977) did not give any description or bibliographic reference to a description for the *Vitzthumegistus*, and, very unfortunately to our discipline, the name *Vitzthumegistus* is not available to science as it is a nomen nudum in status (ICZN, 1999: Art. 13.1.1).

Although the name *Vitzthumegistus* sensu Kethley (1977) was not made available, and so the name is not entering to synonymy, it should be noted that Kethley's unrevealed intention to group the above three species into a single genus is meaningful in

terms of taxonomy as I see that these three species constitute a morphologically and biologically (in terms of the group's host association) unique clade separated from the other genera of Cercomegistiidae, allowing its status as a distinct family within the Cercomegistiidae. In addition, by following Johnston (1960), Kethley (1977) correctly recognized that two male specimens reported as the *Cyclothorax carcinicola* von Frauentfeld, 1868 by Vitzthum (1928: 194) are the cercomegistoid trigynaspids, and offered a new replacement name, *V. andrei*. Furthermore, the name *Vitzthumegistus* is also used in the acarology's most-widely used general textbook of Krantz & Walter (2009) as a distinct genus, different from other known cercomegistoids.

In this standpoint, I would re-recognize the grouping and names of aforementioned three species proposed by Kethley (1977), and would offer a description for the *Vitzthumegistus* (= gen. et nomen novum for *Physalozерcon* sensu André, 1937b), along with offering of the name *V. andrei*, a nomen novum for the so-called *Cyclothorax carcinicola* von Frauentfeld, 1868, by Vitzthum (1928), in order to make these names available, to save the names and taxonomy, and to avoid any further confusion. Since André (1937b) did not give the generic description for the *Physalozерcon*, I would consider the *Vitzthumegistus* a new genus (as with Kethley, 1977) and a new replacement name (nomen novum) for the *Physalozерcon* sensu André (1937b), and the *Vitzthumegistus* is the type genus for the Vitzthumegistidae fam. nov. (Trigynaspida: Cercomegistiidae: Cercomegistoidea) describing herein.

MATERIALS AND METHODS

Notations for idiosomal chaetotaxy follow the Hirschmann (1957) system re-clarified in Karg & Schorlemmer (2011: 5), and terminologies for idiosoma follow Kim (2004). An Olympus model BX51 compound microscope with 100X/1.35 (oil) UPlanApo objective lens with differential interference contrast (DIC) was used to examine the specimens. Lindquist *et al.* (2009a) treated the non-Linnean category "cohort" as a rank between the ranks of order and family. In this article, however, I

recognize the cohort as a rank between the class and order; and the infraorder as a rank between the suborder and superfamily by following the taxonomic hierarchy shown in the Appendix 10 in Lincoln *et al.* (1982: 279). This treatment is not *de novo*, and has been applied to many taxonomic groups of zoology, including, but not limited to, the Crustacea. The infraorders Antennophoriae and Cercomegistinae used in this article are equivalent to the Antennophorina and Cercomegistina, respectively, as used in Kim (2004) and Lindquist *et al.* (2009a); and such usage of naming is intended to avoid the use of the suffix *-ina*, designated for the rank of "subtribe" in zoological nomenclature (ICZN, 1999: Art. 29.2; also see Kim, 2006: 19).

TAXONOMY

Vitzthumegistidae, fam. nov.

Type genus — *Vitzthumegistus* (genus et nomen novum for *Physalozzercon* sensu André, 1937b, non Berlese, 1903)

Diagnosis (based on adult) — Cercomegistoid mesostigmatid mites. Body ellipsoid; yellowish or dark-brown in color. Dorsum with holodorsal shield (or holodorsal shield with a medial transverse thin line of fusion or medial cleft present). Tritosternum narrow, somewhat conical in shape; about 3/4 length of tritosternal laciniae fused together; distal end of each lacinia bifurcated. Presteral shield absent. Unpaired postanal seta absent. Anterior end of gnathotectum roundish, somewhat shield-shaped, with smooth lateral margin (no serration, or no anterior projections present); gnathotectal ventromedian keel absent. Hypostomal setae *hs1* heavily branched (polyramous, hypertrophied), not simple setiform. Corniculi well-sclerotized, horn-like. Paralacinae absent. Palp genua with six setae. Palp tibiae and tarsi normally articulated, not completely fused. Palptarsal claw (apotele) paraxial, three-tined. Chelicerae robust, digits short with numerous fine denticles. Cheliceral excrescences on movable digit proximal, or medio-proximal, hyaline, dendritic (not filamentous). Pilus dentilis on fixed cheliceral digit absent. Femora IV with eight setae. Tarsi I without claw or ambulacrum. Tarsi

II–IV each with paired claws with fan-like pulvillus. Tarsi IV with setae *av4* and *pv4* on ventral intercalary sclerite in circumsegmental fissure between basi- and telotarsus. Female: Sternal shield, neither paired nor fragmented, weakly sclerotized, vestigial, or absent. Metasternal shield, carrying setae *st4*, absent. Sternogynial shield, carrying *stp3*, absent. Latigynial shields (Paragynia sensu Vitzthum, 1937) elongate triangular or subrectangular, fused to ventrianal shield posterolaterally. Mesogynial shield (epigynium sensu Vitzthum, 1937) small or vestigial, fused to ventrianal shield posteriorly. Male genital opening located in area between and around coxae III, with single genital valve; half of valve often fused to hologastric shield posteriorly; eugenital setae on genital valve absent.

Vitzthumegistus

(genus et nomen novum for *Physalozzercon* sensu André, 1937b; non Berlese, 1903)

Type species — *Vitzthumegistus paguroxenus* (André, 1937b), comb. nov. (= *Physalozzercon paguroxenus* André, 1937b)

Diagnosis — same as for family.

Etymology — The name is derived from Hermann Ludwig Wilhelm Graf Vitzthum von Eckstädt (16 January, 1876 – 19 May, 1942); and 'megistus', derived from a Latin word of 'megistanes', meaning magnate, is a common suffix used in the mesostigmatid genera.

Species — *V. paguroxenus* (André, 1937b), comb. nov.; *V. latronis* (Vitzthum, 1937), comb. nov. (= *Cyclothorax latronis* Vitzthum, 1937); and *V. andrei*, (a nomen novum for *Cyclothorax carcinicola* sensu Vitzthum, 1928, non von Frauenfeld, 1868)

***Vitzthumegistus paguroxenus* (André, 1937b), comb. nov.**

(= *Physalozzercon paguroxenus* André, 1937b) (André, 1937b: 48; *q.v.* Johnston, 1960: 444; *q.v.* Kethley, 1977: 139)

Diagnosis — Cercomegistoid vitzthumegistid mite. Anterior end of dorsal shield with a pair of distinctly long *i1* (= *j1*) setae (see André, 1937b:

TABLE 1: Leg chaetotaxy of *Vitzthumegistus paguroxenus* (André, 1937b), comb. nov.

	I	II	III	IV
Coxa	2	2	2	1
Trochanter	5	5	5	5
Femur	10	11	7	8
				(1-2/1-2/1-1)
Genu	12	12	12	11
	(2-3/2-3/1-1)	(2-3/1-3/1-2)	(2-3/1-3/1-2)	(2-3/1-3/1-1)
Tibia	11	10	10	11
		(2-2/1-2/1-2)	(2-2/1-2/1-2)	(2-2/2-2/1-2)
Tarsus	-	19	19	21

49, Fig. 1). Female latigynial shield subrectangular in shape. Ventrianal shield somewhat rhombic in shape, not wide, not covering almost entire venter. Fused metapodal-endopodal-exopodal-peritrematal shields element separated from ventrianal shield.

Type series — Syntype: 2 female (slide number: 6D1, 6D4-6D11, 6D16) and 1 male (slide number: 6D2, 6D3, 6D12-6D15) specimens dissected and mounted on 16 microscopic glass slides. ex. *Coenobita* sp. (Paguroidea: Coenobitidae); Coll. Edgar Aubert de la Rüe (7 October, 1901 – 24 February, 1991). Type specimens (MNHN Register Number Ac246a) located in Marc André collection, Muséum National d'Histoire Naturelle (MNHN), Paris, France.

Type locality — VANUATU: Pentecost Island (Île Pentecôte).

Remarks — Immatures and biology are unknown.

***Vitzthumegistus latronis* (Vitzthum, 1937), comb. nov.**

(= *Cyclothorax latronis* Vitzthum, 1937)
(Vitzthum, 1937: 639; q.v. Johnston, 1960: 442; q.v. Kethley, 1977: 139)

Diagnosis — Cercomegistoid vitzthumegistid mite. Anterior end of dorsal shield with four distinctly long setae (each paired *i1* (= *j1*) and *z1* setae) (see Vitzthum, 1937: 640, Fig. 1); medio-lateral side

of dorsum with two distinctly long setae. Dorso-lateral (marginal) setae short, shorter than (ca. $\leq 1/10$) length of genua. Female latigynial shield elongated subtriangular in shape. Ventrianal shield somewhat tongue-shaped, not wide, not covering almost entire venter.

Type series — Syntype: 3 females (slide number: V1210, V1231, V1232) and 4 males (slide number: V1230, V1233, V1234, V1235), each mounted on a thin square cover slip (!). ex. *Birgus latro* (Paguroidea: Coenobitidae; coconut crab); Coll. Harms. Type specimens located in Hermann Graf Vitzthum collection, Zoologische Staatssammlung (ZSM), München, Germany.

Type locality — Undisclosed (presumably Sumatra, Indonesia)

Remarks — Immatures and biology are unknown.

Vitzthumegistus andrei

(a nomen novum for *Cyclothorax carcinicola* von Frauenfeld, 1868, sensu Vitzthum, 1928)

(q.v. von Frauenfeld, 1868: 893; Vitzthum, 1928: 194; q.v. Oudemans, 1932: LXI; q.v. Vitzthum, 1937: 638; q.v. Johnston, 1960: 442; q.v. Kethley, 1977: 139)

Diagnosis — Cercomegistoid vitzthumegistid mite. Anterior end of dorsal shield with a pair of distinctly long *i1* (= *j1*) setae (see Vitzthum, 1928: 195, Fig. 3). Dorso-lateral (marginal) setae long, close to length of genua. Ventrianal shield wide, al-

TABLE 2: Leg chaetotaxy of *Vitzthumegistus latronis* (Vitzthum, 1937), comb. nov. (V1235)

	I	II	III	IV
Coxa	2	2	2	1
Trochanter	5	5	5	5
Femur	12	10	7	8
Genu	12	12	12	11
	(2-3/1-3/1-2)	(2-3/1-3/1-2)	(2-3/1-3/1-2)	(2-3/1-3/1-1)
Tibia	13	10	9	11
Tarsus	-	19	19	21

TABLE 3: Leg chaetotaxy of *Vitzthumegistus andrei*, nomen nov. (V1208)

	I	II	III	IV
Coxa	2	2	2	2/1
Trochanter	5	5	5	5
Femur	10	10	7	8
Genu	10	10	10	10
	(2-3/1-2/1-1)	(2-3/1-2/1-1)	(2-3/1-2/1-1)	(2-3/1-2/1-1)
Tibia	9	9	9	10
		(2-2/1-2/1-1)	(2-2/1-2/1-1)	(2-2/2-2/1-1)
Tarsus	-	19	19	21

most covers venter. Fused metapodal-endopodal-exopodal-peritrematal shields element fused with ventrianal shield posteriorly.

Type series — Syntype: Two males (slide number: V1207, V1208; each mounted on a thin square cover slip). ex. *Coenobita* sp. (Paguroidea: Coenobitidae); Coll. Fulmek (Leopold Fulmek, 9 November, 1883 – 17 June, 1969), August, 1925. Type specimens located in Hermann Graf Vitzthum collection, Zoologische Staatssammlung (ZSM), München, Germany.

Type locality — INDONESIA: Northeast coast of Sumatra Island, Beach of Perbaungan.

Remarks — The Vitzthum Collection in Zoologische Staatssammlung (ZSM) has two additional microscope slides (slide number: V1214, V1215), which carry the mite specimens from *Coenobita* sp. collected by Johannes Carolus van der Meer Mohr (1892-1969) in March, 1933 at the same type locality (Beach of Perbaungan) in Sumatra Island.

Slide V1214, in poor condition, contains three female specimens mounted together on a thin square cover slip, and slide V1215 carries a single male mounted on a thin square cover slip. Slide V1215 lacks gnathosoma, anterior dorsum, and legs I; and through the V1214, I was able to confirm the presence of three-tined palptarsal claws and polyramous *hs1* setae. However, these four specimens in V1214 and V1215 slides were not included in the original description of Vitzthum (1928), and cannot be treated as name-bearing types. For the minimal change of name, I followed the same specific epithet, *andrei*, that Kethley (1977: 139) proposed in honor of Marc André (10 February, 1900 – 28 May, 1966). Immatures and biology are unknown.

DISCUSSION

The newly recognized genus *Vitzthumegistus* carries eight setae on femora IV, no postanal seta, long setae *av4* and *pv4* on a well-developed ventral intercalary

sclerite on a circumsegmental fissure between basi- and telotarsi IV, six setae on palp genua, three-tined palptarsal claw (apotele), dentate chelicerae, dendritic cheliceral excrescences, and almost fused tritosternal laciniae, which collectively display the typical characteristics of the Cercomegistoidea of the Triginaspida (Kim, 2004). In addition to these characters, the *Vitzthumegistus* carries a holodorsal shield, almost finely dentate cheliceral digits, no free presternal shield, weakly sclerotized entire (*i.e.*, neither paired nor fragmented) sternal shield in the female, smooth anterior and lateral margin of gnathotectum, heavily branched (polyramous) hypostomal setae 1 (*hs1*), and no claws on tarsi I in the adult. In comparison, the members of Cercomegistidae carry two dorsal shields, paired presternal shields, serrate anterolateral gnathotectal margin (often with anterior projections), and simple or weakly barbed hypostomal setae 1 (*hs1*). While Kethley (1977: 139) correctly grouped these species together under a single genus and assigned the genus to the Cercomegistidae, due to the major differences described above, the *Vitzthumegistus* cannot be placed into the Cercomegistidae.

Within the Cercomegistoidea, presence of a holodorsal shield in the adult is found in the Asternoseiidae and Saltiseiidae, but the anterolateral gnathotectal margin in these two families is not smooth, but serrate. The smooth gnathotectal margin is found in the Seiodidae, but seiodids carry two distinct dorsal shields (*i.e.*, podonotal and opisthonotal shields), which are also found in other cercomegistoid families (*i.e.*, Cercomegistidae, Pyrosejidae). In addition, seiodids have tarsi I with claws, and have completely free tritosternal laciniae. In other words, the combination of characters found in the members of *Vitzthumegistus* is not found in any single family in the Cercomegistoidea, and I raise the genus *Vitzthumegistus* to a new family-group within the Cercomegistoidea of the Triginaspida. In their key to the families of Mesostigmata, Lindquist *et al.* (2009b: 158) treated the *Vitzthumegistus* as a separate unit, different from other known cercomegistids. Within the Triginaspida, in which the members often display a variety of host associations (see Kim, 2004: 161 for details),

the Vitzthumegistidae fam. nov. become a unique group, in which the members exhibit associations with paguroid hermit crabs (Crustacea: Decapoda: Paguroidea) in the Indo-Western Pacific (Oriental) region (*i.e.*, Pentecost Island (Île Pentecôte), Vanuatu; Sumatra, Indonesia). Since immatures have not yet been reported from host hermit crabs, the biology of *Vitzthumegistus* remains an intriguing mystery.

Key to species of the genus *Vitzthumegistus* (Based on adult)

1. Anterior end of dorsal shield with four long setae; Medio-lateral side of dorsum with two distinctly long setae. Dorso-lateral (marginal) setae short, shorter than (ca. $\frac{1}{2}$ or shorter) length of genua. *latronis*
— Anterior end of dorsal shield with two long setae; Medio-lateral side of dorsum without two distinctly long setae. Dorso-lateral (marginal) setae long, close to, or longer than, length of genua. 2
2. Ventrianal shield wide, almost covers venter. Metapodal, endopodal, exopodal, peritrematal shields fused together; this fused shield element fused with ventrianal shield posteriorly. *andrei*
— Ventrianal shield not wide, does not cover almost entire venter. Metapodal, endopodal, exopodal, peritrematal shields fused together; this fused shield element separated from ventrianal shield. *paguroxenus*

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ENDNOTE

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