

## *Periacineta mexicana* n. sp. (Ciliophora, Suctorina, Discophryida), Epizoic on Mexican Backswimmers of the Genus *Buenoa* (Insecta, Hemiptera, Notonectidae)

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**ABSTRACT.** A new species of suctorian in the genus *Periacineta*, epibiotic on aquatic bugs (Hemiptera, Heteroptera, Nepomorpha), is described on the basis of morphological characteristics of the cell body, lorica, tentacular placement, and stalk, and its 18S rRNA partial sequence gene. *Periacineta mexicana* n. sp. is a loricate suctorian with elongate body and rounded apical region; tentacles are distributed randomly over apical region and not grouped into fascicles. Macronucleus in adult is elongate and located centrally. The suctorian usually forms closely aggregated pseudocolonies. We provide morphological data based on optical and scanning electron microscopy. A comparison with similar congeners, and emended diagnosis of the genus *Periacineta* also are provided. The ciliates were found attached to the first two pairs of legs of Mexican notonectids *Buenoa pallens* and *Buenoa* spp. (backswimmers).

**Key Words.** *Buenoa pallens*, ciliate, epibiont, Mexico, notonectid, *Periacineta* n. sp., suctorian.

**S**UCTORIANS can be found in all types of aquatic habitats attached to a wide diversity of substrates, including plants and invertebrates, such as crustaceans and insects. For example, *Discophrya elongata*, attaches to aquatic plants, gastropods, and beetles, and aquatic true bugs, such as the “water scorpions” *Nepa cinerea* and *Ranatra linearis*. *Periacineta buckei* has been recorded from a similar variety of plants and invertebrates, including the arachnid *Argyona aquatica* (“water spider”) and nepomorphans (the water scorpions *N. cinerea* and the naucorid *Naucoris cimicoides*) (Collin 1912; Dovgal 1988, 1991, 1996; Matthes 1954; Matthes, Guhl, and Haider 1988).

Several species of suctorians other than *D. elongata* and *P. buckei* are epibionts of aquatic true bugs. Some of them are non-specific in their choice of substrates or hosts. For example, *Tokophrya lemnae* has been reported from another type of predatory aquatic hemipteran, *N. cimicoides* (naucorids or “creeping bugs”) (Dovgal 1988, 1991), and from the isopod *Asellus aquaticus* and the crayfish *Astacus leptodactylus* (Fernandez-Leborans and Tato-Porto 2000). By contrast, *Periacineta notonectae* has been found only on herbivorous aquatic hemipterans (corixids or “water boatmen”), and *Discophrya gessneri* which is specific to the naucorid *Aphelocheirus aestivalis* (Aphelocheiridae) (Matthes et al. 1988).

Species of suctorians comprise 7% of all ciliates (Dovgal 2002), but few new species have been described recently (Chen, Song, and Hu 2005; Dovgal and Lozowski 2008; Fernandez-Leborans, Zitzler, and Gabilondo 2006). Fifty-two species of suctorian ciliates have been reported from Mexico, mainly as epibionts of phanerogams, algae, and crustaceans (Aladro-Lubel, Mayén-Estrada, and Reyes-Santos 2006; Aladro-Lubel et al. 2007; Mayén-Estrada and Aladro-Lubel 1998).

In the present paper, a new species of *Periacineta* Collin 1909 is described from the legs of the predatory hemipteran *Buenoa* (Notonectidae or “backswimmers”) collected at two localities in Hidalgo state, Mexico, which represents the first record of epibiotic suctorian for *Buenoa* species. Morphological information from the new species also enabled us to provide an emended diagnosis of the genus *Periacineta*.

### MATERIALS AND METHODS

**Collection, isolation, and microscopical techniques.** The aquatic true bugs were collected with a 0.5 mm mesh dip net at two sites

in Hidalgo state, Mexico: Tecocomulco Lake (19°52'23"N, 98°23'47"W), and a freshwater pond at Tecamatlán (20°10'60"N, 99°04'00"W). Five samples were obtained from Tecocomulco, and six samples from Tecamatlán (Table 1). Some hosts were fixed with 70% ethanol at the sites where they were collected, and others were transported to the laboratory, where they were maintained in aerated aquaria at room temperature. Basibionts were dissected to isolate the leg pairs bearing the ciliates, so that they could be prepared for observation by light and scanning electron microscopy. For light microscopy, body parts of basibionts were fixed in 70% alcohol, stained with Harris hematoxylin, and mounted in Canada balsam. For scanning electron microscopy (SEM), material was fixed in 1% (v/v) glutaraldehyde, transferred to 2.5% (v/v) glutaraldehyde in 0.1 M sodium cacodylate buffer (pH 7.2), critical point dried, and coated with carbon and gold.

Morphological characteristics of suctorians were measured, and the maximum, minimum, mean, and standard deviation were calculated for each set of measurements. The distribution of ciliates on areas of basibionts was recorded and the prevalence was calculated following Margolis et al. (1982).

**DNA extraction, PCR amplification, and sequencing.** Total genomic DNA was isolated from water bugs preserved in 70% ethanol; tissue was taken from the leg, and DNA was isolated using commercial DNeasy Blood & Tissue kit (Qiagen). The mitochondrial region cytochrome oxidase 1 (*cox-1*) was amplified and sequenced. Universal primer sequences used for PCR, corresponded to those designed by Lunt et al. 1996 (UEA7 for-

Table 1. Prevalence of *Periacineta mexicana* n. sp. on three hosts reported by dates on which samples were taken

	<i>Buenoa</i> sp. 1 (n = 39)	<i>Buenoa</i> sp. 2 (n = 199)	<i>Buenoa pallens</i> (n = 53)
2005 February	—	—	9 (17.0)
March	—	—	7 (13.2)
April	—	—	12 (22.6)
May	—	—	10 (18.8)
July	—	—	8 (15.1)
August	—	—	7 (13.3)
2006 October	3 (7.7)	38 (19.1)	—
2007 March	16 (41.0)	41 (20.6)	—
September	14 (35.9)	40 (20.1)	—
December	6 (15.4)	40 (20.1)	—
2008 March	0	40 (20.1)	—

Data without parentheses are numbers of individual hosts in each sample, and data enclosed in parentheses are percentages of hosts bearing suctorians.

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Table 2. Measurements of *Periacineta mexicana* n. sp. from two localities

	Tecocomulco	Tecomatlán
Length of cell	119.4 ± 23.8 (75.6–168.0) n = 49	117.7 ± 23.6 (84.0–162.4) n = 35
Width of cell	39.8 ± 13.5 (22.4–84.0) n = 49	40.1 ± 14.7 (25.2–84.0) n = 35
Length of lorica	82.7 ± 16.7 (51.9–115.5) n = 50	79.0 ± 15.7 (57.7–111.6) n = 50
Width of lorica	39.8 ± 13.5 (22.4–84.0) n = 49	40.1 ± 14.7 (25.2–84.0) n = 35
Length of macronucleus	54.8 ± 12.8 (28.0–84.0) n = 49	54.0 ± 13.0 (28.0–84.0) n = 35
Width of macronucleus	6.8 ± 2.4 (2.8–14.0) n = 49	6.6 ± 2.3 (2.8–11.2) n = 35
Length of stalk	11.1 ± 3.2 (5.6–17.5) n = 21	9.9 ± 2.3 (5.6–14.0) n = 20
Width of stalk	10.8 ± 4.1 (5.6–24.5) n = 21	8.2 ± 1.3 (5.6–11.2) n = 20
Length of tentacles	35.1 ± 5.5 (25.2–44.8) n = 73	36.3 ± 5.1 (28.0–44.8) n = 50
Height of pseudocolony	330.0 ± 82.7 (200.6–519.2) n = 30	503.8 ± 205.5 (247.8–826.0) n = 30

All measurements are in micrometers. For each measurement, the mean and standard deviation are followed by the range in parentheses.

ward, UEA10 reverse). We followed PCR protocols of Schaefer and Renner (2008). For suctorian species, we isolated DNA from pseudocolonies (10–20 cells) detached from aquatic bugs (*Buenoa* spp.) recollected during January 2010, and fixed in 96% ethanol. The DNA was extracted following the protocol of Chelex 100 Extraction Procedure for Live Ciliates (D. Lynn, pers. commun.). The PCR amplification of 18S rRNA gene was performed following the procedure described by Puitika et al. 2007, using CS322F and EU929R primers, and using RED Taq (Sigma, Toluca, Mexico).

All PCR products were purified using Centrisep columns. Amplified region were sequenced in both directions using the BigDye Terminator Cycle Sequencing kit (Applied Biosystems Inc., Foster City, CA, USA) in an ABI PRISM 3100 automated DNA sequencer (Applied Biosystems Inc.). The sequences were analyzed with BIOEDIT and submitted to GenBank databases.

## RESULTS

**Description (Tables 1–3 and Fig. 1–19).** We observed this species as solitary individuals (Fig. 6, 10, 11, 18b–c) and as individuals aggregated into pseudocolonies (Fig. 1–3, 15–17, 18e). The lorica fits the cell body closely (Fig. 9–13, 18a), and the rounded, apical part of the cell, usually protrudes beyond the aperture of the lorica, sometimes to half of its length (Fig. 8–9, 12, 14–15). Tentacles are long, slender, and clavate. They are dis-

tributed randomly over the apical region, rather than being in fascicles (Fig. 1–2, 4–5, 7–9, 11); actinophores are absent. The lorica is conical, with the aperture splayed outward and usually slightly curved laterally (Fig. 2, 5, 7, 9–10, 12). Transverse ridges (16–40 in number) are characteristic of the lorica wall (Fig. 2, 10, 16). The stalk is short and broad (Fig. 1–2, 10), especially at the base, and is noticeably wide in relation to size of the cell in the youngest individuals (Fig. 6, 18b). With SEM, it can be seen an apical widening of the stalk (physon) (Fig. 6), the upper edge of which overlaps the zone where the stalk joins the lorica.

A single contractile vacuole was observed in the apical region of the cell (Fig. 18a). The macronucleus is located centrally, and is spherical in immature cells (Fig. 11). In mature cells, it is elongate and widened apically, oriented parallel to the long axis of the cell, and two-thirds as long as the cell (Fig. 10, 12–13, 15, 18a). Asexual reproduction is by inversogemmlic budding that takes place in the apical zone of the cell (data not shown).

Hyperphoretic pseudocolonies (Fig. 1–3, 15–17, 18e) presumably are formed by swarms settling on trophants already attached to the host. This is a characteristic peculiar to this species. Usually, the largest, most basally located individual in the pseudocolony was attached to the surface of the host leg or at the base of a setae, and from two to six secondarily attached individuals were attached laterally or apically to the lorica of this basal individual (Fig. 1–3, 15–16). This results in erect racemose

Table 3. Distribution and prevalence of *Periacineta mexicana* n. sp. on the appendages of three species of *Buenoa*

	<i>Buenoa</i> sp. 1 (n = 39)		<i>Buenoa</i> sp. 2 (n = 199)		<i>Buenoa pallens</i> (n = 53)	
	Pseudocolony	Solitary	Pseudocolony	Solitary	Pseudocolony	Solitary
Anterior femur	1 (2.5)	3 (7.7)	29 (14.6)	13 (6.5)	2 (3.7)	4 (7.6)
Anterior tibia	10 (25.6)	9 (23.1)	51 (25.5)	62 (31.2)	13 (24.4)	11 (2.8)
Anterior tarsus	1 (2.5)	5 (12.8)	3 (1.5)	70 (35.1)	1 (1.8)	6 (11.4)
Middle femur	4 (10.2)	11 (28.2)	27 (13.5)	78 (39.2)	6 (11.3)	15 (28.3)
Middle tibia	0	22 (56.4)	14 (7.0)	106 (53.3)	2 (3.7)	18 (34.0)
Middle tarsus	1 (2.5)	13 (33.3)	0	108 (54.4)	2 (3.7)	15 (28.4)
All regions	14 (35.9)	17 (43.5)	67 (33.6)	93 (46.7)	32 (60.5)	13 (24.5)

Data without parentheses are the numbers of individuals that hosted suctorians; data in parentheses are frequencies of hosts with suctorians attached (%).

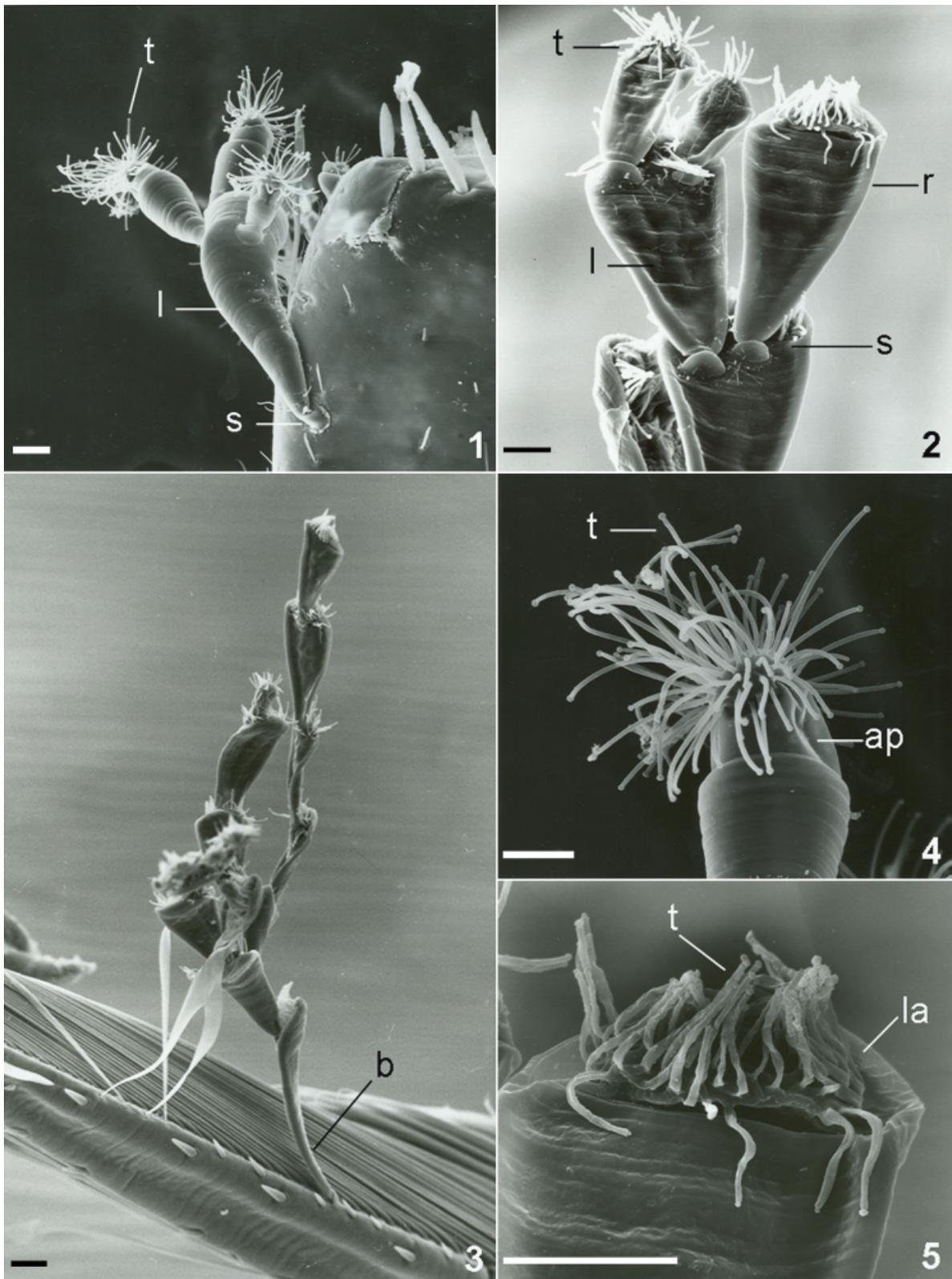


Fig. 1–5. Scanning electron micrographs of *Periacineta mexicana* n. sp. attached to *Buenoa* spp. 1–3. Pseudocolonies. 4–5. Detail of individuals. ap, apical part of cell; b, basal individual; l, lorica; la, lorica aperture; r, ridges; s, stalk; t, tentacles. Scale bars = 24 μm.

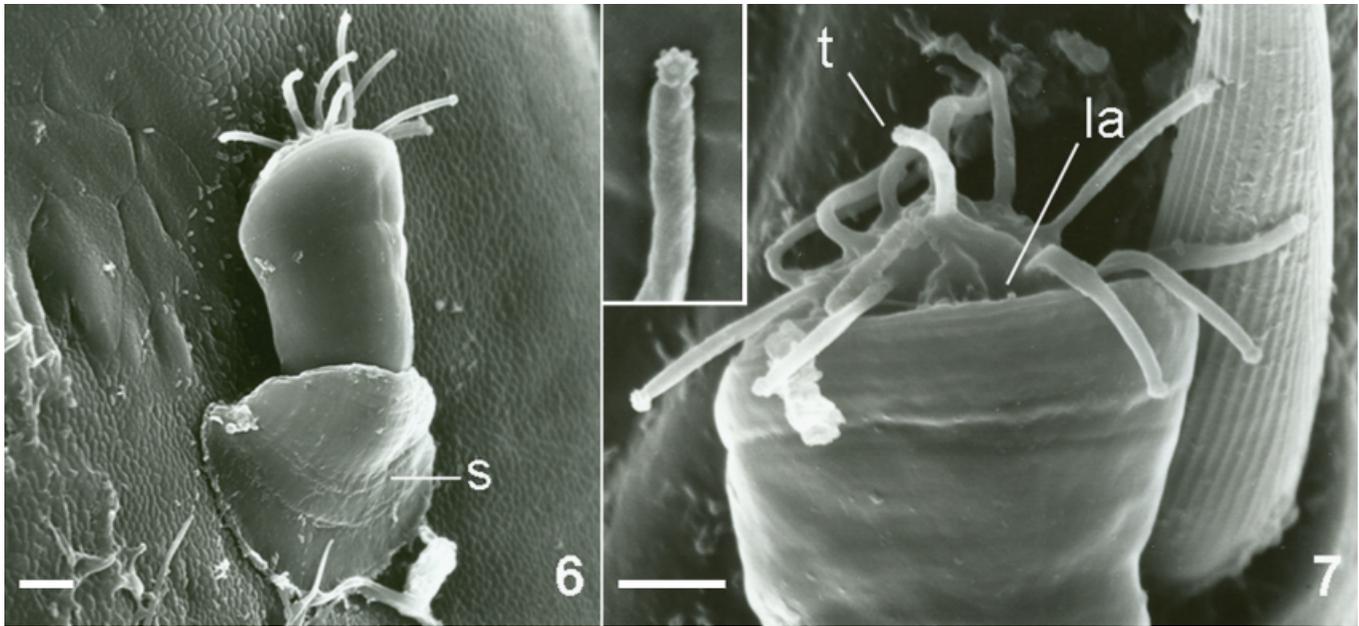


Fig. 6–7. Scanning electron micrographs of *Periacineta mexicana* n. sp. attached to *Buenoa* spp. 6. Young individual showing stalk (s). 7. Detail of lorica aperture (la) and tentacles (t). Scale bars = 5  $\mu$ m.

pseudocolonies, consisting of up to 32 individuals and measuring 200–826  $\mu$ m in height. An endogemmine suctorian *Acineta* sp. (Fig. 17) was commonly attached to these pseudocolonies.

**Sequences.** The GenBank accession numbers of the mitochondrial region cytochrome oxidase 1 (*cox-1*) partial sequences, of each of the three species of *Buenoa* are the following: HM357718 (*Buenoa* sp. 1); HM357719 (*Buenoa* sp. 2), and HM357720 (*Buenoa pallens*). For suctorian species *Periacineta mexicana* n. sp., the accession number of the partial sequence of 507 bp of the 18S rRNA gene (43% GC) is HM357721. The closest sequences in the GenBank database using BLASTN program were the following: *Heliohrya erhardi* (91%) (clones 1, 2, 3, 4, and 5; accession numbers: AYY007445.1, AYY007446.1, AYY007447.1, AYY007448.1, AYY007449.1); *Prodiscophrya* sp. (90%) (clones 1 and 2, accession numbers: AYY331802.1, AYY331803.1), and *Discophrya colini* (90%) (accession number L26446.1).

## DISCUSSION

**Comparison with congeners.** Most species of *Periacineta* have the tentacles grouped in two fascicles, and other than *P. mexicana* n. sp., only *Periacineta hydrochi* and *Periacineta koeppli* have the tentacles distributed randomly over the apical region of the cell (Table 4). However, the new species differs from *P. koeppli*, by having a ridged conical lorica instead of a smooth fan-shaped lorica, an ovoid macronucleus located centrally, and a short stalk with a physon. Finally, the new species readily forms pseudocolonies composed of three to six or more individuals; it associates with members of the genus *Buenoa* (Notonectidae), which is limited to a geographical range extending from southern portions of the Nearctic region in Canada through the United States to the Neotropical region of Mexico, Central America, South America, and the West Indies (Truxal 1953). In comparison, only one other species, *Periacineta gyrini*, has been reported to form a pseudocolony, and this was a single instance of a pseudocolony that consisted of only two individuals. Moreover, *P. gyrini* differs markedly in morphology from *P. mexicana* by the tentacles arrangement in fascicles, trapeziform shape of lorica,

and associates with *Gyrinus aeratus*, a whirligig beetle that has a strictly Holarctic distribution in Canada, Alaska, New York, and European countries. Based on these differences we establish the new species *P. mexicana* n. sp.

**Distribution and prevalence on hosts.** *Periacineta mexicana* n. sp. was restricted to the anterior and middle legs of *Buenoa* sp. 1 and *Buenoa* sp. 2 (Fig. 19) and *B. pallens*, and only to the femurs, tibiae, and tarsi of these legs. The frequency of infestation by solitary and pseudocolonial *P. mexicana* combined ranged from 79–85%. The anterior tibia, middle femur, and middle tibia were the segments with the highest overall prevalence of attached suctorians followed by the middle tarsus (Table 3). Pseudocolonies were less frequent on the two species of *Buenoa* collected from the type locality (35.9% for *Buenoa* sp. 1 and 33.6% for *Buenoa* sp. 2), compared to *B. pallens* from Tecamatlán pond, 60.5% of which harboured pseudocolonies. In all three species of *Buenoa* the anterior tibia was the segment with the highest frequency of pseudocolonies.

The restricted distribution of suctorians to anterior and middle pairs of legs of *Buenoa* species could result from two factors: (a) function and architecture of legs, and (b) the degree to which they are exposed to water. The anterior and middle pairs of legs, usually are folded against the body (Fig. 19), are used for feeding functions, and move less vigorously than the posterior pair of legs, which are used for swimming, possess numerous setae, are unfolded, and therefore are more exposed to a more forceful flow of water that could hinder the trophont's ability to capture prey.

According to Dovgal (2002) and Lynn (2008), species of suctorians in the family Periacinetidae, which includes genera *Periacineta*, *Kormosia*, *Elatodiscophrya*, and *Peridiscophrya*, can be distinguished by the presence of a lorica or stylothea, a laterally flattened trophont, a ribbon-like or ramified macronucleus, and clavate tentacles arranged in fascicles. However, the tentacles are spread over the apical region of the cell in *P. koeppli* and *P. hydrochi*, and not in fascicles, which differs from the character state that is considered critical in family diagnosis.

Collin (1909) proposed the new genus *Periacineta* for those species that lack a stalk and have a lorica like that of *Solenophrya*

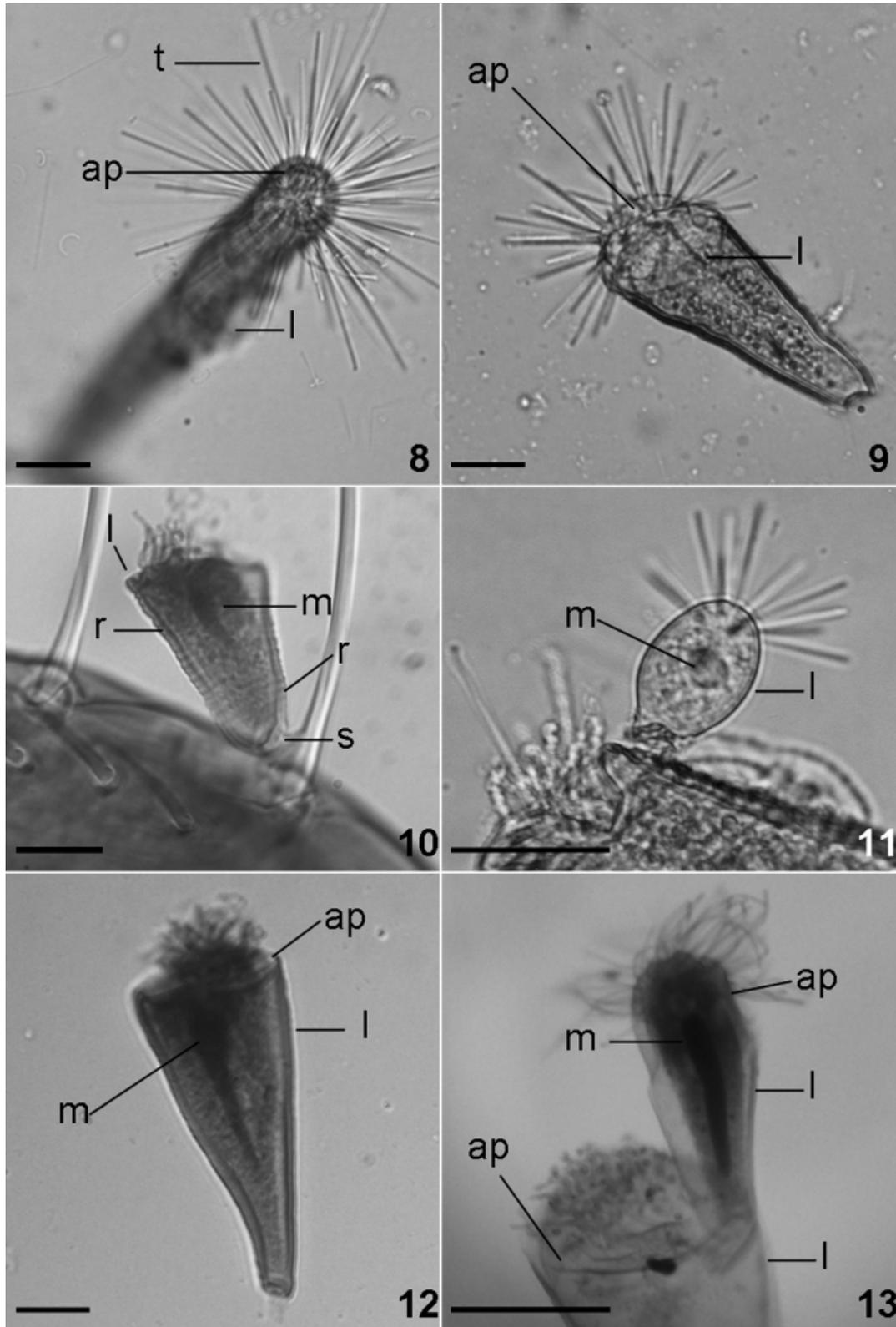


Fig. 8–13. Light photomicrographs of *Periacineta mexicana* n. sp. attached to *Buenoa* spp. 8–9, 11. Living individuals. 10, 12, 13. Individuals stained with Harris hematoxylin. 11. Young living individual. ap, apical part of cell; l, lorica; m, macronucleus; r, ridges; s, stalk; t, tentacles. Scale bars = 30 μm.

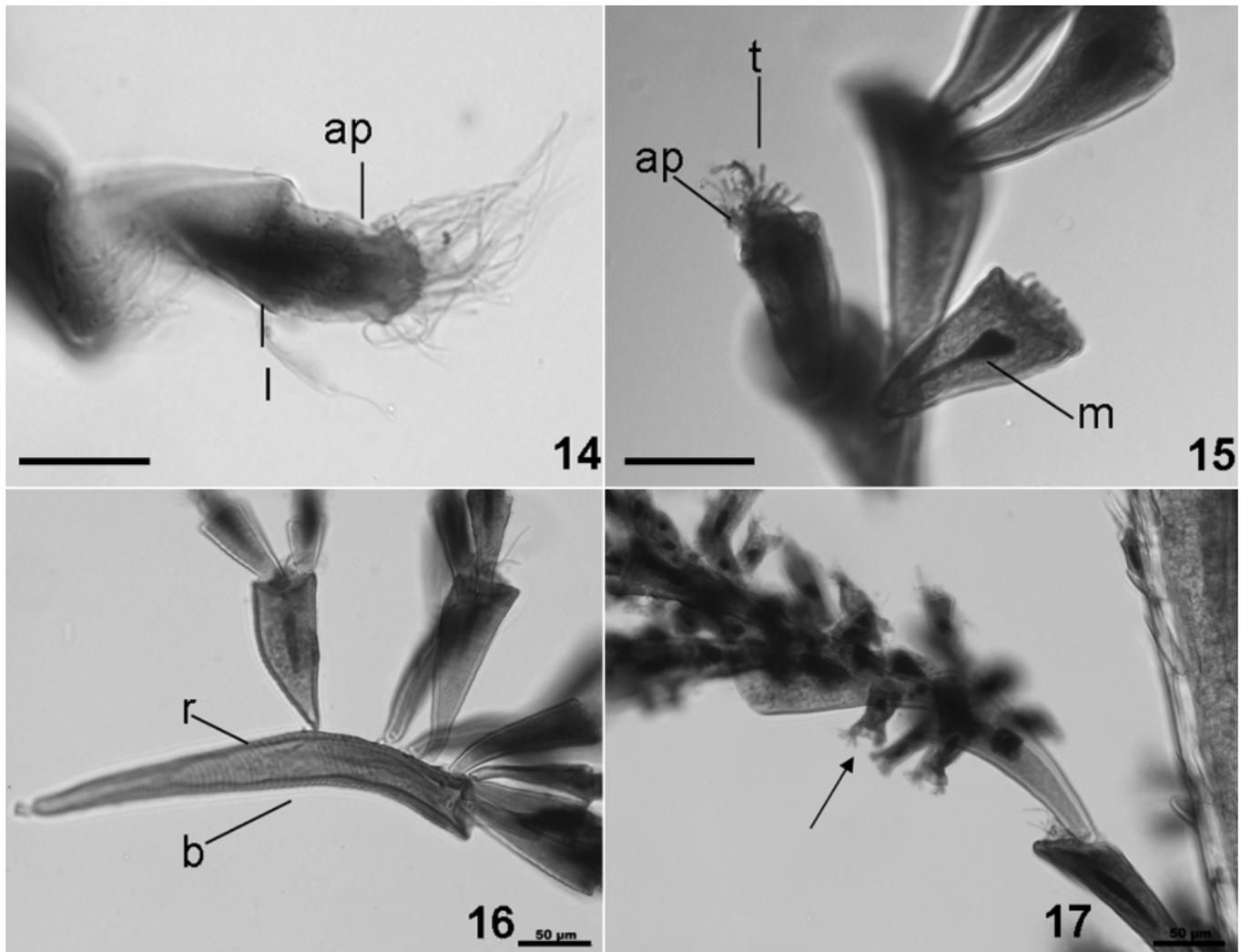


Fig. 14–17. Light photomicrographs of *Periacineta mexicana* n. sp. attached to *Buenoa* spp. Individuals stained with Harris hematoxylin. 14. Detail of individual. 15, 16. Pseudocolonies. 17. Pseudocolony showing *Acineteta* sp. (arrow) attached to *P. mexicana*. ap, apical part of cell; b, basal individual; l, lorica; m, macronucleus; r, ridges; t, tentacles. Scale bars = 50 µm.

that attaches to the substrate with the lorica protuberance itself (i.e. thecostyle). Jankowski (1981) evaluated Collin's diagnosis and reported that all species of the genus have a stalk, and concluded that the genus *Periacineta* must be conserved for the "Acineteta-like discophryids." He considered *Podophrya buckei* Kent, 1880 as the type species of the genus, but did not present a diagnosis of the genus. Jankowski (1981) and Dovgal (2002) included *P. koeppli* in the genus *Periacineta*. However, all species of *Periacineta* except *P. koeppli* have a stalk for which we transfer *P. koeppli* to genus *Kormosia*.

Jankowski (1981, 2007) included two subgenera within *Periacineta*: *Fitonacineta* Jankowski 1981 for species with a single contractile vacuole and *Periacineta* Collin 1909 sensu stricto for species with several contractile vacuoles. However, Matthes et al. (1988) reported that the number of contractile vacuoles varies in the type species of *Fitonacineta*, making this character invalid for taxonomic use in this instance. In any event, establishment of subgenera of protists is generally of no practical use.

Also, Jankowski (1981) proposed three new genera (i.e. *Anisarcon*, *Arcodiscophrya*, and *Tomodiscophrya*) for some species that he removed from *Periacineta*, but these genera were made junior synonyms of *Periacineta* by Dovgal (2002). Matthes et al.

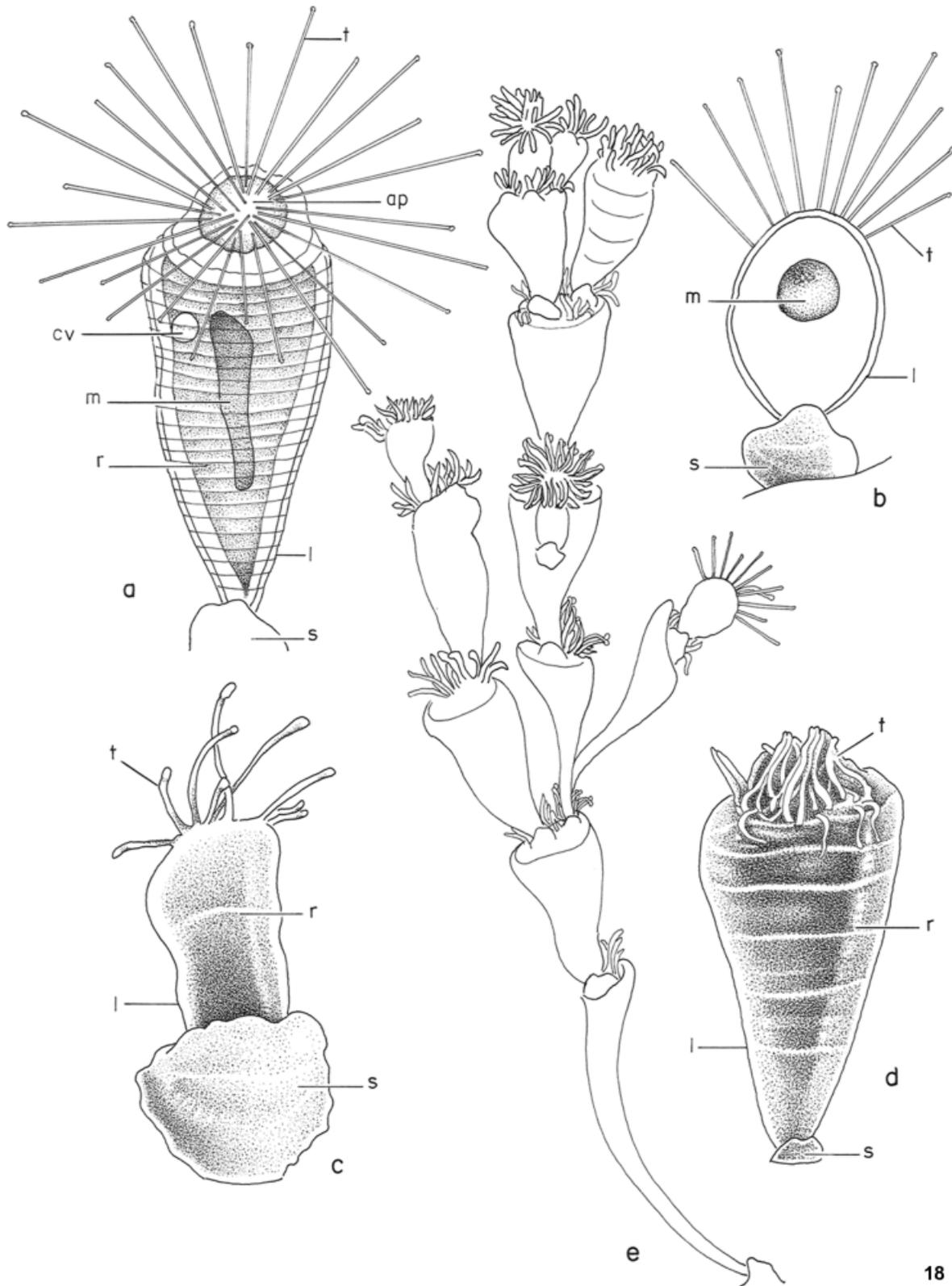
(1988) did not include *Periacineta* in their guide to identification of freshwater suctorians because they place both loricate and aloricate discophryid species into the genus *Discophrya* Lachmann, and synonymized *Periacineta urceolata* and *Periacineta periacinetoides* with *Periacineta buckei*. Also, the genus *Periacineta* is considered a junior synonym of *Discophrya* in the catalogue of generic names of ciliates compiled by Aescht (2001).

Considering the absence of an actual diagnosis of the genus and our description of a new species, we offer an emended diagnosis of the genus *Periacineta*.

Order Discophryida Jankowski, 1975  
Family Periacinetidae Jankowski, 1978

***Periacineta* Collin 1909 emend**

**Emended diagnosis.** Loricate discophryid suctorians that attach to the substrate with stalk clearly separated from the bottom of the lorica, instead of a thecostyle. Lorica and cell body laterally flattened or not flattened; shape conical. Lorica smooth or striated. Tentacles clavate, arranged in fascicles or evenly distributed over apical part of cell body. Macronucleus ovoid, elongate or somewhat branched in its apical part. With one or several contractile



18

Fig. 18. Schematic drawings of *Periacineta mexicana* n. sp. attached to aquatic *Buenoa* spp. **a.** Detailed morphology of cell. **b, c.** Younger individuals. **d.** Loric surface with ridges. **e.** Diagram of pseudocolony organization showing the attachment sites. ap, apical part of cell; cv, contractile vacuole; l, lorica; m, macronucleus; r, ridges; s, stalk; t, tentacles.

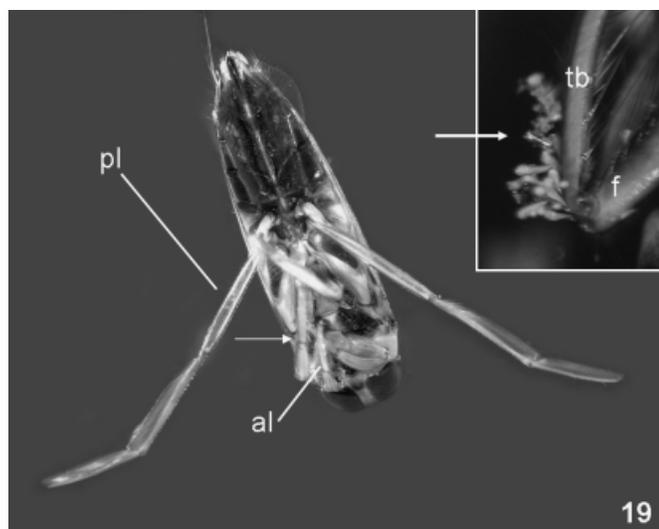


Fig. 19. Individual of *Buenoa* sp. 2 with *Periacineta mexicana* n. sp. attached. Black arrow indicates middle pair of legs. Insert shows a pseudocolony of *P. mexicana* (white arrow) on anterior pair of legs. al, anterior pair of legs; f, femur; pl, posterior pair of legs; tb, tibia.

vacuoles. Freshwater periphytes and epibionts of invertebrates, mainly insects.

**Differential diagnosis.** Species of *Periacineta* differ from representatives of the related genera *Kormosia* Dovgal 2002, *Elatodiscophrya* Jankowski, 1978, and *Peridiscophrya* Nozawa, 1938, by possessing a stalked lorica instead of a thecostyle.

**Species composition.** *Periacineta buckei* (Kent, 1882) (type species), *P. gyrini* Dovgal, 1993, *P. heraldica* (Jankowski 1981), *P. hydrochi* (Matthes 1954), *P. laccophili* (Matthes 1954), *P. molesta* (Matthes 1954), *P. notonectae* (Claparède et Lachmann, 1859), *P. paratuberosa* (Nie et Ho, 1943), *P. striata* Dovgal, 1993 and *P. mexicana* n. sp.

#### *Periacineta mexicana* n. sp.

**Diagnosis.** Loricatae suctoriana, with elongate, conical body (76–168 µm long by 22–84 µm wide), and rounded apical region that protrudes from the lorica for varying distances up to one-half of the length of the entire body. With 10–32 tentacles measuring 25–45 µm in length, distributed randomly over the apical region, and not grouped into fascicles and without actinophores. Macro-

nucleus in adults, elongate (28–84 µm long, 3–14 µm wide), located centrally and parallel to long axis of body. Lorica conical with transverse ridges, measuring 52–116 µm long by 22–84 µm wide. Stalk wide and short (6–18 µm long by 6–25 µm wide) with a prominent basal disc. Usually occurring as hyperphoretic pseudocolonies consisting of two to six or more individuals. Attached to the first two pairs of legs of *B. pallens*, *Buenoa* sp. 1, and *Buenoa* sp. 2 from Hidalgo, Mexico.

**Etymology.** The specific name reflects the geographical distribution of the species in Mexico.

**Type locality and host.** Adult aquatic true bug *Buenoa* sp. 2 (Hemiptera, Heteroptera, Notonectidae), surfaces of the first two pairs of legs, from type locality, Tecocomulco Lake (19°52'23"N, 98°23'47"W).

**Other localities and hosts.** *Buenoa* sp. 1; Mexico, Hidalgo, Tecocomulco Lake, and *B. pallens*; Mexico, Hidalgo, pond at Tecamatlán (20°10'60"N, 99°04'00"W).

**Deposition of type material.** A hapantotype slide of *P. mexicana* (registry number LP/IHNGo-001) has been deposited in the slide collection of the Laboratorio de Protozoología, Facultad de Ciencias, Universidad Nacional Autónoma de México. Also 13 paratype slides (registration numbers LP/IHNGo-002–014) have been deposited in the same collection. Two paratype slides have been deposited at Natural History Museum, London, UK, registration number 2009:8:18:1, and 2009:8:18:2.

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Table 4. Comparison of *Periacineta mexicana* n. sp. with other species of *Periacineta*.

Species	Arrangement of tentacles	Stalk	Shape of lorica	Striations on lorica	Macronucleus	Pseudocolonies presence	Hosts
<i>P. buckei</i>	Two fascicles	Short	Trapeziform	None, smooth	Rounded to elongated	No	Hemipterans, coleopterans, mollusks, aquatic plants
<i>P. gyrini</i>	Two fascicles	Short	Trapeziform	None, smooth	“Ψ” shaped	Yes <sup>a</sup>	Gyrinid coleopterans
<i>P. heraldica</i>	Two fascicles	Short	Shovel shaped	Striated	“c” shaped	No	Coleopterans
<i>P. hydrochi</i>	Random on apical region	Short	Fan shaped	Striated	“c” shaped	No	Coleopterans
<i>P. laccophili</i>	Two fascicles	Short	Trapeziform	None, smooth	“y” shaped	No	Coleopterans
<i>P. molesta</i>	Two fascicles	Short	Trapeziform	None, smooth	Enlarged	No	Coleopterans
<i>P. notonectae</i>	Two fascicles	Short	Conical	None, smooth	Enlarged	No	Corixid hemipterans
<i>P. paratuberosa</i>	Two fascicles	Short	Trapeziform	None, smooth	Enlarged	No	Shrimps
<i>P. striata</i>	Two fascicles	Short	Trapeziform	Striated	Enlarged	No	Coleopterans
<i>P. mexicana</i> n.sp.	Random on apical region	Short	Conical	Striated	Enlarged	Yes	Notonectid hemipterans

<sup>a</sup>Pseudocolony of two individuals; observed only once.

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