Two new species of Cypricercinae McKenzie, 1971 (Crustacea: Ostracoda) from Thailand

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Abstract. Two new species of the subfamily Cypricercinae McKenzie, 1971 are described from the Western part of Thailand: *Pseudostrandesia ratchaburiensis* sp. nov. and *Strandesia prachuapensis* sp. nov. *Pseudostrandesia ratchaburiensis* sp. nov. is mainly characterized by a flange on the antero-ventral part of the left valve (LV), a markedly large β seta on the mandibular (Md) palp, serrated bristles on the third endite of the maxillula (Mx1), a slender caudal ramus (CR) with a long claw Ga (length ca half that of the ramus) and a relatively low number (13) of spiny whorls in the Zenker’s organ. The discovery of both males and females of *Pseudostrandesia ratchaburiensis* sp. nov. in the present study constitutes the first report of a sexual population in this genus, thereby allowing for a comparison of the male reproductive organs (hemipenis and Zenker’s organ) from a new species with those of other genera of Cypricercinae. *Strandesia prachuapensis* sp. nov. is most closely related to *Strandesia odiosa* (Moniez, 1892) and *Strandesia flavescens* Klie, 1932 as they bear similar anterior flanges on the right valve (RV). The key diagnostic features of the new *Strandesia* species are a large carapace (ca 1.5 mm), an angulated antero-ventral part of the LV, a weak and small anterior inner list on the LV, an anterior flange on the RV, a markedly small aesthetasc Y on the second antenna, a large β seta on the Md-palp, smooth bristles on the third endite of the Mx1 and a slender CR with a short claw Ga (length ca ⅓ of the ramus). In addition, *Pseudostrandesia complexa* (Victor & Fernando, 1981) comb. nov. is here proposed.

Keywords. Taxonomy, biodiversity, Southeast Asia, *Strandesia*, ostracods.

Introduction

The subfamily Cypricercinae McKenzie, 1971 presently consists of 11 genera (Meisch *et al.* 2019): *Astenocypris* G.W. Müller, 1912, *Bradleycypri* McKenzie, 1982, *Bradleystrandesia* Broodbakker, 1983, *Bradleytriebella* Savatalintont & Martens, 2009, *Cypricercus* Sars, 1895, *Diaphanocypris* Wurdig & Pinto, 1990, *Nealecypris* Savatalintont & Martens, 2009, *Pseudostrandesia* Savatalintont & Martens, 2009, *Spirocypris* Sharpe, 1903, *Strandesia* Stuhlmann, 1888 and *Tanyocypris* Triebel, 1959. The most diverse genus is *Strandesia*, with 97 species worldwide (Meisch *et al.* 2019). The key character of subfamily Cypricercinae is the presence of a Triebel’s loop on the caudal ramus attachment while the
generic characters are restricted to the valve morphology, e.g., a marginal groove along the ventral margin of the left valve, a number of inner lists, and also the soft parts, such as the structure of the caudal ramus and caudal ramus attachment, the presence/absence of a d-seta on the first thoracopod (T1) and the morphology of the hemipenis (Savatenalinton & Martens 2009a, 2009b). In Thailand, Cypricercinae is the most diverse subfamily, which comprises 23 species in seven genera: Astenocypris, Bradleycypris, Bradleystrandesia, Bradleytriebella, Pseudostrandesia, Strandesia and Tanycypris (Savatenalinton & Suttajit 2016; Savatenalinton 2017). Recently, three cypricercine species were described as new from the country: Strandesia martensi Savatenalinton, 2015, Strandesia pholpunthini Savatenalinton, 2015 and Tanycypris eugenkempfi Savatenalinton, 2017 (see Savatenalinton 2015, 2017). The two most diverse cypricercine genera in Thailand are Strandesia and Pseudostrandesia with eight and seven species, respectively. These two genera are close as they share several aspects, e.g., the morphology of the caudal ramus attachment and the hemipenis (see Savatenalinton & Martens 2009b). One of the primary distinguishing characters is the occurrence of a d-seta on the T1 (present in Strandesia, absent in Pseudostrandesia). The biodiversity of non-marine ostracods in Thailand was studied in several parts of the country, mainly in the northern and northeastern parts, while other parts are still ill-investigated, such as the western part which comprises five provinces: Kanchanaburi, Tak, Prachuap Khiri Khan, Phetchaburi and Ratchaburi. The present contribution deals with two new species of Cypricercinae, which were found in the western part of Thailand.

**Material and methods**

Forty-five water bodies in the western part of Thailand were investigated in the years 2018–2019. Ostracod samples were taken with a hand net (mesh size 200 µm), instantly preserved in 70% ethanol. In the laboratory, specimens were sorted using a binocular microscope, soft parts were dissected in glycerine under a stereo microscope (Olympus SZ-PT) and later sealed on glass slides. Valves were stored dry in micropalaeontological slides. Soft parts were drawn using a camera lucida attached to a compound microscope. Carapaces and valves were observed and illustrated using a Scanning Electron Microscope (JEOL JSM6460LV – at the Faculty of Science, Mahasarakham University, Thailand). The chaetotaxy of the limbs follows the model proposed by Broodbakker & Danielopol (1982), revised for the A2 by Martens (1987) and for the thoracopods by Meisch (2000). The classification of the Cypricercinae follows that proposed by Savatenalinton & Martens (2009b). All type specimens are deposited in the Ostracod Collection in the Faculty of Science, Mahasarakham University, Maha Sarakham, Thailand.

**Abbreviation used in text and figures**

| Abbreviation | Description |
|--------------|-------------|
| A1           | first antenna |
| A2           | second antenna |
| Cp           | carapace |
| CR           | caudal ramus |
| db           | dorsal branch |
| H            | height of valves |
| L            | length of valves |
| LV           | left valve |
| Md           | mandibula |
| Mx1          | maxillula |
| R            | Rome organ |
| RV           | right valve |
| T1           | first thoracopod (maxilliped) |
| T2           | second thoracopod (walking leg) |
| T3           | third thoracopod (cleaning leg) |
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vb  = ventral branch
W   = width of carapace

Repositories
MSU  = Mahasarakham University, Maha Sarakham, Thailand
MSU-ZOC = Ostracod Collection of the Faculty of Science, Mahasarakham University, Maha Sarakham, Thailand

Results

**Taxonomic descriptions**

Class Ostracoda Latreille, 1802
Subclass Podocopa G.O. Sars, 1866
Order Podocopida G.O. Sars, 1866
Suborder Cypridocopina G.O. Sars, 1866
Superfamily Cypridoidea Baird, 1845
Family Cyprididae Baird, 1845
Subfamily Cypricercinae McKenzie, 1971
Tribe Cypricercini McKenzie, 1971

Genus *Pseudostrandesia* Savatenalinton & Martens, 2009

*Pseudostrandesia ratchaburiensis* sp. nov.

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Figs 1–6

Diagnosis

Cp in lateral view elongated (length ca 2.2 times of height) with greatest height situated at one third of length, LV overlapping RV along all free margins, LV with flange on antero-ventral part and one anterior inner list, A1 seven-segmented, A2 with long natatory setae, undivided penultimate segment (in both females and males), Md-palp with long α seta and markedly large β seta, two bristles on third endite of Mx1 serrated, T1 without d-seta, T2 with d1 seta longer (ca two times) than d2 seta, f-seta long (reaching far beyond tip of terminal segment), g1, h1 and h3 setae long (length ca ⅓ of that of h2 claw), T3 with pincer organ, e- and f-setae long, CR slender, length of Ga ca half that of ramus, sa slightly longer than Gp, sp thin and long (reaching tip of ramus), CR attachment stout, with Triebel’s loop, situated at middle of distal part of main branch, db and vb well-developed, right palp of male T1 anteriorly with triangular lobe and two small apical triangular protrusions, hemipenis with medial shield broadly rounded, lateral shield elongated with blunt distal end, postlabyrinthal spermiduct curved, with 2 loops, Zenker’s organ set with 13 spiny whorls, length ca 3.5 times the width.

Differential diagnosis

*Pseudostrandesia ratchaburiensis* sp. nov. is similar to *P. complexa* (Victor & Fernando, 1981) and *P. phetchabunensis* Savatenalinton & Martens, 2010. It differs from *P. complexa* by the more elongated Cp in the lateral view, the large β–seta on the Md-palp, the long g and h3 setae on the T2 and the morphology of the CR. It is obviously distinguishable from *P. phetchabunensis* by the presence of the antero-ventral flange of the LV.

Etymology

The species is named after Ratchaburi Province, where specimens of the new species were discovered.
Type material

Holotype
THAILAND – Ratchaburi Province • ♀ (soft parts dissected in glycerine on a sealed glass slide and valves stored dry in a micropalaeontological slide); Huai Mahat Reservoir, Ban Kha District; 13°27.212′ N, 99°27.721′ E; 20 Oct. 2018; MSU-ZOC.291.

Allotype
THAILAND – Ratchaburi Province • ♂ (stored as the holotype); same collection data as for holotype; MSU-ZOC.298.

Paratypes
THAILAND – Ratchaburi Province • 3 ♀♀ (stored as the holotype); same collection data as for holotype; MSU-ZOC.292 to 294 • 3 ♀♀ (carapaces stored dry in micropalaeontological slides); same collection data as for holotype; MSU-ZOC.295 to 297 • 61 ♀♀, 62 ♂♂ (in 70% ethanol); same collection data as for holotype; MSU-ZOC.302 • 3 ♂♂ (carapaces stored dry in micropalaeontological slides); same collection data as for holotype; MSU-ZOC.299 to 301.

Type locality
A total of 68 female specimens (1 holotype, 67 paratypes) and 66 male specimens (1 allotype, 65 paratypes) were collected at the type locality on 20 Oct. 2018. Accompanying ostracod fauna: Bradleycypris vittata (Sars, 1903), Bradleytriebella decorata (Sars, 1903), Dentocypria chantaranothaii Savatenalinton, 2017, Dentocypria sp., Pseudocypretta maculata Klie, 1932, Pseudostrandesia mamarilorum (Victor & Fernando, 1981), Strandesia hornei Savatenalinton & Martens, 2010, Strandesia kraepelini (Müller, 1906).

Repository
The holotype, allotype and all paratypes are deposited in the MSU-ZOC.

Measurements (in μm)
♀: Cp (n = 3), L = 679–745, H = 318–321, W = 329–336; LV (n = 3), L = 729–745, H = 336–343; RV (n = 3), L = 721–737, H = 336–343.
♂: Cp (n = 3), L = 650–691, H = 307–309, W = 293–295; LV (n = 2), L = 686–691, H = 307–309; RV (n = 2), L = 650–655, H = 304–306.

Description

Female
CP in lateral view (Fig. 1A). Elongated (length ca 2.2 times of height), greatest height situated at one third of length, anterior margin rounded with flange on antero-ventral part of LV, posterior margin more narrowly rounded, LV overlapping RV, especially antero-ventrally, valve surface set with short rim-pore setae.

CP in dorsal view (Fig. 1B). Subelliptical, with greatest width situated slightly behind mid-length, LV overlapping RV anteriorly and posteriorly, anterior and posterior extremities narrowly rounded.

LV in internal view (Fig. 1C, E–F). With groove along ventral margin, dorsal margin gently arched, greatest height situated at one third of length, sloping down to anterior and posterior margin, the former more widely rounded than the latter one, antero-ventral part with flange, ventral margin slightly sinuated
around mid-length, calcified inner lamella relatively wide anteriorly, with one inner list, posteriorly narrower.

RV in internal view (Fig. 1D, G–I). With marginal selvage, calcified inner lamella without inner list, anteriorly broader than posteriorly.

**Fig. 1.** Pseudostrandesia ratchaburiensis sp. nov., ♀. A. Paratype (MSU-ZOC.295). B. Paratype (MSU-ZOC.296). C–I. Holotype (MSU-ZOC.291). A. Cp, right lateral view. B. Cp, dorsal view. C. LV, internal view. D. RV, internal view. E. Posterior part of LV. F. Anterior part of LV. G. Muscle scars of RV. H. Anterior part of RV. I. Posterior part of RV. Scale bars: A–D = 100 μm; E–F, H–I = 50 μm; G = 20 μm. Arrows point toward the anterior end.
A1 (Fig. 3A). First segment with one short, dorso-subapical seta (reaching tip of segment) and two long ventro-apical setae. Second segment slightly wider than long, with one short dorso-apical seta (slightly beyond tip of segment) and long Rome organ. Third segment bearing two setae: one long dorso-apical seta, reaching halfway penultimate segment, and one short ventro-apical seta (reaching tip of next segment). Fourth segment with two long dorsal setae and two subequal, short ventral setae (the longer one reaching slightly beyond tip of next segment). Fifth segment dorsally with two long setae, ventrally with two (one long, one shorter) setae, the shorter one reaching halfway terminal segment. Penultimate segment with four long setae. Terminal segment with three (two long, one short) apical setae and an aesthetasc $y_a$, the latter ca $\frac{4}{5}$ of short apical seta.

A2 (Fig. 3B–C). Exopodite with three (one long, two short) setae, the long one reaching beyond tip of first endopodal segment. First endopodal segment with five long (reaching beyond tip of terminal claws) and one short natatory setae, length of the shortest seta less than halfway penultimate segment, aesthetasc Y long, ventro-apical seta long, reaching beyond tip of terminal segment. Penultimate segment undivided, distally with three serrated claws G1–G3, aesthetasc y2 markedly long (reaching far beyond tip of terminal segment), z1–z3 setae long; this segment medially with two (one long, one shorter) dorsal setae (length of the short one ca $\frac{3}{4}$ of that of the long one) and four ventral setae of unequal length (t1–t4), t4 shortest seta (not reaching tip of segment). Terminal segment (Fig. 3C) with two serrated claws (GM and Gm), g-seta and aesthetasc y3 with accompanying seta, length of Gm ca $\frac{3}{4}$ of that of GM, length of aesthetasc y3 slightly more than half of that of accompanying seta, the latter slightly shorter than Gm, length of seta g ca $\frac{3}{5}$ of that of Gm.

MD-PALP (Fig. 3D). First segment with two large setae (S1 and S2), one slender, long seta and noticeably long, smooth $\alpha$-seta. Second segment dorsally with three unequal long apical setae, length of the shortest ca $\frac{1}{4}$ of that of the longest; ventrally with a group of three long hirsute setae, one shorter hirsute seta and

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**Fig. 2.** *Pseudostrandesia ratchaburiensis* sp. nov., ♂. A. Paratype (MSU-ZOC.299). B. Paratype (MSU-ZOC.300). C–D. Allotype (MSU-ZOC.298). A. Cp, dorso-lateral view. B. Cp, slightly oblique ventral view. C. LV, internal view. D. RV, internal view (idem). Arrows point toward the anterior end. Scale bars: 100 μm.
Fig. 3. *Pseudostrandesia ratchaburiensis* sp. nov. Paratype, ♀ (MSU-ZOC.292). A. A1. B. A2. C. Terminal segment of A2. D. Md-palp. R–Rome organ.
Fig. 4. *Pseudostrandesia ratchaburiensis* sp. nov. Paratype, ♀ (MSU-ZOC. 292). A. Md-coxa. B. Mx1. C. A part of basal protopod with medial endite of T1. D. T1-palp.
Fig. 5. *Pseudostrandesia ratchaburiensis* sp. nov. Paratype, ♀ (MSU-ZOC. 292). A. T2. B. Distal part of T2. C. T3. D. CR. E. CR attachment.
markedly large β-seta (length ca \(\frac{5}{6}\) of that of penultimate segment), the latter plumose, cone-shaped and with pointed tip. Penultimate segment bearing three groups of setae: dorsally with a group of four unequal, long, subapical setae; laterally with apical γ-seta and three further apical setae, the former stout, hirsute, long (length ca 2 times that of terminal segment); ventrally with two (one long, one short) apical setae, the latter reaching slightly beyond mid length of terminal segment). Terminal segment bearing three claws and two setae.

**Md-Coxa** (Fig. 4A). Elongated, distally set with rows of teeth (large dorsally and smaller ventrally) and small setae, and with one dorso-subapical seta situated close to palp.

**Mx1** (Fig. 4B). With two-segmented palp, three endites and large branchial plate; basal segment of palp with a group of four long, unequal apical setae and two (one long, one shorter) subapical setae, the latter reaching beyond tip of terminal segment, terminal segment elongated (length ca twice as long as width), apically with three claws and three setae. Two large bristles on third endite serrated apically. Sideways-directed bristles on first endite unequally long, length of short one ca \(\frac{2}{3}\) of that of long one.

**T1**. Protopodite (Fig. 4C) with two short a-setae and long b-seta, distally with 14 (10 apical, four subapical) hirsute setae of unequal length. Endopodite (Fig. 4D) a weakly built palp, slender shape, with three unequal apical setae.

**T2** (Fig. 5A–B). With seta d1 ca twice the length of seta d2. Second segment with short e-seta (reaching mid-length of penultimate segment). Penultimate segment divided, proximal segment bearing long f-seta (reaching far beyond tip of terminal segment), distal segment with long g-seta (almost the same length as h1 seta). Terminal segment with two (one dorsally, one ventrally) apical h1 and h3 setae and serrated claw (h2), length of h1 seta ca \(\frac{3}{5}\) of that of h2 claw, h3 seta slightly shorter than h1 seta.

**T3** (Fig. 5C). A cleaning limb. First segment with long d1, d2, dp setae. Second segment with long apical e-seta (extending slightly beyond half of the next segment). Third segment with medially long f-seta (reaching beyond tip of segment). Terminal segment with an apical pincer and three setae, one short h1 seta, one claw-like h2 seta and one reflexed subapical h3 seta, length of the latter ca \(\frac{3}{5}\) of that of third segment.

**CR** (Fig. 5D). Slender, ventral margin of ramus with tiny setules, Ga and Gp long, serrated, length of Ga ca half of ramus, length of Gp ca \(\frac{3}{5}\) that of Ga. sa long (slightly longer than Gp), sp thin and long (reaching tip of ramus).

**CR Attachment** (Fig. 5E). Stout, with Triebel’s loop situated at middle of distal part of main branch, db and vb well-developed, vb with swollen end.

**Male**

Carapace and valves as in female, although somewhat smaller (Fig. 2). All limbs as in female, except for last two segments of A2, T1 and reproductive organs (Fig. 6); penultimate segment of A2 with claw-like z1 and z2 setae, considerably reduced claw G1 and with claw G3 reduced to seta (Fig. 6A); T1-endopodites forming asymmetrical prehensile palps; right palp (Fig. 6B) anteriorly with triangular lobe and two small apical triangular protrusions; left palp (Fig. 6C) anteriorly with elongated, curved lobe, two apical spines and few tubercles.

Hemipenis (Fig. 6D) with medial shield rounded, lateral shield elongated with blunt distal end. Postlabyrinthal spermiduct curved, with 2 loops. Zenker’s organ (Fig. 6E) set with 13 spiny whorls, length about 3.5 times the width, distal end plate forming a crown of petal-like structures.
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Genus *Strandesia* Stuhlmann, 1888

*Strandesia prachuapensis* sp. nov.

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Figs 7–10

**Fig. 6.** *Pseudostrandesia ratchaburiensis* sp. nov. Allotype, ♂ (MSU-ZOC.298). A. Distal end of penultimate segment and terminal segment of A2. B. Right prehensile palp. C. Left prehensile palp. D. Hemipenis. E. Zenker’s organ.

**Diagnosis**

Cp large (ca 1.5 mm), elongated in lateral view (length ca 1.7 times of height), LV with angulated antero-ventral part, a weak and small anterior inner list situated on antero-ventral part, RV with anterior
flange, not close to mouth region, A1 seven-segmented with small Rome organ, A2 with long natatory setae, aesthetasc Y markedly small (short and slender) with insertion situated ca one fourth of segment, β-seta on Md-palp large, two large bristles on third endite of Mx1 smooth, d-seta on T1 present, T2 with d1 and d2 setae (length of d2 seta less than half length of d1 seta), f-seta of intermediate length (not reaching tip of terminal segment), T3 with pincer organ, CR slender, claw Ga ca \( \frac{1}{3} \) of ramus, claws Ga and Gp and ventral margin of ramus with tiny spine-like setules, sa seta slightly longer than claw Gp, sp seta slender, reaching slightly beyond tip of ramus, CR attachment with Triebel's loop situated at middle of distal part of main branch.

**Differential diagnosis**

*Strandesia prachuapensis* sp. nov. resembles *S. flavescens* Klie, 1932 and *S. odiosa* (Moniez, 1892). It can be distinguished from them mainly by the narrower anterior flange on the RV, the size of the Cp (ca 1.5 mm), the angulated antero-ventral part of the LV and the small and weak anterior inner list on the LV (for details of the differences, see the Discussion).

**Etymology**

The species is named after Prachuap Khiri Khan Province, which is also called in short 'Prachuap', where specimens of the new species were discovered.

**Type material**

**Holotype**

THAILAND – *Prachuap Khiri Khan Province* • ♀ (soft parts dissected in glycerine on a sealed glass slide and valves stored dry in a micropalaeontological slide); Kui Buri District, rice field; 12°06.36′ N, 99º48.42′ E; 21 Oct. 2018; MSU-ZOC.303.

**Paratypes**

THAILAND – *Prachuap Khiri Khan Province* • 3 ♀♀ (carapaces stored dry in micropalaeontological slides); same collection data as for holotype; MSU-ZOC.304 to 306.

**Type locality**

A total of 4 female specimens (1 holotype, 3 paratypes) were collected at the type locality on 21 Oct. 2018. Accompanying ostracod fauna: *Cypretta* sp., *Cypris subglobosa* Sowerby, 1840, *Dentocypria aequiloba* Savatetalinton, 2017, *Hemicypris exigua* Broodbakker, 1983, *Hemicypris ovata* Sars, 1903, *Ilyocypris monstrifica* (Norman, 1862), *Notodromas* sp., *Pseudostrandesia mamarilorum*, *Stenocypris orientalis* Victor & Fernando, 1981.

**Repository**

The holotype and all paratypes are deposited in the MSU-ZOC.

**Measurements** (in µm)

Cp (n = 3), L = 1446–1483, H = 836–848, W = 662-677; LV (n = 1), L = 1483, H = 848; RV (n = 2), L = 1434, H = 800.

**Description**

**Female**

Cp. Large (ca 1.5 mm), elongated in lateral view (Fig. 7A) (length ca 1.7 times height), anterior and posterior margins widely rounded, LV overlapping RV posteriorly and ventrally, dorsal margin gently arched, greatest height situated at mid-length, valve surface set with short rim-pore setae.
Fig. 7. Strandesia prachuapensis sp. nov., ♂. A. Paratype (MSU-ZOC.304). B. Paratype (MSU-ZOC.305). C–H. Holotype (MSU-ZOC.303). A. Cp, left lateral view. B. Cp, dorsal view. C. LV, internal view. D. RV, internal view. E. Posterior part of LV. F. Anterior part of LV. G. Anterior part of RV. H. Posterior part of RV (idem). Scale bars: A–D = 200 μm; E–H = 100 μm. Arrows point toward the anterior end.
Cp in dorsal view (Fig. 7B). Subelliptical, with greatest width situated at mid-length, anterior margin of RV slightly protruded than LV.

LV in internal view (Fig. 7C, E–F). With groove along valve margin, dorsal margin arched, greatest height situated slightly in front of mid-length; sloping down to anterior and posterior margin, the former widely rounded, the latter slightly less widely rounded, antero-ventral part angulated, ventral margin slightly sinuatured at mid-length; calcified inner lamella relatively wide anteriorly, with a weak and small inner list situated on antero-ventral part, posteriorly narrower.

RV in internal view (Fig. 7D, G–H). With inwardly displaced selvage and anterior flange, the latter not close to mouth region, calcified inner lamella without inner list, anteriorly broader than posteriorly.

A1 (Fig. 8A–A’). First segment with one dorso-subapical seta of intermediate length (almost reaching tip of segment) and two long ventro-apical setae, Wouters organ absent. Second segment slightly wider than long, with one markedly short dorso-apical seta (reaching tip of segment) and small Rome organ. Third segment bearing two (one dorso-apical and one ventro-apical) setae of intermediate length, both reaching slightly beyond tip of next segment. Fourth segment with two long dorsal setae and two subequal, shorter ventral setae (the short one not reaching tip of next segment, the longer one reaching slightly beyond tip of next segment). Fifth segment dorsally with two long setae, ventrally with two (one long, one shorter) setae, the shorter one reaching beyond tip of terminal segment. Penultimate segment with four long setae. Terminal segment with three (two long, one short) apical setae and aesthetasc yₐ, the latter markedly long (ca 1.7 times that of short apical seta).

A2 (Fig. 8B). Exopodite with three (one long, two short) setae, the long one reaching beyond tip of first endopodal segment. First endopodal segment with five long (reaching tip of terminal claws) and one short natatory setae, length of the shortest seta reaching half way the penultimate segment, aesthetasc Y small (short and slender), insertion situated ca ¼ of segment, ventro-apical setae long, reaching slightly beyond tip of penultimate segment. Penultimate segment undivided, distally with three serrated claws G₁–G₃, aesthetasc y₂ short (not reaching tip of terminal segment), z₁–z₃ setae long; this segment medially with two (one long, one shorter) dorsal setae (length of the short one ca ¼ of that of the long one) and four ventral setae of unequal length (t₁–t₄). Terminal segment with two serrated claws (GM and Gm), g-seta and aesthetasc y₃ with accompanying setae, length of Gm ca ¾ of that of GM, length of aesthetasc y₃ more than half of that of Gm and slightly shorter than accompanying seta, length of g-seta ca ¾ of aesthetasc y₃.

Md-coxa (Fig. 8C). Elongated, distally bearing rows of teeth (large dorsally and smaller ventrally) and small setae, and one dorso-subapical seta situated close to palp.

Md-palp (Fig. 9A). First segment with two large setae (S₁ and S₂), one slender, long seta and long, smooth α-seta. Second segment dorsally with three unequal long apical setae, length of the shortest seta less than half of that of the longest seta; ventrally with a group of three long hirsute setae, one shorter hirsute seta and large β-seta (length ca ¾ of that of penultimate segment), the latter large, plumose, cone-shaped and with pointed tip. Penultimate segment consisting of three groups of setae: dorsally with a group of four unequal, long, subapical setae; laterally with apical γ-seta and three further apical setae, the former stout, hirsute, long (length ca 1.5 times of that of terminal segment); ventrally with two (one long, one short) apical setae, the latter reaching ⅗ of length of terminal segment. Terminal segment bearing three claws and two setae.

Mx₁ (Fig. 9B). With two-segmented palp, three endites and large branchial plate; basal segment of palp with a group of five long, unequal apical setae and two (one long, one shorter) subapical setae, the latter reaching half way of terminal segment, terminal segment elongated, apically with three claws and three
Fig. 8. *Strandesia prachuapensis* sp. nov. Holotype, ♀ (MSU-ZOC.303). A. A1. A’. Aesthetasc-like setae on third and fourth segments of A1. B. A2. C. Md-coxa. R–Rome organ.
Fig. 9. *Strandesia prachuapensis* sp. nov. Holotype, ♀ (MSU-ZOC.303). A. Md-palp. B. Mx1. C. Basal protopod with medial endite of T1. D. T1-palp.
Fig. 10. *Strandesia prachuapensis* sp. nov. Holotype, ♀ (MSU-ZOC.303). A. T2. B. T3. C. CR. D. Distal end of CR. E. CR attachment.
setae. Two large bristles on third endite smooth. Sideways-directed bristles on first endite unequally long, length of short one ca half of that of long one.

T1 (Fig. 9C). Protopodite with two short a-setae, long b and d-setae, masticatory process distally with 14 (10 apical, four subapical) hirsute setae of unequal length. Endopodite a weakly built palp with three unequal apical setae.

T2 (Fig. 10A). With seta d1 more than twice the length of seta d2. Second segment with short e-seta (reaching slightly beyond mid-length of penultimate segment). Penultimate segment divided, proximal segment bearing f-seta of intermediate length (not reaching tip of terminal segment), distal segment with a short g-seta (reaching slightly beyond tip of terminal segment). Terminal segment with two (one dorsally, one ventrally) apical h1 and h3 setae and a serrated claw (h2), h1 and h3 setae subequal in length, length of claw h2 longer than that of penultimate segment.

T3 (Fig. 10B). A cleaning limb. First segment with long d1, d2, dp setae. Second segment with long apical e-seta (ca ⅔ of next segment). Third segment with medially short f-seta (not reaching tip of segment). Terminal segment with apical pincer and three setae, one short h1 seta, one claw-like h2 seta and one reflexed subapical h3 seta, length of the latter ca ⅔ of that of third segment.

CR (Fig. 10C–D). Slender, claws Ga and Gp weakly serrated, claw Ga short (ca ⅓ of ramus), length of claw Gp ca 3/5 of that of claw Ga, sa seta slightly longer than claw Gp, sp seta slender, reaching slightly beyond tip of ramus, ventral margin of ramus with tiny setules.

CR Attachment (Fig. 10E). With Triebel’s loop situated at middle of distal part of main branch, db and vb well-developed, vb with swollen end.

Male
Unknown.

Key to Pseudostrandesia species
1. Cp in dorsal view with beak-like anterior end ................................................................. 2
   – Cp in dorsal view without beak-like anterior end ........................................................ 3

2. Cp in dorsal view with beak-like posterior end, penultimate segment of A2 not divided ..............
   – Cp in dorsal view with rounded posterior end, penultimate segment of A2 divided ..................
P striatoreticulata (Klie, 1932)

3. Cp with large posterior LV overlap over RV, Cp in frontal view not oblique ..........................
P thailandensis Savatenalinton & Martens, 2010
   – Cp without large posterior LV overlap over RV .......................................................... 4

4. LV with antero-ventral lip-like flange ............................................................................. 5
   – LV without antero-ventral flange ................................................................................ 6

5. β-seat on Md-palp markedly large, h3 seta on T2 remarkably long .......... P ratchaburiensis sp. nov.
   – β-seat on Md-palp small, h3 seta on T2 short ... P complexa (Victor & Fernando, 1981) comb. nov.

6. Cp in lateral view with narrow, bluntly pointed posterior end, very small overlap anteriorly ..........
P calapanensis (Tressler, 1937)
   – Cp in lateral view with rounded posterior end ............................................................. 7
7. Cp in lateral view subovate, LV without anterior inner list .......................................................... P. guleni Külköylüoğlu, Yavuzatmaca & Yılmaz, 2020
   – Cp in lateral view elongated, LV with anterior inner list ................................................................
   ...................................................................................................................................................... 8
8. Cp with large anterior overlap, Cp oblique in frontal view ............................................................... P. mamarilorum (Victor & Fernando, 1981)
   – Cp with small anterior overlap ........................................................................................................ 9
9. Cp in lateral view with greatest height situated at mid-length, one bristle on Mx1 3rd endite smooth
   and one serrated ........................................................................................................................... P. ovata Savatenalinton & Martens, 2010
   – Cp in lateral view with greatest height situated before mid-length, both bristles on Mx1 3rd endite
     serrated ......................................................................................................................................... P. petchabunensis Savatenalinton & Martens, 2010

Discussion

Pseudostrandesia

One of the discriminating characters between the genera Strandesia and Pseudostrandesia is the occurrence
of the d-seta on the T1, which is present in the former and absent in the latter genus (Savatenalinton &
Martens 2009b). The terminal part of the T1 protopodite (masticatory process) contains many setae
which, in Cypricercinae, are divided into two groups: apical and subapical setae. The former group
usually consists of 10 setae while about four setae belong to the latter (see Savatenalinton & Martens
2009a, 2009b, 2010). Frequently, one of the subapical setae is erroneously indicated as a d-seta. For
example, in Strandesia mamarilorum Victor & Fernando, 1981, although the presence of T1 d-seta was
mentioned in the description, no d-seta appeared in the original illustrations (see Victor & Fernando
1981). The absence of the d-seta on the T1 in this species was confirmed by the redescription, and it
was thus transferred to Pseudostrandesia (see Savatenalinton & Martens 2010). A similar case probably
occurs in Strandesia complexa Victor & Fernando, 1981. Strandesia complexa was described based on
material from the Philippines (Victor & Fernando 1981), and it has not been reported again since its
discovery, thus it remains an endemic species of the country. The redescription of S. complexa should
confirm the presence/absence of the d-seta on the T1. However, based on the present information with
regards, particularly, to its illustrations, the d-seta is absent on the T1 of S. complexa. Thus, here it is
tentatively transferred to the genus Pseudostrandesia.

Pseudostrandesia ratchaburiensis sp. nov. described here resembles P. complexa in the presence of
an antero-ventral flange of the LV and a similar sized Cp. However, the distinguishing characters are
recognized in valves and the soft parts morphology. In the new species, the Cp is more elongated in the
lateral view. The diagnostic features of the soft parts are clearly seen in the Md-palp, the T2 and the CR.
The β-seta on the Md-palp is somewhat large in the new species, while it was small in P. complexa. The
long g and h3 setae of the T2 in the new species are also indicative aspects for discrimination between
these two taxa. Moreover, the morphology of the CR shows several distinguishing aspects. The claw Ga
is longer in Pseudostrandesia new species appearing half length of the ramus (less than half the length
of the ramus in P. complexa). The sa seta is longer than the claw Gp in the new species, whereas it is
shorter in P. complexa. In addition, the sp seta of the new species is also longer (slightly beyond the tip
of the ramus), while it does not reach the tip of the ramus in P. complexa.

Apart from P. complexa, P. ratchaburiensis sp. nov. is similar to P. phetchabunensis, especially in the
carapace shape in the lateral view, at first glance. The presence of the antero-ventral flange of the LV
in the new species is clearly an indicative character to separate it from P. phetchabunensis. In addition,
the differences between these two species are found in the soft parts morphology. Pseudostrandesia
ratchaburiensis sp. nov. is distinguishable from P. phetchabunensis by, for example, the absence of the
Wouters organ, the longer α- and the larger β-setae on the Md-palp, the longer h1 seta on the T2 and the longer claw Ga of the CR.

All species of *Pseudostrandesia* are represented by parthenogenetic populations, except for *P. ratchaburiensis* sp. nov. The discovery of males and females of *P. ratchaburiensis* sp. nov. is the first report of a sexual population in this genus. This reveals that the hemipenis morphology of *Pseudostrandesia* sp. nov. conforms to the type C of the hemipenis proposed by Savatenalinton & Martens (2009b), which is the character of *Cypricercus* and some *Strandesia* species resulting in the affinity among these three genera. However, the Zenker’s organ of *P. ratchaburiensis* sp. nov. possesses a considerably smaller number of spiny whorls, ca 13, whereas it is ca 20–28 spiny whorls in *Cypricercus, Strandesia* (see Savatenalinton & Martens 2009a) or even in other cypricercine genera, such as *Bradleycypris* (see Savatenalinton & Martens 2010), *Bradleystrandesia* (see Savatenalinton & Martens 2009b) and *Tanycypris* (see Savatenalinton 2014). The shorter Zenker’s organ observed in *Pseudostrandesia ratchaburiensis* sp. nov. would reflect its smaller sperm size or potentiality of sperm transfer, as Zenker’s organ is used for sperm pumping during copulation.

Currently, there are 10 species of *Pseudostrandesia* worldwide (Meisch et al. 2019; Külköylüoğlu et al. 2020; present study). Thus far, eight species, including the new species and new combination, have been reported merely from Southeast Asian countries, while the two remaining species (*P. calapanensis* and *P. guleni*) have also been recorded in the Palearctic region. This implies that this lineage would originated from Southeast Asia. In Thailand, eight *Pseudostrandesia* species have been encountered. All of them are rare or uncommon species in the country, except for *P. mamarilorum* (see Savatenalinton & Suttajit 2016), five of which are endemic to Thailand.

**Strandesia**

*Strandesia prachuapensis* sp. nov., *Strandesia flavescens* and *Strandesia odiosa* are very similar at first sight forming a closely related species complex. Hence, one could doubt the validity of the specific status of these taxa. However, their identity as separate species can be strongly supported by the additional aspects of the valves and soft parts.

*Strandesia prachuapensis* sp. nov. resembles *S. flavescens* and *S. odiosa* mainly in the presence of the anterior flange on the RV and the large size of Cp. *Strandesia flavescens* was described from Indonesia (Klie 1932) and subsequently found in India (Víctor & Fernando 1979a), and recently in South Korea (Smith et al. 2014). *Strandesia odiosa* was also described from Indonesia (Sulawesi – Moniez 1892) and the type materials were re-examined by Victor & Fernando (1979b). They not only provided the redescription with some illustrations but also placed *S. flavescens* as a junior synonym of *S. odiosa*. However, Smith et al. (2014) provided some distinguishing features of these two taxa and reinstated *S. flavescens* as a valid species, based on a specimen from South Korea. This allocation was later followed by Meisch et al. (2019). Although *S. prachuapensis* sp. nov. shares the presence of the RV anterior flange with *S. flavescens* and *S. odiosa*, the aspect of this structure is different. In the new species, the anterior flange is narrower and does not reach the mouth region, whereas it is wide and reaches the mouth region in the two related taxa. The carapace size of the new *Strandesia* species (ca 1.5 mm) is somewhat smaller than that of *S. flavescens* and *S. odiosa*, which have lengths of ca 2 mm (see Smith et al. 2014) and 2.4 mm (see Victor & Fernando 1979b), respectively. In the *Strandesia* new species, the aspect of the LV antero-ventral part is outstanding showing more angulated, while this part is rounded in both *S. flavescens* and *S. odiosa*. The inner list on the LV anterior inner lamella is also different among these three taxa. There is no inner list in *S. odiosa*, while the obvious inner list is seen in *S. flavescens*, and a weak and small inner list existing on the antero-ventral part is recognized in *S. prachuapensis* sp. nov.
Additionally, other distinguishing features can be observed in these three related species. *Strandesia prachuapensis* sp. nov. can be distinguished from *S. flavescens* by the more arched Cp in the lateral view, the absence of septa-like structures on the LV, the longer claw Ga and the shorter claw Gp. *Strandesia* new species differs from *S. odiosa* by the more elongated Cp, the smooth bristles on the Mx1 third endite (serrated in *S. odiosa*), the length of the shortest natatory seta on the A2 (longer in the new species) and the shorter f-seta on the T2. It should be noticed that the insertion of the aesthetasc Y on the A2 in *S. prachuapensis* sp. nov. is rather more proximal, situating ca one fourth of the segment, whereas in other *Strandesia* species, it is typically approximately mid-length on the first endopodal segment.

*Strandesia prachuapensis* sp. nov. also shares the presence of an anterior flange on the RV with another Southeast Asian *Strandesia, S. feuerborni* Klie, 1932. However, the anterior flange of *S. feuerborni* is considerably larger and slightly slopes downward as well as reaching the mouth region. This notable anterior flange, together with an obvious dorsal hump on the RV are the outstanding indicative characters of *S. feuerborni*, which cannot be confused with *S. prachuapensis* sp. nov.

It should be noted that, on the third and the fourth segments of the A1 in *S. prachuapensis* sp. nov., the ventral setae have an unusual aspect, appearing like aesthetasc-like setae (Fig 8A'). Such setae have also been obviously recognized in other cypricercine species, such as *Pseudostrandesia thailandensis, Pseudostrandesia mamarilorum* (see Savatenalinton & Martens 2010), *Pseudostrandesia striatoreticulata, Tanycypris siamensis* Savatenalinton & Martens, 2009 and *Bradleytriebella tuberculata* (Hartmann, 1964) (see Savatenalinton & Martens 2009b). The A1 seta is known as a swimming appendage in most ostracods and bears several sensory organs/setae, e.g., Rome organ, Wouters organ and aesthetasc y\textsubscript{a}. Hence, the presence of these modified setae in the *Strandesia* new species, including other representatives of Cypricercinae, is highly possibly related to sensory reception. The detailed morphology of the A1 setae, together with the comparison of these aesthetasc-like setae and normal setae, will be present elsewhere.

Most cypricercine species have marginal selvage on the RV while in the LV, it lies apart from the valve margin. In Cypricercinae, the anterior flange that occurs on the RV only, is a rare feature as it has been recognized in only a few species. According to the diagrams of the marginal zone structure provided by Horne & Colin (2005), the morphology of the RV anterior flange in *Strandesia* is similar to that of *Cypris* O.F. Müller, 1776. Both taxa have an anterior flange on the RV resulting from the inwardly displaced selvage. One-hundred and one species of *Strandesia* have so far been recorded worldwide covering many zoogeographical regions (see Meisch *et al.* 2019; Ferreira *et al.* 2020; present study), and only eight of them, including the new species, possess an anterior flange on the RV, which would indicate that this character is more derived. These eight species can be divided into three groups, on the basis of zoogeographical distribution, namely Oriental and Palaearctic, Afrotropical and Neotropical regions. The former group comprises four species (*S. feuerborni, S. flavescens, S. odiosa* and *S. prachuapensis* sp. nov.) while two (*S. evae* Gauthier, 1951 and *S. hancocki* (Lowndes, 1931)) and two (*S. ewaldi* Karanovic, 2006 and *S. colombiensis* Roessler, 1990) species, respectively, belong to the two latter groups. Since their fossils are unknown, their origins remain obscure.

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