

## Two new *Pediculaster* (Acari: Siteroptidae) species from Thailand and Mexico

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### Summary

The phoretic females of two new *Pediculaster* (Acari: Siteroptidae) species, *P. canacidalis* sp. n. and *P. thailandensis* sp. n. from flies in Thailand, are described. *P. thailandensis* has also been collected from flies Mexico. An attempt is made to devise a key for the identification of these new species from taxonomically similar ones.

**Keywords:** Taxonomy, Acari, Siteroptidae, *Pediculaster*, Diptera, Thailand, Mexico.

### Résumé

Deux nouvelles espèces phorétiques de *Pediculaster* (Acari: Siteroptidae), *P. canacidalis* sp. n. et *P. thailandensis* sp. n., récoltées sur des diptères de Thaïlande, sont décrites. *P. thailandensis* a été également récolté sur des mouches mexicaines. Une clé provisoire est proposée pour déterminer les espèces taxonomiquement proches.

### Introduction

During my visit to the Royal Institute of Natural Sciences of Belgium (RISNB) some years ago, Dr. Fain requested the identification and description of new *Pediculaster* species from their collection. Several acarologists working at the Institute had classified different *Pediculaster* species as *Pediculoides* or *Pygmephorus*. However, the new species belong to the genus *Pediculaster* as defined for the Neotype (CAMERIK, in print).

### Materials and Methods

Microscope material from the RISNB collection was used for the following descriptions:

1. *P. canacidalis* sp. n.: All phoretic females. Thailand (4 slides: 1, 1, 2, 3 specimens; n° 96047); Phang Nga prov., Khao Lak, Nangton, 8.IV.1996. Surpalitoral on drift material. From Canacidae (Diptera). Coll. P. Grootaert.
2. *P. thailandensis* sp. n.: All phoretic females.
  - a. Thailand (2 slides: 6, 13 specimens; n° 98034): Ranong Prov, Ban Bang Khang, 5.V.1998. River bed. Host: small diptera. Coll. P. Grootaert.
  - b. Mexico (4 slides: 1, 2, 5, 8 specimens; from small fly, Chloropidae, n°11): Playa del Caermen (Tulum); 16.VII.1993. Also from

Tethinidae (Diptera), rocky seashore Tulum. Coll. P. Grootaert.

All type material was deposited in the IRSNB, Brussels.

The mites were studied and drawn using an OLYMPUS BH2 phase-contrast light microscope with a LEITZ WETZLAR drawing tube, under 100× oil immersion objective. The drawings, traced in ink, were scanned into Corel Photo Paint-10 software, edited and annotated. Body parts and idiosomal setae were measured in µm from images captured through a NIKON phase contrast microscope fitted with a PANASONIC DIGITAL VIDEO CAMERA (Model WV CP 410/G), utilizing Simple PCI software. The different body parts were measured as described in CAMERIK & UECKERMANN (1995), except opisthosomal width taken across apodemes 3 as described in CAMERIK (1996). Setal notation, abbreviations and terminology of structures are based on LINDQUIST (1986).

The two new species are compared with eleven other *Pediculaster* species with which they have the following morphological characters in common: two-chambered stigmata, dorsal opisthosomal seta *c*<sub>1</sub> shorter than or equal to *c*<sub>2</sub>; leg I with long, cylindrical solenidion ω<sub>1</sub> and leg II with a large baculiform ω. A key is proposed to distinguish between these thirteen species.

Drawings of the two new, and eleven other *Pediculaster* species as these occur in their original publications (as listed below), are used to compile the identification key. List of publications of phoretic *Pediculaster* females with two stigmatal chambers: *P. athiasae* WICHT, 1970, *P. canacidalis* (in this publication), *P. dominguezii* ATHIAS-HENRIOT, 1961, *P. entzi* MAHUNKA, 1976, *P. malyi* SAMSINAK 1989, *P. manicatus* (Berlese, 1904) CAMERIK, 2001, *P. moravicus* SAMSINAK, 1984, *P. muscarius* Martin, 1978, *P. norrbomi* SAMSINAK, 1989, *P. pfefferianus* SAMSINAK, 1984, *P. pseudomanicatus* CAMERIK, 2001, *thailandensis* (in this publication), and *P. zaheri* SEVASTIANOV AND ABO-KORAH, 1984.

### Statistical analysis

The Thailand and Mexican populations are assumed here to represent the same species, *P. thailandensis* n.sp. This concept was statistically tested for variation within and between populations with the Coefficient of Variance [CV = % . (Standard Deviation/Average)] on 39 quantified characters.

Table 1. Key to the phoretic females of *Pediculaster* (Acari: Siteroptidae) species with two stigmatal chambers.

The thirteen *Pediculaster* species have the following characters in common: *Sc*<sub>1</sub> capitate, with a long, straight stem, inserted in bothridium; dorsal setae *e* *s* *f*; *h*<sub>1</sub> > *h*<sub>2</sub>; *ps*<sub>2</sub> > *ps*<sub>1</sub>, *ps*<sub>3</sub>; apodemes V rudimentary structures at the base of trochanter IV; stigmata with two chambers.

- 1a Setal distribution on coxisternae: 3-3-3-3 ..... go to 3a  
 1b Setal distribution on coxisternae: 3-2-3-3 ..... go to 2a
- 2a *h*<sub>1</sub> > *h*<sub>2</sub> ..... *P. pfefferianus*  
 2b *h*<sub>1</sub> < *h*<sub>2</sub> ..... *P. manicatus*
- 3a *c*<sub>1</sub> = *c*<sub>2</sub> ..... go to 4a  
 3b *c*<sub>1</sub> ≠ *c*<sub>2</sub> ..... go to 6a
- 4a *d* = *c*<sub>1</sub> ..... go to 5a  
 4b *d* < *c*<sub>1</sub> ..... *P. athiasae*
- 5a *2a* < *2b*; *v*<sub>1</sub> > *v*<sub>2</sub> ..... *P. entzi*  
 5b *2a* > *2b*; *v*<sub>1</sub> < *v*<sub>2</sub> ..... *P. malyi*
- 6a *e* = *f* ..... go to 7a  
 6b *e* ≠ *f* ..... go to 8a
- 7a *h*<sub>1</sub> = *h*<sub>2</sub> \* 2 ..... *P. thailandensis*  
 7b *h*<sub>1</sub> = *h*<sub>2</sub> \* 4 ..... *P. moravicus*
- 8a *v*<sub>1</sub> > *v*<sub>2</sub> ..... *P. entzi*  
 8b *v*<sub>1</sub> ≠ *v*<sub>2</sub> ..... go to 9a
- 9a *v*<sub>1</sub> < *v*<sub>2</sub> ..... *P. malyi*

- 9b *v*<sub>1</sub> = *v*<sub>2</sub> ..... go to 10a
- 10a *2b* >> *2a* = *2c* ..... *P. muscarius*  
 10b *2b* ≠ >> *2a* = *2c* ..... go to 11a
- 11a *4b* = *4a* \* 2 ..... go to 12a  
 11b *4b* ≠ = *4a* \* 2 ..... go to 14a
- 12a *h*<sub>1</sub> > *h*<sub>2</sub> \* 3 ..... *P. moravicus*  
 12b *h*<sub>1</sub> ≠ > *h*<sub>2</sub> \* 3 ..... go to 13a
- 13a *e* ≤ *f* \* 1/2 ..... *P. norrbomi*  
 13b *e* = *f* ..... *P. thailandensis*
- 14a ventral setae barbed ..... *P. dominguezii*  
 14b ventral setae not barbed (except or *ps*<sub>2</sub>) ..... go to 15a
- 15a Prodorsal shield anteriorly bell-shaped ..... *P. zaheri*  
 15b Prodorsal shield anteriorly not bell-shaped ..... go to 16a
- 16a *ch*<sub>1</sub> = *ch*<sub>2</sub> ..... *P. canacidalis*  
 16b *ch*<sub>1</sub> = *ch*<sub>2</sub> \* 2 ..... *P. pseudomanicatus*

Abbreviations: = about the same size as; ≠ is not; \* multiplied by.

### Description of both new species

Exoskeleton strongly sclerotized, punctate, yellow to light brown in colour. Chaetotaxy and solenidiotaxy complete, as described in Table 1 of CAMERIK & COETZEE, 1997 (except for solenidia  $\phi$  on legs II and III, which were mistakenly printed as *u* in the publication).

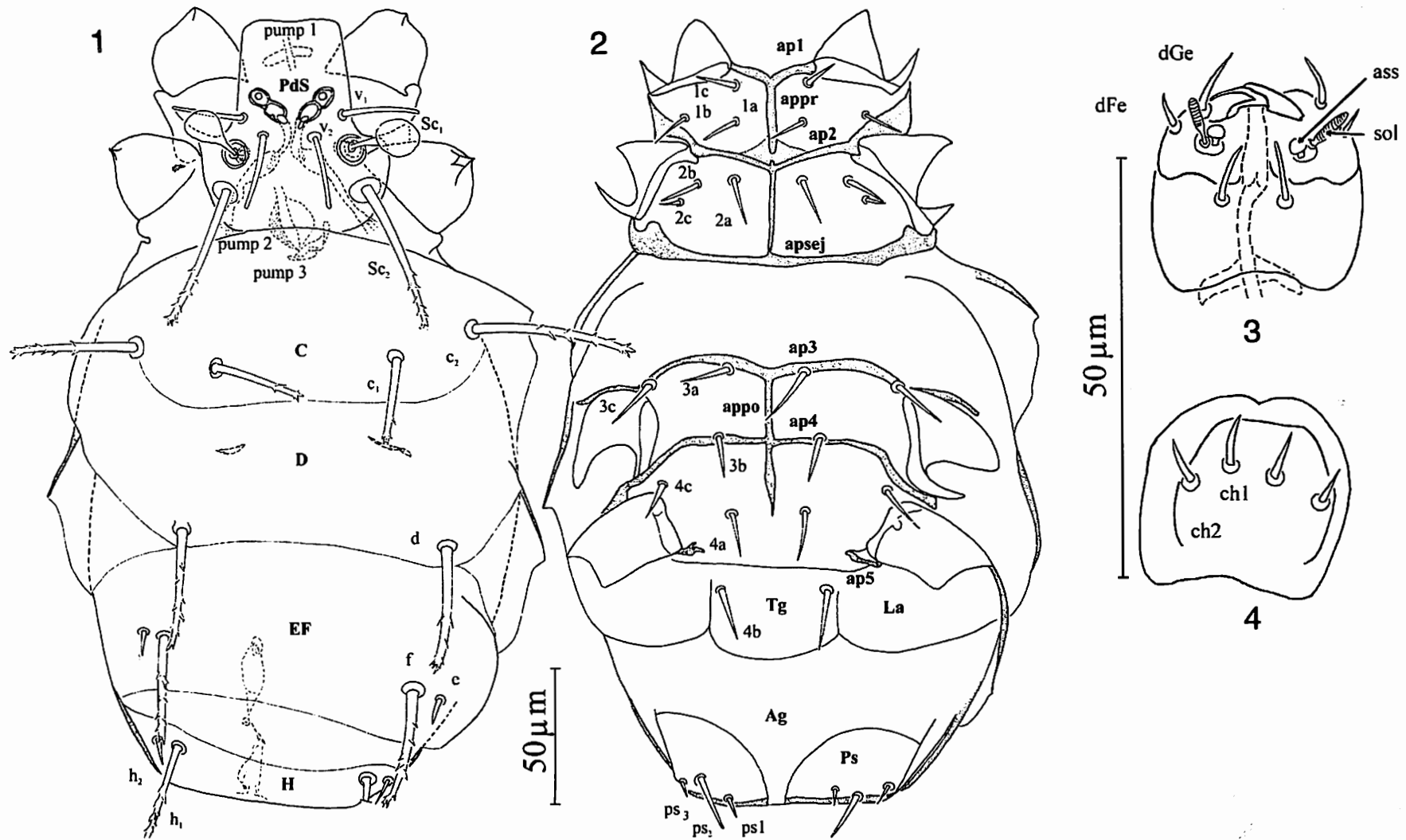
#### *P. canacidalis* sp. n. (Figs 1-9)

Measurements ( $\mu$ m) in Table 2.

Gnathosomal capsule (Gn): dorsal cheliceral setae *ch*<sub>1,2</sub> smooth, *ch*<sub>1</sub> anterior of shorter *ch*<sub>2</sub>. Femoral setae *dFe* much shorter than genual *dGe*; subcapitular setae *su* reaching accessory setigenous structure (ass), which is very close to the solenidion.

Pharyngeal pump system: Pumps 1-3 striated. Pump 1 ribbon shaped; situated at the proximal end of GN. Pump 2 oval, pump 3 elliptical, situated under coxisternae II.

Idiosomal dorsum: Prodorsal shield (PdS) anterior rectangular, posterior trapezoid. Stigmata two-chambered, anterior of setae *v*<sub>2</sub>. Dark, brown, structures in external chamber not in all specimens, possibly spores. Verticals *v*<sub>1</sub> and *v*<sub>2</sub> about equally long. Except for *v*<sub>1</sub>, *v*<sub>2</sub>, *e* and *h*<sub>2</sub>, all dorsal setae pilose. Scapulars *Sc*<sub>1</sub> capitate in trichobotrium; *Sc*<sub>2</sub> long. Setae *c*<sub>1</sub> shorter than *c*<sub>2</sub>; *d* longer than setae *c*<sub>1</sub>; *e* slimmer and about one fifth of *f*; *h*<sub>1</sub> about five times longer than *h*<sub>2</sub>. No



Figs 1-4. *P. canacidalis* n.sp. 1: idiosomal dorsum with pharyngeal pumps 2, 3; 2: Idiosomal venter; 3: Gnathosomal venter; 4: Gnathosomal dorsum.

Table 2. *Pediculaster canacidalis* n. sp, phoretic females (n=3). Key: Std. Dev = Standard Deviation.

Characters	Specimens	1	2	3	Average	Std. Dev
Idiosoma	(L)	195.0	241.8	247.0	227.9	28.6
Gnathosoma	(L)	14.5	24.2	26.2	21.6	6.3
Gnathosoma	(W)	12.4	26.2	31.7	23.4	9.9
Stigma	(L)	13.3	10.4	15.2	13.0	2.4
	(W)	4.0	4.1	13.3	7.1	5.3
Prosoma	(L)	52.0	72.8	59.8	61.5	10.5
Prosoma	(W)	41.6	41.6	54.6	45.9	7.5
Opisthpsoma	(L)	143.0	169.0	187.2	166.4	22.2
Opisthpsoma	(W)	70.2	67.6	85.8	74.5	9.8
Leg I		80.6	75.4	91.0	82.3	7.9
Leg II		88.4	78.0	91.9	86.1	7.2
Leg III		83.2	78.0	93.6	84.9	7.9
Leg IV		104.0	78.0	122.2	101.4	22.2
<b>Dorsal Setae</b>						
<i>vl</i>		21.3	20.7	24.2	22.1	1.9
<i>v2</i>		20.0	20.7	25.5	22.1	3.0
<i>Sc1</i>		20.0	24.2	22.8	22.3	2.1
<i>Sc2</i>		67.8	43.5	44.2	51.8	13.8
<i>c1</i>		23.9	24.2	29.0	25.7	2.9
<i>c2</i>		39.9	38.6	44.9	41.1	3.3
<i>d</i>		33.3	34.5	41.4	36.4	4.4
<i>e</i>		6.7	3.5	6.9	5.7	1.9
<i>f</i>		26.6	31.1	42.1	33.3	8.0
<i>h1</i>		26.6	27.6	35.9	30.0	5.1
<i>h2</i>		5.3	3.5	6.9	5.2	1.7
<b>Ventral Setae</b>						
<i>1a</i>		11.7	7.6	10.4	9.9	2.1
<i>1b</i>		11.7	9.7	13.8	11.7	2.1
<i>1c</i>		11.7	7.6	7.6	9.0	2.4
<i>2a</i>		-	6.9	12.4	9.7	3.9
<i>2b</i>		-	10.4	13.8	12.1	2.4
<i>2c</i>		-	6.2	6.9	6.6	0.5
<i>3a</i>		10.6	10.4	11.7	10.9	0.7
<i>3b</i>		10.6	11.7	13.8	12.0	1.6
<i>3c</i>		10.6	12.4	15.2	12.7	2.3
<i>4a</i>		10.6	10.4	12.4	11.1	1.1
<i>4b</i>		12.0	12.4	15.2	13.2	1.7
<i>4c</i>		10.6	9.7	12.4	10.9	1.4
<i>ps1</i>		2.7	2.1	6.9	3.9	2.6
<i>ps2</i>		18.0	9.1	20.8	16.0	6.1
<i>ps3</i>		2.7	3.5	-	3.1	0.6
<b>Pump</b>	1 (l)	2.7	2.6	5.5	3.6	1.6
	(w)	5.3	8.1	6.2	6.5	1.4
	2 (l)	12.0	12.5	14.6	13.0	1.4
	(w)	5.3	6.5	7.0	6.3	0.9
	3 (l)	-	6.5	5.2	5.9	0.9
	(w)	8.0	8.3	9.1	8.5	0.6

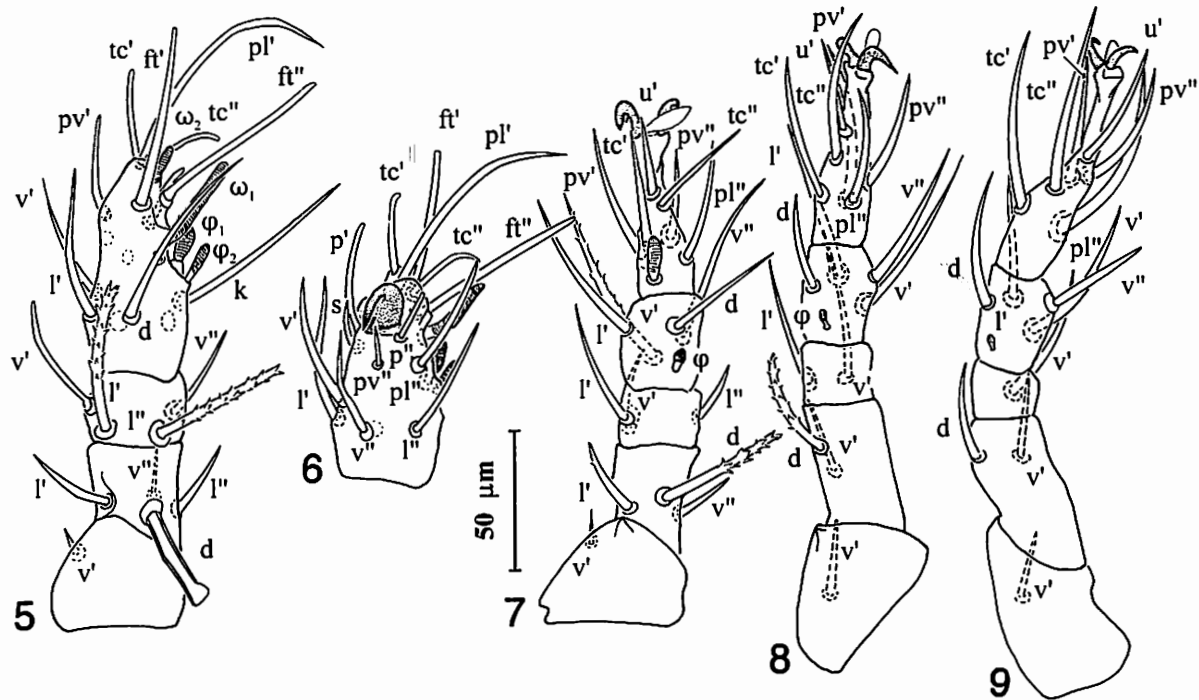
cupulae noticed.

Idiosomal venter: all setae smooth. Coxisternal setal distribution 3-3-3-3. Pseudoanal setae *ps*<sub>1,3</sub> short, *ps*<sub>2</sub> longest. Apodemes (ap) 1-4 strongly sclerotized, ap 5 rudimentary structures at the base of trochanter IV.

Legs: Setae smooth or pilose. Chaetotaxy and

solenidiotaxy complete. Subterminal claw I robust and fitting into a "counterpiece" made up of setae *u'-u''*; claws II and III with pad, claws IV simple. Empodia distally pointed or circular.

Legs I: Subterminal, robust claw. Tibiotarsus with relatively long eupathidia *tc'*, *tc''* about half the size of *ft'*, *ft''*; *p'* two and a half times the size



Figs 5-9. *P. canacidalis* n.sp. 5: Leg I, dorsal view; 6: Leg I, ventral view; 7: Leg II, dorsal view; 8: Leg III, dorso-lateral view; 9: Leg IV, lateral view.

of  $p''$ . Solenidium  $\omega_1$  cylindrical, three times as long as  $\omega_2$ ;  $\phi_1$  baculiform, stouter than cylindrical  $\phi_2$ . Setae  $pv'$  three times the length of  $pv''$ ;  $v'$  as long as  $v''$ ;  $l'$  longer than  $l''$ ;  $pl'$  about twice as long as  $pl''$ ;  $d$  as long as  $k$ . Genu: Laterals pilose, equally long, verticals smooth or barbed,  $v'$  longer than  $v''$ . Femoral setae smooth, seta  $d$  terminally obtuse,  $l''$  shorter than  $l'$ . Seta  $v'$  on trochanter short and smooth.

Legs II: Trochanteral  $v'$  short and smooth. Femoral  $d$  distally pilose, much longer than  $l'$ ,  $v''$ . Genual setae smooth;  $l'$  longest, followed by  $v'$ ,  $l''$  shortest. Tibial  $d$  shortest and close to  $\phi$ ;  $l'$  slightly shorter than verticals;  $v'$  pilose, about as long as smooth  $v''$ . Tarsus with "padded" c laws,  $\omega$  baculiform, about one third of tarsal length (excluding claws). All tarsal setae smooth,  $u'$  shortest;  $tc''$  reaching slightly beyond claws.

Legs III: Trochanteral  $v'$  long relative to those of legs I and II. Femoral  $v'$  smooth and shorter than pilose  $d$ . Genu with long, smooth  $l'$ ,  $l''$ . Tibial  $d$  shortest, smooth, associated with solenidium  $\phi$ . Verticals  $v'$ ,  $v''$  and lateral  $l'$  smooth and about the same length. Tarsal setae smooth: tectals  $tc'$ ,  $tc''$ , about the same length,  $pl''$  slightly shorter;  $pv'$  much longer than  $pv''$ . Unguinal  $u'$  shortest. Claws padded.

Legs IV: trochanteral  $v'$  smooth; smooth femoral  $v'$  as short as smooth  $d$ . Genu carrying smooth seta  $v'$ . Tibial setae smooth, seta  $d$  close to  $\phi$  as long as smooth  $l'$ ;  $v'$  longer than  $v''$ . Tarsal setae smooth,  $u'$  slender;  $pl''$  slightly longer than

tectals;  $tc'$  as long as  $tc''$ . Primiventrals  $pv'$ ,  $pv''$  about the same length. Simple terminal claws.

***P. thailandensis* sp. n.**  
(Figs 10-21)

Measurements ( $\mu\text{m}$ ) in Table 3.

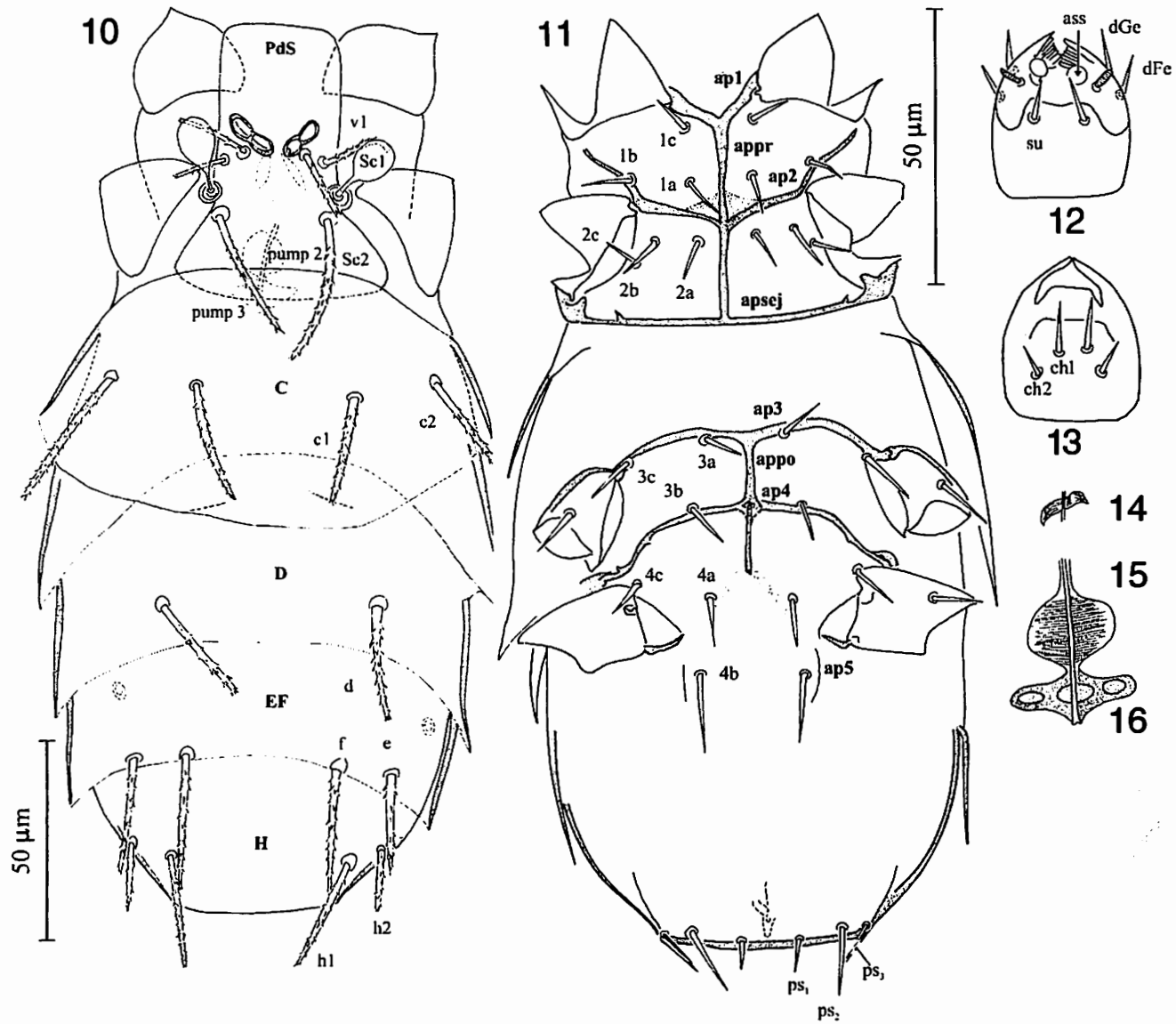
Gnathosomal capsule (Gn): dorsal cheliceral setae  $ch_{1,2}$  smooth;  $ch_1$  longer than and anterior of  $ch_2$ . Femoral ( $dFe$ ) slightly shorter than genual ( $dGe$ ) setae; subcapitular ( $su$ ) reaching accessory setigenous structure (ass), which is close to the solenidium.

Pharyngeal pump system: pumps 1 and 2 clearly striated; no striation of pump 3. Pump 1 ribbon shaped; situated below Gn. Pump 2 oval, pump 3 elliptical-diamond shaped, situated under coxisternae II.

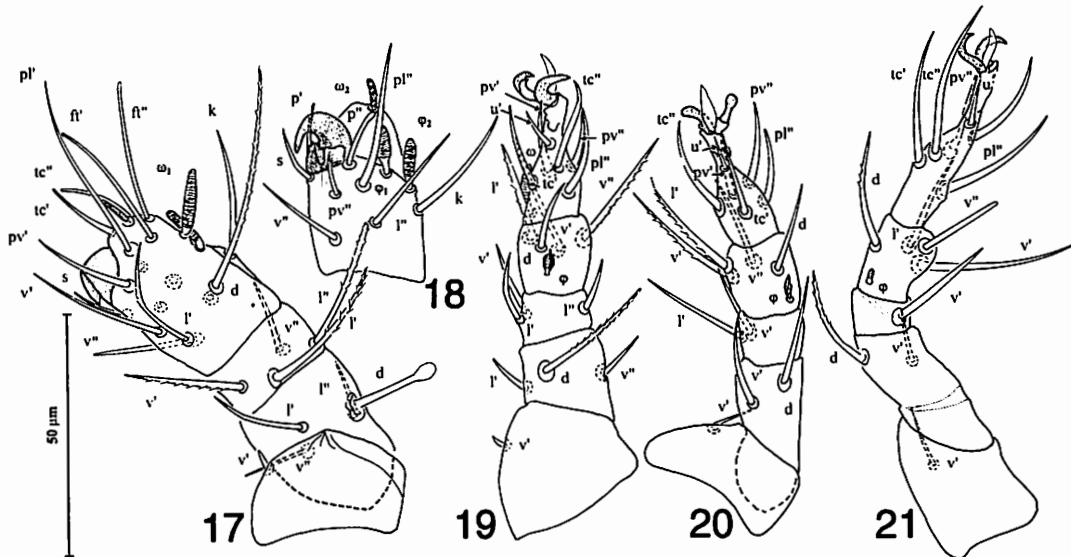
Idiosomal dorsum: Prodorsal shield (PdS) anterior rectangular, posterior trapezoid. Stigmata two-chambered, anterior of setae  $v_2$ ; verticals  $v_1$  shorter than  $v_2$ . All dorsal setae pilose. Scapulars  $Sc$ , capitate in circular trichobothrium;  $Sc_2$  long. Setae  $c_1$  shorter than  $c_2$  and as long as  $d$ ;  $e$  slightly shorter than  $f$ ;  $h_1$  about twice the size of  $h_2$ . No  $\phi$ upula noticed.

Idiosomal venter: all setae smooth. Coxisternal setal distribution 3-3-3-3. Setae 4b longest. Pseudo anal setae  $ps_2$  longest. Apodemes (ap) 1-4 strongly sclerotized, ap 5 rudimentary structures at the base of trochanter IV.

Legs: Setae smooth, barbed or pilose.



Figs 10-16. *P. thailandensis* n.sp. 10: Idiosomal dorsum, pharyngeal pumps 2, 3; 11: Idiosomal venter; 12: Gnathosomal venter; 13: Gnathosomal dorsum; 14: Pharyngeal pump 1; 15: Pharyngeal pump 2; 16: Pharyngeal pump 3.



Figs 17-21. *P. thailandensis* n.sp. 17: Leg I, dorso-antaxial view; 18: Leg I tibiotarsus, ventro-paraxial view; 19: Leg II, dorso-paraxial-view; 20: Leg III, dorsal view; 21: Leg IV, dorso-paraxial-view.

Chaetotaxy and solenidiotaxy complete; empodia distally pointed.

Legs I: Tibiotarsus with eupathidia  $ft'$ ,  $ft''$  about one and a half time as long as  $tc'$ ,  $tc''$ ;  $p'$ ,  $p''$  about the same length and shorter than tectals. Solenidion  $\omega_1$  long, cylindrical; short, slender  $\omega_2$  terminally on tibiotarsus (TiTa). Solenidia  $\phi_1$ ,  $\phi_2$  about the same length, baculiform  $\phi_1$  more robust than cylindrical  $\phi_2$ . Setae  $pv''$  two and a half as long as  $pv'$ ;  $v'$  longer than  $v''$ ; laterals ( $l'$ ,  $l''$ ) about the same length; seta  $d$  longest, seta  $k$  close to  $\phi_2$ . Genu: Laterals pilose, equally long; verticals barbed,  $v'$  longer than  $v''$ . Femoral setae smooth, seta  $d$  terminally spatulate,  $l''$  shorter than  $l'$ . Seta  $v'$  on trochanter spiniform.

Legs II: Trochanteral  $v'$  spiniform. Femoral  $d$  pilose, much longer than smooth  $l'$ ,  $v''$ . Genual setae smooth;  $l'$ ,  $v'$  longer than  $l''$ . Tibial  $d$  shortest and close to  $\phi$ ;  $l'$  barbed and shorter than  $v'$ ;  $v''$  barbed, as long as  $v''$ . Tarsal  $\omega$  long, cylindrical. All tarsal setae smooth,  $u'$  shortest.

Legs III: Trochanteral  $v'$  long relative to those of legs I and II. Femoral  $v'$  smooth, shorter than smooth  $d$ . Genual  $l'$  smooth and longer than smooth  $v'$ . Smooth tibial  $d$  associated with solenidion  $\phi$  and shorter than barbed  $l'$ . Verticals  $v'$  barbed, longer than  $v''$ . All tarsal setae smooth. Tarsal  $tc'$  shorter than  $tc''$ . Primiventrals  $pv'$  shorter than  $pv''$ .

Legs IV: trochanteral  $v'$  long, smooth; smooth femoral  $v'$  shorter than pilose  $d$ . Genu carrying robust, long, smooth seta  $v'$ . Tibia with barbed seta  $d$  close to  $\phi$  and about as long as smooth  $l'$ ;

smooth  $v'$  longer than rigid, smooth  $v''$ . All tarsal setae smooth,  $u'$  shortest;  $tc''$  longest and reaching beyond terminal claw;  $pv'$  about as long as  $pv''$ .

#### Discussion

1. The discussion below refers to the key for the phoretic females in Table 1 and the original drawings of the different species.

Although ATHIAS-HENRIOT (1961) did not draw solenidion  $\omega_2$  in *P. dominguezi*, it is assumed that it is much smaller than  $\omega_1$ , as this is characteristic for the genus.

Phoretic females of *P. pfefferianus* SAMSINAK, 1984, and *P. manicatus* (BERLESE, 1904) are different from the remainder of the listed species (Table 1), as they have CX setal distribution 3-2-3-3, a complete apV in the phoretic female; setae  $pv'$  and  $pv''$  of legs II, III are not setiform but spiniform. Currently, these two species are still classified under the genus *Pediculaster*.

*P. flechtmanni* is omitted since only normal females were drawn and described by WICHT, 1970; MARTIN, 1978 and SMILEY, 1978. GAO, ZOU & MA, 1988, published drawings of the normal as well as the phoretic females of *Siteroptes* (now classified under *Pediculaster*) *flechtmanni*. However, the question is whether the last authors correctly identified the species as *P. flechtmanni*. I consider the following characters of the normal females drawn by them to be different from *P. flechtmanni* WICHT, 1970, and more like *P. muscarius* MARTIN, 1978 (Table 3 below).

Table 3. *Pediculaster thailandensis* n. sp. phoretic females. Key: (l) = length; (w) = width; GN = gnathosoma; stig. = Stigma; Pros. = prosoma; Opisth. = Opisthosoma

Species	character	Idiosoma	GN (l)	GN (w)	Stig. (l)	Stig. (w)	Pros. (l)	Pros. (w)	Opisth. (l)	Opisth. (w)	Leg I	Leg II	Leg III	Leg IV	v1	v2	Sc1	Sc2	c1	c2
Thailand 1		260.0	25.3	30.6	14.6	5.3	57.2	41.6	202.8	88.4	78.0	83.2	85.8	88.4	23.4	49.4	46.8	70.2	59.8	72.8
Thailand 2		226.0	-	-	23.9	5.3	52.0	44.2	174.2	65.0	75.4	65.0	70.3	101.4	31.2	44.3	41.6	75.4	52.0	67.6
Thailand 3		210.5	-	-	16.8	4.9	50.0	45.0	160.5	72.8	78.4	76.3	86.6	112.1	23.8	39.3	18.9	26.3	29.5	36.9
Thailand 4		202.9	26.1	-	11.9	4.2	52.1	49.3	164.0	65.1	74.3	71.7	76.6	93.2	14.5	21.2	17.8	34.3	25	33.7
Average		224.9	25.7	30.6	16.8	4.9	52.8	45.0	175.4	72.8	76.5	74.1	79.8	98.8	23.2	38.6	31.3	51.6	41.6	52.8
Standard deviation		25.3	0.6		5.1	0.5	3.1	3.2	19.2	11.0	2.0	7.7	7.8	10.4	6.8	12.3	15.1	24.8	16.9	20.3
Coefficient of Variance		11.2	2.3		30.4	10.2	5.9	5.1	11.0	15.1	2.6	10.4	9.8	10.5	29.3	31.9	48.2	48.1	40.1	38.5
Mexico 1		257.1	-	-	13.0	4.1	54.7	50.8	202.4	71.8	76.3	71.3	75.3	97.8	16.1	17.3	19.0	41.3	25.5	36.7
Mexico 2		190.7	16.7	22.0	13.8	4.9	49.4	40.6	144.9	61.4	76.3	66.3	62.5	84.7	14.5	22.7	19.3	36.4	26.7	36.4
Mexico 3		201.7	24.3	24.3	10.9	3.4	54.2	49.0	150.9	67.9	80.3	72.5	76.3	105.5	20.2	18.4	20.0	39.0	27.8	33.9
Mexico 4		216.5	-	-	14.3	3.9	51.6	50.1	192.5	91.0	77.6	70.0	71.4	96.0	16.9	19.6	18.6	40.1	18.6	35.9
Average		216.5	20.5	23.2	13.0	4.1	52.5	47.6	172.7	73.0	77.6	70.0	71.4	96.0	16.9	19.5	19.2	39.2	24.7	35.7
Standard deviation		29.1	5.4	1.6	1.5	0.6	2.5	4.7	29.0	12.7	1.9	2.7	6.3	8.6	2.4	2.3	0.6	2.1	4.1	1.3
Coefficient of Variance		13.4	26.3	6.9	11.5	14.6	4.8	9.9	1.7	17.4	2.5	3.9	8.8	9.0	14.2	11.8	3.1	5.4	16.6	3.6
<b>Statistic Analysis of the combined populations</b>																				
Average		184.3	17.3	26.9	15.6	4.7	43.9	38.5	145.3	62.0	63.4	60.8	63.8	81.7	20.0	28.6	27.0	44.3	33.0	42.3
Standard Deviation		84.9	11.3	4.4	6.7	2.3	19.6	17.3	67.1	25.9	30.3	26.0	28.0	36.0	7.1	12.5	12.7	16.2	13.7	15.7
Coefficient of Variance		11.6	18.6	17.5	27.5	15.6	4.9	8.6	13.1	15.1	2.5	7.9	10.6	9.1	28.9	45.2	46.6	38.8	44.1	37.1
<b>Continued</b>																				
Species	character	e	f	h1	h2	1a	1b	1c	2a	2b	2c	3a	3b	3c	4a	4b	4c	ps1	ps2	ps3
Thailand 1		49.4	62.4	33.8	52.7	5.3	5.3	8.0	6.7	8.0	6.7	8.0	8.0	10.6	9.3	12.0	8.0	6.7	12.0	18.6
Thailand 2		49.4	57.2	49.4	28.6	5.3	6.7	9.3	6.7	13.3	6.7	8.0	8.0	6.7	9.3	12.0	8.0	6.7	16.0	13.3
Thailand 3		23.4	33.6	26.0	18.7	6.2	6.9	10.5	7.2	10.9	6.8	8.1	7.7	9.1	9.5	12.1	8.5	7.3	15.1	15.1
Thailand 4		21.6	30.3	24.3	14.2	7	8.8	14.2	7.7	11.5	6.9	8.3	7.1	10.1	9.4	14.7	9.6	8.6	17.8	13.3
Average		36.0	45.9	33.4	28.6	6.0	6.9	10.5	7.1	10.9	6.8	8.1	7.7	9.1	9.4	12.7	8.5	7.3	15.2	15.1
Standard deviation		15.5	16.3	11.5	17.2	0.8	1.4	2.7	0.5	2.2	0.1	0.1	0.4	1.7	0.1	1.3	0.8	0.9	2.4	2.5
Coefficient of Variance		43.0	35.5	34.4	60.1	13.3	20.3	25.7	7.0	20.2	1.5	1.2	5.2	18.7	1.1	10.2	9.4	12.3	15.8	16.5
Mexico 1		25.4	33.6	30.1	16.1	8.5	11.4	11.8	10.1	12.0	9.9	14.8	9.8	9.9	10.4	13.5	11.5	8.5	15.4	14.2
Mexico 2		25.1	30.6	28.5	15.4	7.2	9.2	8.9	8.7	12.1	8.9	10.3	9.3	11.7	9.3	10.5	11.1	6.1	16.2	13.9
Mexico 3		25.0	31.1	32.9	12.6	7.3	7.4	10.8	9.7	13.6	9.7	8.6	7.5	13.4	12.1		10.2	7.0	12.6	13.3
Mexico 4		25.9	32.3	30.1	15.7	6.9	9.4	8.8	8.7	13.8	9.1	10.7	7.4	11.0	9.1	15.2	11.7	8.1	17.2	14.5
Average		25.4	31.9	30.4	15.0	7.5	9.4	10.1	9.3	12.9	9.4	11.1	8.5	11.5	10.2	13.1	11.1	7.4	15.4	14.0
Standard deviation		0.4	1.3	1.8	1.6	0.7	1.6	1.5	0.7	1.0	0.5	2.6	1.2	1.5	1.4	2.4	0.7	1.1	2.0	0.5
Coefficient of Variance		1.6	4.1	5.9	10.7	9.3	17.0	14.9	7.5	0.8	5.3	20.7	14.1	13.0	13.7	18.3	6.3	14.9	1.3	3.6
<b>Statistic Analysis of the combined populations (continued)</b>																				
Average		30.9	37.2	30.4	25.4	6.7	8.5	11.0	7.3	11.7	6.6	7.8	7.1	10.2	8.1	11.4	8.8	7.2	14.2	13.7
Standard Deviation		11.7	13.2	9.1	16.3	2.9	4.7	5.6	2.6	4.3	3.2	4.1	2.5	4.1	3.8	3.9	3.0	2.7	4.3	4.0
Coefficient of Variance		38.1	33.4	24.5	61.5	16.4	23.5	19.4	15.9	16.0	17.3	25.0	12.3	19.4	10.2	13.2	15.0	12.2	13.1	12.4

Values in bold are the averages of the measurements of characters in the population from the same column.  
Key: White: data set. Highlighted light gray: statistical analysis of both populations. Middle gray: CV higher than 25%. Dark grey: Analysis of combined populations  
Variation within the populations: There is a CV of 30.8% in the Thai population, 10.3% in the Mexican population. This means that the high variation is mainly caused by the Thai mite population.



<i>P. flechtmanni</i> WICHT, 1970	<i>P. flechtmanni</i> GAO, ZOU & MA, 1988 <i>P. muscarius</i> MARTIN, 1978
$d > cl$ $2b \approx 2a$ $ps2 < ps1 * 2$	$d \leq cl$ $2b > 2a$ $ps2 \approx ps1 * 4$

Key: > greater than; < smaller than;  $\leq$  smaller than or equal to;  $\approx$  about the same size as; \* multiply by.

## 2. Statistical analysis

The statistical analysis of data collected in the Thailand and Mexico populations (Table 3) resulted in 12 out of 39 characters (highlighted middle gray) with a Coefficient of Variance (CV) higher than 25%. This means that 30.8% of the total number of characters appears to be different between the two populations. Ten out of these are opisthosomal dorsal setae, traditionally used as species-determining criteria. However, the variation is highest within the Thailand population only and not between the two populations. I suggest that this size variation be the consequence of environmental and nutritional factors in Thailand, and subsequently of no taxonomic relevance and therefore that the two populations of Thailand and Mexico represent the same species.

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