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Special Issue: Fossil and Modern Clam Shrimp (Branchiopoda: Spinicaudata, Laevicaudata)

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Spinicaudata Catalogus (Crustacea: Branchiopoda)

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The Spinicaudata (spiny clam shrimp) are a large group of freshwater, bivalved branchiopod crustaceans in need of taxonomic revision. Herein, the extant Spinicaudata families and genera are defined and diagnosed according to modern standards. An annotated catalogue of the Spinicaudata taxa is presented with synonyms. More than 747 spinicaudatan taxa are presented, of which 215 are considered valid families, genera and species. Chresonyms are provided for taxa redescribed according to modern standards. It is hoped that this catalogue will provide a basis for further taxonomic revision and phylogenetic work within the Spinicaudata.

Key words: Spiny clam shrimp, Diplostraca, Onychocaudata, Checklist, Systematics.

BACKGROUND

The Spinicaudata (spiny clam shrimp) are the second largest group of freshwater dwelling bivalved branchiopod crustaceans after the Cladocera (Brendonck et al. 2008; Rogers 2009) and have the most confused taxonomy of any branchiopod group. This confusion resulted from a combination of: 1) the great plasticity of the few available morphological characters within the group; 2) the tremendous and poorly understood range of intra- and interspecific, generic and familial morphological variation; 3) the lack of sexually selected characters and high number of hermaphroditic lineages; 4) poor and inadequate descriptions and type material; 5) a great disparity between the methods and descriptive language used by clam shrimp palaeontologists and biologists, and; 6) the large number of researchers working in isolation and/or focusing only on local taxa when more holistic approaches were needed.

This catalogue is the third produced on the Branchiopoda, the first two being on the Anostraca (Rogers 2013) and the Laevicaudata (Rogers and Olesen 2014). This catalogue is patterned in part on the recent catalogs on decapod crustaceans (*e.g.*, Ng et al. 2008, De Grave and Fransen 2011).

Spinicaudatan fossils have been reported from as far back as the Devonian (Tasch 1969) and from all continents, with extant forms known to occur on all continents except Antarctica as well as many oceanic islands (Brendonck et al. 2008, Rogers 2009). Modern clam shrimp occur in seasonally astatic aquatic habitats and inland saline pools and lakes (Brendonck et al. 2008; Rogers 2009). The number of spinicaudatan species has historically been in flux, as many species have myriad synonyms, many nomina inquirenda occur, and many new species are described regularly. Some 195 valid species names are recognized here. Endemicity is high, with 41.7% of species known only from the type locality and 27.1% known from ten or fewer localities.

This catalog also reflects the many advances in phylogeny made in recent years (*e.g.*, Schwentner et al. 2009 2020a; Weeks et al. 2009), as well as classifications based upon modern genus concepts (*e.g.*, Belk 1989; Rogers et al. 2012). There are 748 taxa presented in this checklist under the suborder Spinicaudata, including four valid families, 16 valid genera, 194 valid species, and 572 synonyms, homonyms, nomina nuda, nomina dubia, species inquirendae, and nomina oblita. Chresonyms

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are provided for taxon redescriptions that facilitate identification and evolutionary relationships. Spelling errors (unless widely promulgated) from the literature are not included. Diagnoses of the spinicaudatan higher taxonomic levels are provided.

Fossil spinicaudatans are not included and are beyond the scope of this catalogue. It is important to note that clam shrimp bodies and limbs do not preserve well (Tasch 1969), with only the carapaces typically being preserved. Fossil spinicaudatan taxonomy and systematics, especially at the species level is still very much unsettled, and I recommend the excellent work by Astrop and Hegna (2015) as the best possible starting point for understanding the taxonomy and relationships for those organisms, although the morphological phylogeny presented there conflicts with the molecular phylogeny presented in Schwentner et al. (2020a).

A Brief History of Spinicaudata Taxonomy

Although originally treated with the Laevicaudata and Cyclestherida in the order Conchostraca, morphological and, eventually, molecular studies demonstrated that this concept was invalid (Fryer 1987; Olesen 1998 2000 2007 2009; Negrea et al. 1999; Spears and Abele 2000; Brabrand et al. 2002; deWaard et al. 2006; Stenderup et al. 2006; Richter et al. 2007; Schwentner et al. 2018). The term 'Conchostraca' was abandoned as a useful concept in the early 1980s, and the name now conveys no systematic or phylogenetic meaning (Fryer 1987; Olesen 1998 2000; Martin and Davis 2001; Brendonck et al. 2008; Rogers 2009; Ahyong et al. 2011) and should not be used. Following modern methods, all extant clam shrimp groups and the Cladocera are placed within the order Diplostraca, which contains the Laevicaudata (smooth clam shrimp) and the Onchyocaudata (Schwentner et al. 2018). Onchyocaudata comprises the Spinicaudata and the Cladoceromorpha, with Cladoceromorpha comprising Cyclestherida and Cladocera (Olesen 2007 2009; Olesen and Richter 2013).

Linnaeus (1761) described the first spinicaudatan clam shrimp: *Monoculus lenticularis*. Hermann (1804) described a second species, which he called *Daphnia gigas*. Brongniart (1820) based on material from France, described *Limnadia hermanni*, giving us the first of the currently recognized genera. All three of these first taxa (and others) were eventually synonymized as *Limnadia lenticularis* (Linnaeus, 1761).

Audouin (1837) erected *Cyzicus* to contain *Limnadia tetracerus* Krynicki, 1830 and his *Cyzicus bravaisii*. Rüppell (in Strauss-Durchheim 1837) erected *Estheria* for his species *E. dahalacensis*, with the genus characters given being identical to Audouin's *Cyzicus* (Mattox, 1957a). However, Rüppell's collection was comprised of both *Cyzicus* and what would eventually be called *Leptestheria*. Keillhack (1910) recognized that *Estheria* Rüppell was a homonym of *Estheria* Robineau-Desvoidy 1830 (Diptera) and thus preoccupied. Joly (1842) in his review of the clam shrimp proposed *Isaura* to replace Rüppell's *Estheria*, rejecting the name *Cyzicus*. However, Daday (1915) pointed out that *Cyzicus* had priority and that the name *Isaura* was debatably preoccupied by *Isaures* Savingny, 1817 (Cnidaria). Daday (1913a b 1915) moved *Estheria dahalacensis* Rüppell, 1837 to a new genus: *Leptestheria*. Bock (1953) argued strongly for maintaining the genus name *Isaura*, creating a new family for it, ignoring the priority of *Cyzicus*. Mattox (1957a) officially put the matter to rest by presenting the entire history of the controversy before the IUCN, who put the name *Cyzicus* on the Official List of Generic Names, and put *Estheria* Rüppell, 1837 and *Isaura* Joly, 1842 on the Official List of Rejected and Invalid Names (ICZN 1958). Strangely, Alonso (1996) and Dumont and Negrea (2002) chose to use *Isaura* over *Leptestheria* with no explanation. (Some palaeontologists did as well; *e.g.*, Reible 1962).

Joly (1842) provided a review of the few European taxa described. The first monographic treatment of Spinicaudata was prepared by Baird (1849), wherein all spinicaudatans were placed in the Limnadiidae. Baird (1849) provides a very interesting history of the discovery of spinicaudatans, describing the great confusion in the taxonomy already apparent in less than 100 years of the group's taxonomy. Unfortunately, Baird (1849) added to the confusion, by redescribing taxa he had never actually observed and leaving type specimens that were nothing more than dry, empty carapaces. Some of his taxa have subsequently been treated as nomina nuda or inquirenda due to the lack of detail in his descriptions and the condition of some of his type material (Rogers and Padhye 2015).

The first real monographs were provided by Daday, wherein he described numerous new and redescribed old species from all over the world (Daday 1913a b 1914 1915 1923 1925 1926). Daday revised the spinicaudatan clam shrimp genera in three papers (Daday 1913a b 1915) creating a certain amount of confusion in the process. The first two were published in separate journals, but both on 12 April. In these two papers he presents new genera, of which *Caenestheria* and *Eocyzicus* were nomina nuda, until the descriptions and definitions were published by Daday in 1915. Daday describes *Caenestheriella*, *Eoleptestheria*, *Leptestheria*, and *Leptestheriella* (in that order) in his 1913a paper, and uses those names in his 1913b paper, but neither paper cites the other. Many of Daday's taxa and others were defined based on characters of the carapace (number of growth lines, carapace proportions, and ornamentation of the intervals), number of limbs, number of antennomeres, and spine arrangements.

Although Daday's (1913a b 1914 1915 1923 1925 1926) monographs were greatly criticized (*e.g.*, Ueno 1927; Barnard 1929; Brehm 1933; Gauthier 1933; Linder 1945; Botnariuc 1945 1947; Margalef 1953; Straškraba 1965a b 1966) no competing system was developed. Furthermore, although many authors (Vecchi 1922; Gauthier 1933; Linder 1945; Botnariuc 1945 1947; Straškraba 1965a b 1966; Wiltshire 1973; Marinček and Petrov 1985; Petrov and Marinček 1995; Rogers et al. 2012 2017) demonstrated that most traditional characters used to describe spinicaudatans were dependent on the age of the animal or on the nutritive quality of the food received, new taxa were still described using those characters (*e.g.*, Mattox 1953a 1954a b; Nayar and Nair 1968; Hu 1988a), even though many of those authors cited these works and lauded their findings.

Brtek (1997 2002) provided the first modern catalogues of all branchiopod taxa, including Spinicaudata. Unfortunately, the text has many problems and has created confusion (criticised in Rogers 2003 2006). The English and editing is poor, and several taxa previously synonymized based on quantified analyses were resurrected without any justification, and little if any mention of the previous analyses. Similarly, two species are shown as valid names simultaneously in two separate genera (*Cyzicus crinitus* (Thiele, 1900) and *C. ellipticus* (Sars, 1897) also in *Eocyzicus*).

Naganawa (2001a b) presented a new classification for the Spinicaudata, presenting all large branchiopod crustaceans (Anostraca, Notostraca, and clam shrimp) in a separate subclass from the Cladocera, and furthermore broke up the Spinicaudata into three suborders: Cyclostraca (containing the Cyclestheriidae (of the separate order Cyclestherida)); Spinirostria (containing the Cyzicids and Leptestheriids, divided among five families), and; Procephalida (containing the Limnadiidae, divided among three families). However, none of the previous nor later morphological and molecular work supported Naganawa's classification.

Since 1996, numerous morphological studies (Belk 1996; Martin and Belk 1989; Olesen 1998 2000 2007 2009; Rabet 2010; Orridge 2011; Rabet et al. 2015; Rogers et al. 2017; Schwentner et al. 2012a; Timms 2016a b 2018; Timms and Schwentner 2017; Tippelt and Schwentner 2018), molecular studies using increasingly more powerful analyses (Spears and Abele 2000; Brabrand et al. 2002; de Waard et al. 2006; Hoeh et al. 2006; Stenderup et al. 2006; Richter et al. 2007; Reiger et al. 2010; Sun et al. 2011; Fritsch et al. 2013; Schwentner et al. 2009 2012b 2018 2020a) and combined analyses (Weeks et al. 2009; Schwentner et al. 2011; Rogers et al. 2012; Richter et al. 2007) have resolved the relationships between the Diplostracan suborders, relationships between Spinicaudata families and genera, and informed species definitions. At this time, we have the clearest conceptual understanding of the higher taxonomy and phylogenetic relationships at family level and above that we have ever had. However, there is still much work to be done at genus and species levels.

Catalogue structure

The catalogue portion follows the format of the recent catalogues on branchiopod (Rogers 2013; Rogers and Olesen 2014) and decapod crustaceans (*e.g.*, Ng et al. 2008; De Grave and Fransen 2011) for taxonomic consistency among these widely used tools. Supraspecific taxa are presented in bold. Genera and species are listed alphabetically. Synonyms are presented following an equal sign (=). Only taxonomically relevant references are included due to space. Where an important analysis is relevant for a synonymy, a reference is provided as "fide" the synonymizer. For example: = *Eulimnadia chacoensis* Gurney, 1931 fide Martin 1989. Chresonyms are presented parenthetically after the original author and date, and are referred to as "in the sense of" the redescriber. For example: *Limnadopsis parvispinus* Henry, 1924 *sensu* Timms, 2009a.

Comments are provided as appropriate, including distribution, important type localities, type material locations, and outlier localities. However, many of the determinations here are in need of verification: records are included, but not necessarily verified or substantiated. Historically, most workers only examined taxa from their region, with no comparative analysis against identified material from other areas. To this day, it is a problem despite all the literature that demonstrates that such a myopic view is nearly useless. The Spinicaudata are very plastic, taxonomically confused, and many are poorly described. All information presented here needs to be checked in detail, through additional collections, examination of specimens and if possible molecular studies as well. These errors may be due to my missing a certain piece of literature, or misunderstanding some datum. This catalogue is designed as a starting point for future revisionary work using modern methods and a broad, global perspective of these animals. That being said, I expect that there are errors in this catalogue.

RESULTS

SYSTEMATICS

Spinicaudatan systematics have been problematic from the beginning. However, great strides have been made in the last two decades establishing the families and genera and their evolutionary relationships. One thing is salient: spinicaudatan taxonomic categories must be defined using molecular tools and morphological characters that are informed by good molecular data. At this time, some genera are reasonably well defined, but most need revision. These genera are being used here as categorical groups for species placement, pending proper testing of those genera. I am confident that more genus level clades and species will be revealed.

On the other hand, spinicaudatan species are mostly poorly defined, and we are just beginning to understand and appreciate the complexity of the group. The species listed here are nearly all problematic, in need of comparison with related forms, and need detailed molecular study in order to properly revise them. I expect that a great many of the species listed here are invalid. I equally suspect that there are a great many more undescribed species that we have yet to descry even in the material before us.

CLASS BRANCHIOPODA Latreille, 1817
SUBCLASS PHYLLOPODA Tasch, 1969
Diplostraca, Gerstaecker, 1866

Spinicaudata Linder, 1945

= Spinirostria Naganawa, 2001b **New Combination**
= Procephalida Naganawa, 2001b **New Combination**

Diagnosis: Branchiopod diplostracan crustaceans with carapace not truly bivlaved, no hinge present. Carapace folded in half longitudinally, generally bearing growth lines. Entire adult animal encompassed within carapace. Antenna I is not subarticulated. Male first two limb pairs modified as claspers to amplex female during mating.

Comments: Naganawa (2001b) proposed a major phylogenetic spilt within Spinicaudata, with the Limnadiidae in the “Procephalida” and the remaining spinicaudatan families in the “Spinirostria”. Similarly, Astrop and Hegna (2015) produced a phylogeny hypothesising that the Limnadiidae are the living remnant of the Vertexioidea Kobayashi, 1954, *sensu* Astrop & Hegna, 2015, and that the remaining extant spinicaudatan families were the living remnant of the Eosestherioidea Zhang & Chen, in Zhang et al., 1976, *sensu* Chen & Shen, 1985. However, the molecular analyses of Schwentner et al. (2020a) does not support either of these hypotheses.

Limnadiidae Burmeister, 1843

= Limniadiidae Burmeister, 1843 *nomen nullum* fide Tasch 1969
= Limnadiadae Baird, 1849 *nomen imperfectum*
= Limnadidae Girard, 1854 *nomen imperfectum*
= Imnadiidae Botnariuc & Orghidan, 1941
= Estheriinidae (Kobayashi, 1954)
= Limnadopseidae Novojilov, 1958
= Limnadopsioidea Novojilov, 1958
= Limnadopsidae Tasch, 1969
= Paraimnadiidae Roessler, 1991a
= Metalimnadiidae Roessler, 1995a
= Limnadopsinae Dumont & Negrea, 2002

Diagnosis: (modified from Rogers et al. 2012) Cephalic fornicies absent. Rostrum variable, blunt to acute, long or short. Rostrum lacking an apical spine. Compound eyes projecting in ocular tubercle. Frontal organ present, typically pedunculate, sometimes sessile (*Metalimnadia* and *Imnadia*). Occipital condyle present or absent. Carapace thin, laterally compressed, umbone present (*Limnadopsis*), lacking (most genera) or obscure (*Metalimnadia*). Carapace with or without melanistic pigmentation, growth lines often obscured or absent. Male first two thoracopods with endopod (*sensu* Olesen 2007) bearing apical suctorial organ or modified tactile setae (absent in *Metalimnadia*). Eggs 170–250 µm in diameter, varying in shape and ornamentation.

Comments: Rogers et al. (2012) conducted a preliminary revision of the limnadiid genera, primarily to create well defined categories for species group revisions. This starting point has allowed for quantitative species revisions, and provided a quantitative basis for describing new taxa (Timms and Schwentner 2012 2017).

The eggs are highly ornamented in this family, and the egg morphology is typically species specific. Important works for this family include Belk (1989), Pereira and García (2001), Rogers et al. (2012), and Bellec and Rabet (2016). Bellec and Rabet (2016) report an undescribed genus under the name “Limnadiidae lineage BO sp. 1”, which has been supported in molecular studies (Schwentner et al. 2020a).

Australimnadia Timms & Schwentner, 2012

Diagnosis: (modified from Timms and Schwentner 2012 2017). Populations composed of males and hermaphrodites; amplexus has not been observed. Rostrum broadly triangular, with female rostrum more apically rounded. Angle between rostrum and frons from 90° to 100°. Occipital notch, occipital condyle absents.

Frontal organ pedunculate, length 0.3–2.5x distance of organ from ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate. Umbone absent. Carapace unpigmented. Muscle scar circular, or angled 35° to 45° from normal, *i.e.*, body horizontal axis. Clasper endopods bearing an apical suctorial organ. Endite IV with apical dense field of long spines. Female IX and X thoracopods with elongated exopod for egg attachment. Thoracic segments with a low medial protrusion or spines. Telsonic ventroposterior angle without spiniform projection. Telson posteriolateral spine rows confluent dorsally, confluence not projecting. Telson spine rows each with 20–25 spines. Telsonic spine rows heteromorphic between portions anterior and posterior of the caudal filaments. Caudal filaments inserted between the eighth and tenth spine pair, on a low or prominent mound. Cercopods sinuate to straight, with a proximal dorsomedial longitudinal row of plumose setae extending 50–80% of the cercopod, and a dorsal cirrus on the apical 10–20% of the cercopod.

Eggs double discoid or nearly double discoid with broad facets.

Comments: The type species is *Australimnadia gigantea* Timms & Schwenter, 2012, a junior synonym of *Limnadia grobbeni* Daday, 1925: 160, by original designation. The eggs of all three species are depicted in Timms and Schwentner (2017).

Attributed Species

Australimnadia grobbeni (Daday, 1926)

= *Limnadia grobbeni* Daday, 1926
= *Austrolimnadia gigantea* Timms & Schwentner, 2012 (fide Timms and Schwentner 2017)

Comments: Eastern and northern Australia.

Australimnadia multifaciata Timms & Schwentner, 2017

Comments: Australia: Western Australia, along the Pilbarra Coast.

Australimnadia torqueova Timms & Schwentner, 2017

Comments: Southwestern coast of Western Australia.

Calalimnadia Rabet & Rogers, in Rogers et al., 2012

Diagnosis: (modified from Rogers et al. 2012) Hermaphrodites only. Rostrum rounded. Angle between rostrum and frons 100° to 120°. Naupliar eye shape variable from oval to triangular. Occipital notch occipital condyle absents. Pedunculate frontal organ length approximately 1.5x distance of organ from ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate, rarely sinuate. Carapace surface between growth lines smooth. Umbone absent. Carapace without pigmentation. Muscle scar angle 35° to 40° from normal. Eggs attaching to prolonged exopods of thoracopods IX and X. Thoracic segments smooth or with dorsoposterior ridge margined with spines or setae. Telson with posteriorly directed spiniform projection present on ventroposterior angle, anteriad of cercopod base. Telson posterior margin posteriolateral spine rows dorsally confluent, confluence not projecting. Each row with average of 23 spines. Caudal filament originating between spine rows at third or fifth spines from confluence. Caudal filament never borne on mound. Cercopods straight, elongate, ~3x length of telson ventral margin, each medially with longitudinal row of setae on proximal 80–90%, with apex beyond the cirrus bent dorsally. Setae long and plumose. Setal row terminates with single spine. Cercopod with subapical, dorsal cirrus, extending from 4 to 15% of cercopod length. Egg averages 170 µm in diameter, spherical to subspherical, with broad, round ridges, with narrow slits between ridges.

Attributed Species

Calalimnadia mahei Rabet & Rogers, in Rogers et al., 2012

= "Undescribed eulimnadoid." Weeks et al., 2009
= "Undescribed limnadiid." Hoeh et al., 2006

Comments: Known only from Mauritius Island.

Eulimnadia Packard, 1874

= *Eulimadia* (in error). Sars, 1895, 1896a b
= *Limnadia* Webb & Bell, 1979; Brtek 1997; Naganawa 2001a b
= *Uenia* Naganawa, 2001b

Diagnosis: (modified from Rogers et al. 2012) Populations composed of males and hermaphrodites (except *E. agassizii* which is only composed of hermaphrodites); amplexus is venter to venter. Rostrum variable, blunt to acute, long or short. Angle between rostrum and frons 80° to 100°. Occipital notch occipital condyle absents. Pedunculate frontal organ length approximately 1.55x distance of organ from ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate, rarely sinuate. Carapace surface between growth lines smooth. Umbone absent.

Carapace occasionally pigmented. Muscle scar angle from 0° to 90° from normal. Clasper endopods each bearing an apical suctorial organ. Endite IV may be broadly transverse or bear dense apical field of short setae, or a few long setae or spines. Thoracic segments smooth or with dorsoposterior ridge rimmed with spines or setae. Eggs attaching to prolonged exopods of thoracopods VII and VIII or VIII, VIII to IX or XII, IX and X, X and XI, or XI and XII. Telson with a subcercopodal, posteriorly directed spiniform projection on ventroposterior angle, anteriad of cercopod base. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not projecting. Each row has from 6 to 22 spines. Caudal filament originating between spine rows at second, third, fourth, fifth, or seventh spines from confluence. Caudal filament borne on projecting mound. Cercopods arcuate, occasionally sinuate. Cercopod with medial longitudinal setal row on proximal 75 to 80%. Setae plumose and long. Setal row terminates with single spine. Cercopod with subapical, dorsal cirrus, extending from 5–30% of cercopod length. Eggs 170–250 µm in diameter. Shape spherical to subspherical or cylindrical to subcylindrical with one end larger than other. Eggs with large rectilinear polygonal depressions separated by ridges, occasionally with lamellar or setaform spines at polygon ridge line confluences (Belk 1989; Martin 1989; Martin and Belk 1989; Rabet 2010).

Comments: No type species was designated by Packard (1874). The type for the genus is designated here as *Limnadia agassizii*. Important works on this genus include Belk (1989), Martin (1989), Martin and Belk (1989), Rabet (2010), Rogers et al. (2012), and Marinone et al. (2016). Species are so far only reliably separated by egg morphology (Belk 1989; Martin and Belk 1989; Rabet 2010; Rogers et al. 2012; Padhye and Kulkarni 2017), including internal characters (Rabet et al. 2012). However, external characters in sediment collected eggs may be affected by the environment (Rabet et al. 2014).

Webb and Bell (1979), Brtek (1997) and Naganawa (2001a b) all treated *Eulimnadia* under *Limnadia*, however morphological and molecular characters more than justify this genus as distinct (Martin and Belk 1989; Rogers et al. 2012).

Reports of undescribed *Eulimnadia* from the Neotropical region are reviewed in Rogers et al. (2020). *Eulimnadia victoriae* Brady, 1916 is a *Cyclestheria* (Cyclestheridia) (fide Brendonck 1999). A single hermaphrodite specimen (lacking eggs) reported from Thailand (Rogers et al. 2012) had a rostral spine. This is the only record of a rostral spine in Limnadiidae, and no other specimens have been found.

Attributed Species

Eulimnadia acutirostris Daday, 1926 *sensu* Rabet, 2010; Rabet et al., 2015

= *Limnadia acutirostris* (Daday, 1926)

Comments: Known only from the type locality in either Niger or Mali, in the Niger River Basin. Redescribed by Rabet et al. (2015).

Eulimnadia adarensis Rabet & Lluch, in Rabet et al., 2015

Comments: From two pools in the Wagchoodda Region of Mauritania.

Eulimnadia aethiopica Daday, 1926 *sensu* Rabet, 2010; Rabet et al., 2015

= *Limnadia aethiopica* (Daday, 1926)

Comments: The type locality is either in modern day Chad or Cameroon, and is the only known locality for this species. Figured by Monod (1969a) and redescribed according to modern standards by Rabet et al. (2015).

Eulimnadia agassizii (Packard, 1874)

= *Limnadia agassizii* Packard, 1874
= *Eulimnadia stoningtonensis* Berry, 1926, fide Belk, 1989

Comments: USA: New England states. The type locality is Penikese Island, Massachuttesettes. The egg is depicted in Belk (1989). Smith (1992) redescribed the type material and provided SEM images of the egg.

Eulimnadia antlei Mackin, 1940

= *Limnadia antlei* (Mackin, 1940)

Comments: USA. The egg is figured in Belk (1989).

Eulimnadia astraova Belk, 1989

= *Limnadia astraova* (Belk, 1989)
= *Eulimnadia texana* in Moore, 1965 (fide Belk 1989)
= *Eulimnadia inflecta* in Moore and Burn, 1969 (fide Belk 1989)

Comments: USA. The egg is figured in the original description.

Eulimnadia australiensis Timms, 2016a

= *Eulimnadia australicemsis* Timms, 2016a

(misspelling)

Comments: Australia: northern New South Wales, Queensland.

Eulimnadia behningi Smirnov, 1949

= *Limnadia behningi* (Smirnov, 1949)

Comments: Uzbekistan. The egg is unknown.

Eulimnadia belki Martin, 1989

= *Limnadia belki* (Martin, 1989)

Comments: ranges from southern México south to northern South America (Rogers and Cruz-Rivera 2020). Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs.

Eulimnadia beverleyae Timms, 2016a

Comments: Paroo Desert of New South Wales and Queensland, Australia.

Eulimnadia bondi Padhye, Rabet, Kulkarni and Pagni, 2018

Comments: Goa State, India. The eggs are cylindrical. This species should be compared with *E. indocylindrova*, *E. tauluoensis*, and *E. braueriana*.

Eulimnadia brasiliensis Sars, 1902

= *Limnadia brasiliensis* (Sars, 1902)

Comments: Brazil, Venezuela (Pereira and García 2001; Rogers et al. 2020). Martin (1989) and Pereira and García (2001) provide images of the egg. Cesar's (1990) records are actually *E. pampa* (Marinone et al. 2016). Reible (1962) provides a poor image.

Eulimnadia braueriana Ishikawa, 1895

= *Limnadia braueriana* (Ishikawa, 1895)
= *Eulimnadia packardiana* Ishikawa, 1895 (fide Rabet 2010)
= *Limnadia packardiana* (Ishikawa, 1895) (fide Rabet 2010)
= *Eulimnadia taoluoensis* Hu, 1986a
= *Limnadia taoluoensis* (Hu, 1986a)

Comments: Eastern China, Japan, Korea, Taiwan (Hu 1986; Olesen and Grygier 2003; Shen and Huang 2008; Kwon et al. 2010; Rabet 2010; Wang 2014). The type locality for *E. braueriana* is Kugenuma in modern Kanagawa Province, Japan, and the type locality for *E. packardiana* is Nikkô in Tochigi Province, Japan. Hu described *E. taoluoensis* in his 1986a paper, but also presented it as new in his 1986b paper. Naganawa and Orgilijanova (2000) treated *E. taoluoensis* as a junior synonym of *E. braueriana*, but provided no explanation. Comparison of the eggs for the two taxa (Shen and Huang 2008: 354, fig. 1D and; Wang et al. 2014: 414, fig. 2B) demonstrate that they are probably synonyms. However, Shen and Huang's (2008) SEM of the egg from the vicinity (?) of the type locality, depicts eggs that are covered in debris, and were possibly air dried alcoholic specimens (Rogers and Padhye 2015). They appear to be lacking "inflated rims" (Rabet 2010), but this could be an artefact of maturity or preservation and drying. This species needs to be compared with *E. indocylindrova* and *E. bondi*.

Eulimnadia canalis Timms, 2016a

Comments: Australia: northwestern New South Wales and southwestern Queensland.

Eulimnadia chacoensis Gurney, 1931

= *Limnadia chacoensis* (Gurney, 1931)

Comments: Paraguay. Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. The egg is depicted in Martin and Belk (1989 and Marinone et al. (2016). See discussion in Marinone et al. (2016) regarding *E. ovisimilis* as a probably synonym of *E. chacoensis*.

Eulimnadia chaperi (Simon, 1886) (fide Padhye & Rabet 2017)

= *Limnadia chaperi* Simon, 1886
= *Eulimnadia azisi* Subash Babu & Bijoy Nandan, 2010 (fide Padhye and Rabet 2017)

Comments: Type locality given is India: Karnataka State: Ballari. Treated as a junior synonym of *E. compressa* by Daday (1927). Redescribed by Padhye and Rabet (2017). The egg is remarkably similar to *E. cryptus*, and SEM is required for separation.

Eulimnadia colombiensis Sars, 1902

= *Limnadia colombiensis* Sars, 1902
= *Eulimnadia* "*columbica*" Daday unpublished ms name (fide Martin 1989)
= *Eulimnadia belki* Martin, 1989
= *Limnadia belki* (Martin, 1989)

Comments: northern South America (Rogers and Cruz-Rivera 2020). Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. The egg is depicted in Roessler (1989 1991b) and in Pereira and García (2001).

Eulimnadia contraria **Timms, 2016a**

= *Eulimnadia* sp. E Schwentner et al., 2015 (fide Timms 2016a)

Comments: Central Queensland, Australia.

Eulimnadia cryptus **Sanoamuang, Padhye, and Rogers, 2020**

= *Eulimnadia* "*magdalensis*" Rabet, 2010
= *Eulimnadia* "*magdalensis*" Padhye & Rabet 2017

Comments: India, Thailand, and Cambodia. The eggs are remarably similar to *E. magdalensis* of the Americas, and *E. chaperi*. SEM is required for proper identification.

Eulimnadia cylindrova **Belk, 1989**

= *Limnadia cylindrova* (Belk, 1989)

Comments: From deserts of southern USA and northern México (Rogers and Cruz-Rivera 2020). Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. The egg is depicted in the original description and in Pereira and García (2001).

Eulimnadia dahli **Sars, 1896b (fide Timms 2016a)**

= *Limnadia dahli* (Sars, 1896b)

Comments: Northern Territory, Queensland, and Western Australia, Australia. The egg is figured by Timms (2016a).

Eulimnadia diversa **Mattox, 1937**

= *Limnadia diversa* (Mattox, 1937), fide Belk, 1989
= *Eulimnadia inflecta* Mattox, 1939, fide Belk, 1989
= *Eulimnadia thompsoni* Mattox, 1939, fide Belk, 1989
= *Eulimnadia alineata* Mattox, 1953a, fide Belk, 1989
= *Eulimnadia ventricosa* Mattox, 1953b, fide Belk, 1989
= *Eulimnadia oryzae* Mattox, 1954a, fide Belk, 1989
= *Limnadia oryzae* (Mattox, 1954a)
= *Eulimnadia francesae* Mattox, 1953b, fide Belk, 1989

Comments: USA east of the Great Plains, with invasive poulations in California. The egg is figured in Belk (1989).

Eulimnadia dubia **Daday, 1913a**

= *Limnadia dubia* (Daday, 1913a)

Comments: New Guinea. The egg is undescribed.

Eulimnadia follisimilis **(Pereira & García, 2001)**

Comments: Venezuela.

Eulimnadia garretti **(Richters, 1882)**

= *Limnadia garretti* Richters, 1882

Comments: Tahiti. The egg has not been figured, but this species is being redescribed.

Eulimnadia geayi **Daday, 1913a**

= *Limnadia geayi* (Daday, 1913a)
= *Eulimnadia* "*columbica*" Daday unpublished ms name (fide Martin 1989)

Comments: Mexico to Colombia and Venezuela (Pereira and García 2001; Reed et al. 2015). The egg is depicted by Martin (1989) and Pereira and García (2001). Martin (1989) points out that: "Daday's (1926) illustration of the egg of *E. geayi* also shows a spherical egg with somewhat acute surface projections, but this is inconsistent with eggs of *E. geayi* in the Hungarian Museum. The eggs of *E. geayi* are short, grooved cylinders with one end of the cylinder slightly wider than the other."

Eulimnadia gibba **Sars, 1900**

= *Limnadia gibba* (Sars, 1900)

Comments: Tamil Nadu, India. Rogers and Padhye (2015) discuss *E. gibba* and suggest that it needs closer examination.

Eulimnadia gnammophila **Timms, 2016a**

= *Eulimnadia dahli* in Timms, 2006, Weeks et al., 2006, and Reed et al., 2015 (fide Timms 2016)
= *Eulimnadia feriensis* in Weeks et al., 2006, and in Reed et al., 2015 (fide Timms 2016a)

Comments: Occurs across the southern portions of Australia from Western Australia to Victoria. This species is a gnamma (rockpool) specialist.

Eulimnadia graniticola Rogers, Weeks, & Hoeh, 2010

Comments: Georgia and Florida, USA.

Eulimnadia hansoni Timms, 2016a

= *Eulimnadia* sp. G Schwentner et al., 2015 (fide Timms 2016a)
= *Eulimnadia* sp. H Schwentner et al., 2015 (fide Timms 2016a)
= *Eulimnadia* sp. K Schwentner et al., 2015 (fide Timms 2016a)
= *Eulimnadia* sp. O Schwentner et al., 2015 (fide Timms 2016a)

Comments: Inland Australia, particularly in the Paroo Desert region.

Eulimnadia indocylindrova Durga Prasad & Simhachalam, 2004 (fide Padhye et al. 2015)

Comments: India, Thailand (Rogers et al. 2016a). Rogers et al. (2016a) suggest that *E. indocylindrova* may be a synonym of *E. taoluoensis*. Images of the egg in Shen and Huang (2008: 354, fig. 1C) are of specimens obscured by debris and were possibly air dried alcoholic specimens before being prepared for SEM study. They appear to be lacking "inflated rims" (Rabet 2010), but this could be an artefact of egg shell maturity or air drying (Rogers et al. 2016a). This species needs to be compared closely with *E. braueriana* and *E. bondi*. It is possible that *E. braueriana* is a senior synonym of *E. indocylindrova*.

Eulimnadia insularis Rogers & Cruz-Rivera, 2020

= *Eulimnadia texana* (Packard, 1871) in Smith and Wier 1999

Comments: Puerto Rico, Jamaica, Virgin Islands. Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. Smith and Wier (1999) present images of the eggs.

Eulimnadia kimberleyensis Timms, 2018

Comments: Australia: Western Australia, known only from the Gardner Plateau. This species is a rock pool (gnamma) specialist.

Eulimnadia magdalensis Roessler, 1990 *sensu* Rabet, 2010

Comments: Brazil, Colombia, Venezuela (Roessler 1995a; Pereira and García 2001; Rabet et al. 2012 2014; Godinho et al. 2014; Bellec and Rabet 2016; Marinone et al. 2016; Rogers et al. 2020). Material reported from Cambodia (Rabet 2010; Padhye and Rabet 2017) needs further examination but is probably conspecific with *E. cryptus*. The egg is pictured in Pereira and García (2001) and Marinone et al. (2016).

Eulimnadia margaretae Bond, 1934 *sensu* Thiéry, 1996, Rabet et al., 2015

= *Limnadia margaretae* (Bond, 1934)

Comments: Oman, United Arab Emirates, Yemmen (Rabet et al. 2015). Redescribed by Rabet et al. (2015).

Eulimnadia mauritiana (Guérin, 1837)

= *Limnadia mauritana* (Guérin, 1837)

Comments: Mauritius (Simon 1886).

Eulimnadia michaeli Nayar & Nair, 1968 *sensu* Rogers, Dadseepai, & Sanoamuang, 2016a

= *Limnadia michaeli* (Nayar & Nair, 1968)
= *Eulimnadia khoratensis* Rogers, Dadseepai, & Sanoamuang, 2016a

Comments: India, Sri Lanka, Thailand (Rogers and Padhye 2015; Rogers et al. 2016a; Padhye and Kulkarni 2017). The types are presumed lost. The eggs are figured in Samyiah et al. (1985), Rogers et al. (2016a), and also in Padhye and Kulkarni (2017), who examine morphological variation in this species.

Eulimnadia orinoquiensis (Roessler, 1991b) fide Rogers et al. 2020

= *Limnadia orinoquiensis* Roessler, 1991b

Comments: Colombia.

Eulimnadia ovilunata Martin & Belk, 1989

= *Eulimnadia* sp. A. Martin, 1989

Comments: Argentina, Brazil (Martin and Belk 1989; Marinone et al. 2016). The egg is pictured in Marinone et al. (2016) and in the original description.

Eulimandia ovisimilis Martin & Belk, 1989

= *Eulimnadia ovismilis* (Belk, 1989) in error in Durga Prasad & Simhachalam, 2004

Comments: Paraguay and Argentina. Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. The egg for *E. ovisimilis* is presented in the original description and Marinone et al. (2016). Marinone et al. (2016) demonstrate that this species may very well be a junior synonym of *E. chacoensis*.

Eulimnadia pampa **Marinone, Urcola & Rabet, 2016**

= *Limnadia brasiliensis* (Sars, 1902) in César, 1990

Comments: Argentina.

Eulimnadia pinocchionis **Timms, 2016a**

Comments: Known only from the type locality a single gnamma (rock pool) in the Pilbara coastal plain of Western Australia.

Eulimnadia rogersi **Rabet & Gallerne, in Rabet et al., 2015**

Comments: Known only from the type locality in Adrar, Mauritania.

Eulimnadia taroomaensis **Timms, 2016a**

= *Eulimnadia* sp. M Schwentner et al., 2015 (fide Timms 2016)

Comments: Taroom District, Queensland, Australia.

Eulimnadia texana **Packard, 1871**

= *Limnadia texana* (Packard, 1871)

Comments: Widespread in the Americas and associated islands (Brendonck et al. 1990; Pereira and García 2001; Rogers et al. 2020). Brendonck et al. (1990) demonstrates great overlap in the egg morphology among New World taxa with cylindrical eggs. The egg is depicted in Belk (1989) and Pereira and García (2001).

Eulimnadia ulurensis **Timms, 2016a**

Comments: This species is a gnamma (rock pool) specialist, known only from Uluru and Kata Tjuta rocks, Northern Territory, Australia.

Nomina dubia, nuda, and species inquirendae:

Eulimnadia africana **(Brauer, 1877)** ***nomen nudum*** **fide Rabet et al. 2015**

= *Limnadia africana* Brauer, 1877

Comments: Type locality given as “Khartoum”, in the Sudan. The eggs are unknown. Barnard’s (1929) material is probably a misidentification (Rabet et al. 2015).

Eulimnadia antillarum **(Baird, 1852)** ***nomen dubium*** **fide Martin 1989, Rogers et al. 2020**

= *Limnadia antillarum* Baird, 1852

Comments: Caribbean Islands and coasts. Full discussion of the confusion and history of this name in Rogers et al. (2020). The eggs are unknown.

Eulimnadia azerbaidshanica **Smirnov, 1936** ***nomen dubium*** **fide Rabet et al. 2015**

= *Limnadia azerbaidshanica* (Smirnov, 1936)

Comments: The eggs are unknown.

Eulimnadia compressa **(Baird, 1860)** ***nomen dubium*** **fide Padhye & Rabet 2017**

= *Estheria compressa* Baird, 1860
= *Limnadia compressa* (Baird, 1860)
= *Eulimnadia similis* Sars, 1900 fide Rabet 2010
= *Limnadia similis* (Sars, 1900) fide Rabet 2010
= *Eulimnadia* sp. Rogers et al., 2013

Comments: India. Baird’s description was limited to the carapace and the types have been lost, while Daday’s material is either unassignable or misidentified (Padhye and Rabet 2017).

Eulimnadia curvirostris **Roen, 1952** ***species inquirenda***

= *Limnadia curvirostris* (Roen, 1952)

Comments: Vicinity of Beidaihe, Hebei Province, China. No types were deposited or designated. The eggs are unknown, and it has not been collected since it was discovered. It is probably a synonym of *E. braueriana*.

Eulimnadia gunturensis **Radhakrishna & Durga Prasad, 1976** ***species inquirenda***

= *Limnadia gunturensis* (Radhakrishna & Durga Prasad, 1976)

Comments: Andhra Pradesh, India. The egg is unknown.

Eulimnadia minuta **Daday, 1926** ***nomen nudum*** **(fide Rabet et al., 2015)**

= *Limnadia minuta* (Daday, 1926)

Comments: Described from the Ivindo area of

Gabon. The eggs are unknown.

Eulimnadia kobai Uéno, 1940 *species inquirenda*

= *Limnadia kobai* (Uéno, 1940)

Comments: Shenyang, Liaoning Province, China. No types were designated and no deposited material was referenced, and the egg was neither figured nor described. This species may be a synonym of *E. braueriana.* It is partially figured in Dong et al. (1982).

Eulimnadia ovata Nayar, 1965 *nomen dubium*

= *Limnadia ovata* (Nayar, 1965)
= *Eulimnadia ovata inversa* Battish, 1981
= *Limnadia ovata inversa* (Battish, 1981)

Comments: Northern India. The type locality is a ditch at Khetri, Rajasthan, near the Haryana border. The type locality for *E. o. inversa* is Ludhiana, in Punjab to the north. The eggs of this species are undescribed and the types are apparently lost (Rogers and Padhye 2015).

Eulimnadia pulchra Mohammad, 1986 *species inquirenda*

= *Limnadia pulchra* (Mohammad, 1986)

Comments: Iraq; known only from the type locality northeast of Baghdad, and a site near Mosul. The egg was never described. The type is a single male deposited in the British Museum (1984.191). Six paratypes were also collected, but their whereabouts were not recorded. Brtek (1997) writing about *E. pulchra*, inexplicably stated: "(the pertinence to this genus is uncertain) (sic) - probably gen. nov." There is no obvious evidence as to what his statement was based upon.

Eulimnadia santiaguensis (Cesar, 1991) *species inquirenda* (fide Marinone et al., 2016)

= *Limnadia santiaguensis* Cesar, 1991

Comments: Argentina. Possibly a senior synonym of *E. pampa* (Marinone et al., 2016).

Eulimnadia subtropica Daday, 1913b *species inquirenda* (fide Rabet, 2010)

= *Limnadia subtropica* (Daday, 1913b)

Comments: The eggs are unknown.

Eulimnadia tropica Rammner, 1933 nomina dubia fide Rogers et al. 2020

= *Limnadia tropica* (Rammner, 1933)

Comments: The types are juveniles.

Gondwanalimnadia Rogers, Rabet and Weeks, 2016b

= *Afrolimnadia* Rogers, Rabet and Weeks, 2012

Diagnosis: (modified from Rogers et al. 2012) Populations composed of males and hermaphrodites; amplexus is venter to venter. Rostrum variable, typically rounded in females, acute to aciculate in males. Angle between rostrum and frons from 80° to 100°. Occipital notch occipital condyle absents. Pedunculate frontal organ length 0.7 to 2.5x distance of organ from ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate, rarely sinuate. Carapace surface between growth lines slightly to strongly malleate. Umbone absent. Carapace unpigmented. Muscle scar angle 35° to 40° from normal, *i.e.*, body horizontal axis. Clasper endopods bearing an apical suctorial organ. Endite IV with an apical dense field of long spines. Female thoracopods IX and X with prolonged exopods for egg attachment. Thoracic segments smooth. Telson with posteriorly directed spiniform projection present at ventroposterior angle, anteriad of cercopod base. Telson posteriolateral spine rows confluent dorsally, confluence not projecting. Each row with 10–15 spines. Caudal filament originating between spine rows at third spine pair from confluence. Caudal filament never borne on mound. Cercopods dorsal margin sinuate, longer than ventral telson margin. Cercopod medial surface with single basal spine and longitudinal row of plumose setae along proximal 80%. Cercopod with subapical, dorsal cirri, extending 5% of the cercopod length. Males amplex females venter to venter, at right angles to female's body. Egg diameter 100–150 μm, spherical to subspherical. Eggs with narrow, slit shaped depressions, separated by narrow ridges.

Comments: Rogers et al. (2012) described this genus based on material ascribed to *Eulimnadia alluaudi*. The name *Afrolimnadia*, however, was preoccupied for a fossil genus of spinicaudatan clam shrimp (Lioestheriidae) (Tasch 1987), and the same authors amended the name to *Gondwanalimnadia* (Rogers et al. 2016b). The authors were not fully confident in the specific determination for the material ascribed to this genus (see below). Therefore, whereas the genus is valid (based upon morphological (Rogers et al. 2012) and molecular (Weeks et al. 2009) studies) the identity of the sole species placed in this genus remains unclear. The egg is depicted by Rabet (2010).

Attributed Species

Gondwanalimnadia alluaudi **(Daday, 1926)**

= *Eulimnadia alluaudi* Daday, 1926
= *Limnadia alluaudi* (Daday, 1926)
= *Afrolimnadia alluaudi* (Daday, 1926)

Comments: The material examined by Rogers et al. (2012) was collected from the Republic of South Africa, identified based on the original description and other references to the South African fauna (Brendonck 1999). However, this species was originally described from Madagascar. There are obvious inconsistencies in the egg morphology (Rabet 2010) between the populations.

Imnadia **Hertzog, 1935**

Diagnosis: (modified from Rogers et al. 2012). Populations composed of males and females; amplexus is venter to venter. Angle between rostrum and frons 100° to 80°. Occipital notch broad and shallow, twice as broad as deep. Occipital condyle conical. Frontal organ sessile. Carapace with dorsal margin smooth, lacking carinae, hinge line arcuate. Carapace surface between growth lines smooth. Umbone absent. Carapace without pigmentation. Muscle scar angle 30° from normal. Thoracic segments smooth. Clasper endopods each bearing an apical suctorial organ. Endite IV with apical dense field of long spines. Eggs attaching to prolonged exopods of thoracopods IX and X. Telson with posteriorly directed spiniform projection present on ventroposterior angle. Telson posterior margin spine rows confluent dorsally, not projecting. Each row with 11–19 spines. Caudal filament born on a low mound or not, originating between spine rows between third through six spines from confluence. Cercopods slightly sinuate, each medially with longitudinal row of long plumose setae on proximal 60%. Setal row terminates with a single spine. Cercopod with subapical dorsal cirrus, extending 35% of cercopod length.

Eggs 100-150 μm in diameter, subspherical with slit shaped polygonal depressions separated by lamellar ridges (Thiéry and Gasc 1991).

Comments: Monotypic.

Attributed Species

Imnadia yeyetta **Hertzog, 1935**

= *Imnadia voitestii* Botnariuc and Orghidan, 1941
= *Imnadia cristata* Marinček, 1972
= *Imnadia banatica* Marinček & Valvajter, 1982
= *Imnadia panonica* Marinček et Petrov, 1984

Comments: Austria, the Balkans, Czech Republic, France, (Loeffler 1961; Šrámek-Hušek et al. 1962; Straškraba 1966; Thiéry and Pont 1987; Miličić and Petrov 2007; Eder 2002). Marinček and Petrov (1984) review the variation in this species. Brtek (1957) provides a redescription.

Limnadia **Brongniart, 1820**

= *Monoculus* Linnaeus, 1761
= *Daphnia* Herman, 1802
= *Limnadella* Girard, 1854
= *Estheria* Baird, 1860

Diagnosis: (modified from Rogers et al. 2012). Populations nearly always composed of hermaphrodites, with males exceedingly rare (Sassaman 1995; Eder et al. 2000; Weeks et al. 2008). Amplexus is venter to venter. Rostrum variable; typically blunt in hermaphrodites and acute in males. Angle between rostrum and frons 100° to 80°. Occipital notch and condyle absent. Frontal organ pedunculate. Frontal organ length 2–2.5 times distance between base of frontal organ and ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate. Carapace surface between growth lines smooth or faintly malleate. Umbone absent. Carapace without pigmentation. Muscle scar angle 20 to 40° from normal. Thoracic segments smooth or with dorsoposterior ridge margined with spines or setae. Clasper endopods each bearing and apical suctorial organ. Endite IV with apical dense field of long spines. Eggs attaching to prolonged exopods of thoracopods X and XI. Telson without spiniform projection on ventroposterior angle, anteriad of cercopod base. Telson posterior spine rows confluent dorsally, confluence not projecting. Each row with 11–19 spines. Caudal filament originating at or above apex of dorsal spine row confluence. Caudal filament never borne on mound. Cercopods arcuate, with or without a medial longitudinal row of setae along proximal 30–40%. Setae simple, short, sometimes spiniform. Setal row terminates with 0–9 spines. Cercopod with subapical, dorsal cirrus, extending from 10–50% of cercopod length. Eggs 120–170 μm in diameter, double discoidal in shape. Eggs with narrow slit shaped depressions separated by low ridges.

Comments: Bellec et al. (2018) presents the most recent review of the genus, but it is still limited. Additional revisonary work is needed, and the eggs need to be compared and studied in detail. There is still one additional undescribed species in the USA (Rogers per. obs.). Sars (1903) reported and figured *Limnadia* sp. which he reared from soil collected in Sumatra, identifying the form as *L. lenticularis*. Whether this represents a new species or contamination from one of his

European cultures of *L. lenticularis* remains to be seen.

Attributed Species

Limnadia americana **Morse, 1868**

= *Limnadia lenticularis* (Linnaeus, 1761) pro partim

Comments: Southeastern USA. Bellec et al. (2018) demonstrates that this species is valid. The egg is depicted by Martin (1989).

Limnadia lenticularis **(Linnaeus, 1761)**

= *Monoculus lenticularis* Linnaeus, 1761
= *Daphnia gigas* Hermann, 1802
= *Estheria gigas* (Hermann, 1804)
= *Limnadia hermanni* Brogniart, 1820
= *Limnadia gigas* Grube, 1853
= *Limnadia americana* Morse, 1868

Comments: Europe (Šrámek-Hušek et al. 1962; Eder 2002). Eder et al. (2000) provide detailed descriptions of the male. Eggs figured in Thiéry and Gasc (1991).

Limnadia nipponica **Ishikawa, 1895**

= *Limnadia lenticularis* (Linnaeus, 1761) pro partim

Comments: Japan. Bellec et al. (2018) demonstrates that this species is valid. Eggs figured in Shen and Huang (2008).

Nomina nuda and species inquirendae

Limnadia coriacea **Haldeman, 1842** ***species inquirenda***

= *Limnadella coriacea* (Haldeman, 1842)
= *Limnadella kitei* Girard, 1854 (fide Brtek, 1997)
= *Limnadia kitei* (Girard, 1854)

Comments: Unrecognisable from the description, reported once from Pennsylvania and once from Ohio, USA.

Limnadia melotensis **Gulia, 1873** ***nomen nudum***

= *Limnodia melitensis* Gulia, 1873 *nomen imperfectum*

Comments: Gulia (1873) mentions this taxon, but provides no description or figures, and no material was ever deposited.

Limnadopsis **Spencer and Hall, 1896**

= *Estheria* Baird, 1860 (in part)
= *Limnadiopsis nomen imperfectum* fide Daday, 1925; Schneider and Sissom 1982
= *Limnadiopsium* Novojilov, 1958

Diagnosis: (modified from Rogers et al. 2012) Populations composed of males and females; male amplexes female on posterior carapace margin, keeping body in line, single file, behind female. Rostrum variable, blunt to acute, triangular or truncated, long or short, lacking apical spine. Angle between rostrum and frons 50° to 100°. Occipital notch and condyle absent. Frontal organ pedunculate. Frontal organ length 1.0 to 3.5 times distance between base of frontal organ and base of ocular tubercle. Carapace dorsal margin growth lines expanded dorsally into carinae or smooth. Carapace hinge line arcuate or straight. Carapace surface between growth lines smooth. Umbone typically present, rarely absent. Carapace with or without some pigmentation. Muscle scar angle ranges from 40 to 90 degrees from normal. Thoracic segments may have a dorsoposterior ridge or a dorsoposterior projection margined with spines or setae. Male first two thoracopods with endopod with scaliform setae, lacking a suctorial organ. Endite IV typical for family. Eggs attaching to prolonged exopods of thoracopods IV to XII, VI to XI, or IX, X and XI. Telson with or without a spiniform projection on ventroposterior angle anteriad of cercopod base. Telson posterior margin spine rows confluent dorsally, with confluence projecting dorsoposteriorly or with spines at confluence larger in diameter than subsequent spines. Each row averaging 22.3 spines. Caudal filament originating between spine rows at either third or fourth, or fourteenth and fifteenth spines from confluence. Cercopods arcuate, each medially with longitudinal setal row along proximal 30 to 70%. Setae plumose, simple or setaform spines, long or short. Setal row terminates in one to six spines. Cercopod with subapical, dorsal cirrus, extending 5 to 40% cercopod length. Eggs 150–200 µm in diameter, varying greatly in shape, with species specific morphology. Eggs with large polygonal depressions separated by ridges, occasionally with lamellar or setaform spines at polygon ridge line confluences (Timms 2009a).

Comments: Important works on this genus include Timms (2009a), Weeks et al. (2009), and Schwentner et al. (2011). As in most limnadiid genera, the egg morphology is also species specific. The eggs are depicted in Timms (2009a) and Schwentner et al. (2012a b).

Attributed Species

Limnadopsis birchii (Baird, 1860) *sensu* Timms, 2009a

= *Estheria birchii* Baird, 1860
= *Estheria birchi* Baird, 1860 *nomen imperfectum*
= *Limnadopsis squirei* Specner & Hall, 1896
= *Limnadiopsis britchii nomen imperfectum* Daday, 1925; Novojilov, 1958

Comments: Arid and semiarid inland Australia; not reported from Tasmania or Victoria. Baird's types are missing, but Spencer and Hall's types for *L. squirei* are available (Timms 2009a). The eggs are figured in Timms (2009a).

Limnadopsis bloodwoodensis Schwentner, Timms, and Richter, 2012a

= *Limnadopsis* sp. 'Roskos' Schwentner et al., 2011

Comments: Australia: New South Wales, Queensland.

Limnadopsis brevirostris Schwentner, Timms, and Richter, 2012a

= *Limnadopsis* sp. 'Lagoon' Schwentner et al., 2011

Comments: Known only from the type locality, Queensland, Australia.

Limnadopsis centralensis Schwentner, Timms, and Richter, 2012a

Comments: Erldunda-Curtin Springs area south of Alice Springs, Northern Territory, Australia.

Limnadopsis minuta Timms, 2009a

Comments: Known only from the type locality at Keep River National Park, Northern Territory, Australia. A surprisingly small species in this genus.

Limnadopsis multilineata Timms, 2009a

Comments: Australia: northern Western Australia.

Limnadopsis occidentalis Timms, 2009a

Comments: Australia: central Western Australia.

Limnadopsis paradoxa Timms, 2009a

Comments: Australia: New South Wales, South Australia (one record in each), Western Australia (many records).

Limnadopsis paratatei Schwentner, Timms, and Richter, 2012a

= *Limnadopsis* cf. *tatei* 'Carter's' Schwentner et al., 2011

Comments: Paroo Desert on the New South Wales, Queensland border, Australia.

Limnadopsis parvispinus Henry, 1924 *sensu* Timms, 2009

Comments: Australia: New South Wales and Queensland. Syntypes at the Australian Museum.

Limnadopsis pilbarensis Timms, 2009a

Comments: Australia: Pilbarra region, in Western Australia.

Limnadopsis tatei Spencer and Hall, 1896 *sensu* Schwentner et al. 2012

= *Limnadia tatei* (Spencer and Hall, 1896)
= *Limnadopsium tatei* (Spencer and Hall, 1896)
= *Limnadopsis* cf. *tatei* 'Titanic' Schwentner et al., 2011

Comments: Central and northern inland Australia. The eggs are figured and a neotype fixed in Timms (2009a).

Nomina dubia

Limnadopsis brunneus Spencer and Hall, 1896 *nomen dubium*, fide Timms, 2009a

Comments: Described from four dried specimens (lost), collected in the vicinity of Darwin, Northern Territory. The description is not useful as the text and the figures are contradictory, and the characters used are not specific to any one *Limnadopsis* species (Timms 2009a). Material reported by Schnieder and Sissom (1982) cannot be located (Timms 2009a).

Metalimnadia Mattox, 1952

= *Paraimnadia* Roessler, 1991a

Diagnosis: (modified from Rogers et al. 2012) Populations composed of males and females; amplexus is venter to venter. Rostrum acute, truncated or elongate and truncated in both sexes. Angle between rostrum and frons 80° to 110°. Occipital notch present. Frontal organ sessile, slightly protruding. Carapace dorsal margin smooth, without dorsal carinae. Umbone present, with lateral carinae or tubercles. Hinge line straight or arcuate, anterior end may project. Carapace surface between growth lines smooth, punctate, or malleate. Carapace often with pigmentation. Muscle scar circular or elongate, with angle at 20 degrees from normal. Thoracic segments sometimes with dorsoposterior ridge margined with spines or setae. Male first two thoracopods with endopod bearing an apical suctorial organ. Endite IV typical for family. Eggs attaching to prolonged exopods of thoracopods IX and X. Telson with spiniform projection on ventroposterior angle, anteriad of cercopod base. Telson posterior spine rows confluent dorsally, with confluence not projecting. Each row with nine to 16 spines. Caudal filament originating between spine rows at second, third, or fourth spines from confluence. Cercopods straight in proximal two thirds and slightly arcuate apically. Cercopods each medially with longitudinal row of short or long plumose setae along proximal 60%. Setal row terminates with short spine. Cercopod with subapical dorsal cirrus. Eggs 130 to 160 μm in diameter, subcylindrical and tumid. Eggs with thin ridges, with regularly spaced spinules.

Comments: Roessler (1995b) and Rogers et al. (2020) note that there are undescribed species in Brazil. This genus appears to be rock pool specialists.

Attributed Species

***Metalimnadia serratura* Mattox, 1952**

= *Paraimnadia guayanensis* Roessler, 1991a

Comments: Colombia, Guyana, and Venezuela (Mattox 1952; Roessler 1995a b; Pereira and García 2001; Rogers et al. 2020). The eggs are depicted by Pereira and García (2001).

***Paralimnadia* Sars, 1896b, *sensu* Rogers et al., 2012, Timms and Rogers, 2020**

= *Eulimnadia* pro partim. Sayce 1903; Wolf 1911; Dakin 1914; Henry 1924; Richter & Timms 2005
= *Limnadia* pro partim. Brtek 1997

Diagnosis: (modified from Rogers et al. 2012). Populations composed of males and females; male amplexes female on posterior carapace margin, keeping body in line, single file, behind female. Rostrum variable, from blunt to acute, long or short, in both sexes. Angle between rostrum and frons 80° to 100°. Occipital notch and condyle absent. Frontal organ pedunculate. Frontal organ length 0.5 to 1.5 times distance between base of frontal organ and base of ocular tubercle. Carapace dorsal margin smooth, lacking carinae, hinge line arcuate, rarely sinuate. Carapace intervals smooth. Umbone absent. Carapace with or without pigmentation. Muscle scar angle 10 to 80 degrees from normal. Thoracic segments with dorsoposterior ridge margined with spines or setae. Male first two thoracopods with endite V bearing apical suctorial organ. Endite IV typical for family, although sometimes broadly transverse or bearing dense, apical setal field. Eggs attaching to prolonged exopods of thoracopods IX and X, X and XI, or XI and XII. Telson without spiniform projection on ventroposterior angle, anteriad of cercopod base. Telson posterior margin spine rows confluent dorsally, with confluence projecting or not. Each row averaging five to 25 spines. Caudal filament originating between spine rows at third, fourth, or fifth spines from confluence. Cercopods arcuate, occasionally sinuate. Cercopod medial surface with longitudinal row of setae along proximal 40 to 60%. Setae plumose, sometimes long or short. Setal row terminates with one spine. Cercopod with subapical, dorsal cirrus, extending 10 to 50% of cercopod length. Eggs 100 to 170 μm in diameter, spherical to subspherical in shape. Eggs with large rectilinear polygonal depressions separated by ridges, occasionally with lamellar or setaform spines at polygon ridge line confluences.

Comments: The type species for the genua is *Limnadia stanleyana* King, 1855, by monotypy. Recent work has helped us in separating this genus from *Eulimnadia* (Timms and Rogers 2020). The genus occurs in Australia, New Zealand, and the Celebes Islands.

Attributed Species

***Paralimnadia ammopholos* Timms, 2016b**

Comments: Australia: temporary rainfilled hollows in coastal dunes in northern New South Wales, just south of the Queensland border.

***Paralimnadia badia* (Wolf, 1911) *sensu* Timms, 2016b**

= *Eulimnadia badia* Wolf, 1911
= *Limnadia badia* (Wolf, 1911)

Comments: Australia; Western Australia and South Australia. This species is a rock pool (gnamma) specialist. Dakin (1914) described variation from the original description. The egg is figured by Timms (2016b).

***Paralimnadia bishopi* Timms, 2016b**

Comments: Known only from the type locality on

Cape York, in northern Queensland, Australia. The type locality is in coastal sand dunes.

Paralimnadia centenaria **(Timms, 2016a) fide Timms and Rogers, 2020**

= *Eulimnadia centenaria* Timms, 2016a

Comments: Australia: Katherine area of Northern Territory.

Paralimnadia cygnorum **(Dakin, 1914)** ***sensu*** **Timms, 2016b**

= *Limnadia cygnorum* Dakin, 1914

Comments: Australia: southern Western Australia. The type locality is given as Cannington on the Swan River. The egg is figured by Timms (2016b).

Paralimnadia datsonae **(Timms, 2015) fide Timms and Rogers, 2020**

= *Eulimnadia datsonae* Timms, 2015

Comments: Australia: southern Western Australia.

Paralimnadia feriensis **(Dakin, 1914)** ***sensu*** **Timms, 2015, fide Timms and Rogers, 2020**

= *Eulimnadia feriensis* Dakin, 1914
= *Limnadia feriensis* (Dakin, 1914)

Comments: Western Australia, Australia. Redescribed by Timms (2015).

Paralimnadia flavia **Timms, 2016b**

Comments: Extreme northern Western Australia and Northern Territories, Australia.

Paralimnadia hyposalina **Timms, 2016b**

Comments: Australia: hyposaline pools in southwestern Western Australia.

Paralimnadia laharum **Timms, 2018**

Comments: Australia: Victoria. Endemic to the Grampian Mountains. This species is a rock pool (gnamma) specialist.

Paralimnadia marplesi **(Timms & McLay, 2005) fide Timms and Rogers, 2020**

= *Eulimnadia marplesi* Timms & McLay, 2005

Comments: New Zealand. Collected originally in 1962 and not reported since.

Paralimnadia minyspinosa **Timms & Schwentner, 2020**

Comments: Australia: New South Wales. Endemic to Gibralter National Park. This species is a rock pool (gnamma) specialist.

Paralimnadia monaro **Timms, 2016b**

Comments: Known only from southern New South Wales, Australia. This species occurs in pools in granitic sands and muddy basalt on the Monaro Plateau. Schwentner et al. (2020b) demonstrate that this species is probably at least two highly endemic species.

Paralimnadia montana **Timms, 2016b**

Comments: Australia: northwest New South Wales mountains. Occurs in gnammas and muddy pools on basalt.

Paralimnadia multispinosa **Timms, 2016b**

Comments: Known only from the Payne's Find area in southern Western Australia, Australia.

Paralimnadia queenslandicus **Timms, 2016b**

= *Paralimnadia* sp. A Schwentner et al., 2015

Comments: Queensland and adjacent inland New South Wales, Australia.

Paralimnadia rivolensis **(Brady, 1886)** ***sensu*** **Timms, 2015**

= *Eulimnadia rivolensis* Brady, 1886
= *Limnadia rivolensis* (Brady, 1886)
= *Eulimnadia palustera* Timms, 2015 fide Timms and Rogers, 2020

Comments: Australia: South Australia, Tasmania, Victoria, Western Australia (Dakin 1914; Gurney 1927). Records for NSW, QLD, and NT in Spencer and Hall are errors. The type locality is given as Rivoli Bay, South Australia. The egg is figured in Timms (2015 and 2016b).

Paralimnadia saxitalis **Timms, 2016**

Comments: Australia: one location each in southern Northern Territories (Uluru) and northeast New South Wales (Mt Kaputar). This species is a gnamma (rock pool) specialist.

Paralimnadia sordida (King, 1855) *sensu* Timms, 2016b

= *Limnadia sordida* King, 1855
= *Eulimnadia sordida* (King, 1855)
= *Eulimnadia victoriensis* Sayce, 1903 fide Timms, 2016b
= *Limnadia victoriesnsis* (Sayce, 1903)

Comments: Coastal portions of New South Wales and Victoria, Australia. The egg is figured by Timms (2016b).

Paralimnadia stanleyana (King, 1855) fide Sars, 1896b, *sensu* Timms, 2016b

= *Limnadia stanleyana* King, 1855
= *Eulimnadia stanleyana* (King, 1855)

Comments: Coastal New South Wales, Australia; other records are likely misidentifications (Timms 2016b). This species is a gnamma (rock pool) specialist on sandstone. The egg is figured and the complex nomenclatural history is discussed by Timms (2016b).

Paralimnadia urukhai (Webb & Bell, 1979) *sensu* Timms & Schwentner, 2020

= *Limnadia urukhai* Webb & Bell, 1979
= *Limnadia upukhai* Webb & Bell, 1979 in error in Shen and Huang 2008

Comments: Timms and Schwentner (2020) redescribed this species, pointing out that there are two genetic lineages. Eastern portion of the New South Wales/ Queensland border region, Australia. This species is a rock pool (gnamma) specialist. Schwentner et al. (2020b) demonstrate that this species is probably two or three highly endemic species.

Although never specifically mentioned in the original description, it would appear that the describers named this species after the Uruk-hai, a fictional breed of half human, half orc (goblin) from J.R.R. Tolkien's fantasy books, "The Lord of the Rings".

Paralimnadia vinculuma (Timms, 2015) fide Timms and Rogers, 2020

= *Eulimnadia vinculuma* Timms, 2015

Comments: Australia: southwestern Western Australia.

Paralimnadia westraliensis Timms, 2016b

Comments: Australia: Western Australia.

Paralimnadia woltereckі (Brehm, 1933) New Combination

= *Eulimnadia woltereckі* (Brehm, 1933)
= *Limnadia woltereckі* Brehm, 1933

Comments: Celebes. Reported only once. Based on the drawings by Brehm (1933), this species appears to have the morphological characteristics of *Paralimnadia*.

Cyzicidae Stebbing, 1910

= Estherianae Packard, 1874
= Estheriidae Sars, 1900
= Caenestheriidae Daday, 1913a: 12 (pro partim)
= Isauridae Bock, 1953
= Bairdestheriidae Novojilov, 1954, in part
= Straskrabiidae Naganawa, 2001b **New Combination**

Diagnosis: (From Schwentner et al. 2020a). Cephalic fornices extending anteriorly to rostral apex. Rostrum variable, blunt to acute, long or short, generally triangular to subquadrate in lateral view. Rostrum with or without an apical spine. Compound eyes fused medially, sometimes projecting in smoothly arcuate ocular tubercle. Frontal organ sessile. Occipital notch present. Carapace thick, generally rounded. Carapace dorsal margin smooth, lacking carinae, hinge line straight. Carapace with or without pigmentation, growth lines obvious, projecting. Umbone present, projecting well above hinge line. Muscle scar rarely visible. Male first two thoracopods with endopod (*sensu* Olesen, 2007) lacking an apical suctorial organ or modified tactile setae. If modified setae or spines are present these are never arranged in a transverse apical row of spatulate spines. Telson without a ventroposterior, posteriorly directed spiniform projection. Eggs 110–170 μm in diameter, spherical and generally lacking ornamentation.

Comments: Two genera are recognised here. Daday (1913a: 14) designated *Cyzicus* as the type genus. Novojilov (1954) created Bairdestheriidae for a large number of fossil genera, among which were *Opsipolygrapta* and *Pseudograpta*, and then moved several recent cyzicid species into these genera based on their descriptions. However, the relationships are at best dubious, and no subsequent authors have followed this arrangement.

Cyzicus Audouin, 1837

= *Estheria* Rüppell in Strauss-Durchheim, 1837 (pro partim), nomen praeoccupatum
= *Isaura* Joly, 1842 nomen praeoccupatum
= *Caenestheriella* Daday, 1914: 106, fide Margalef, 1953, fide Straškraba 1965b

= *Caenestheria* Daday, 1914: 53 (pro partim)
= *Bairdestheria* Raymond, 1946
= *Opsipolygrapta* Novojilov, 1954 (pro partim)

Diagnosis: (From Schwentner et al. 2020a). Populations composed of males and females (except *C. gynecia* which is only composed of hermaphrodites); amplexus is venter to venter. Rostrum subtriangular (usually females) to subquadrate (usually males), depending on age and gender. Angle between rostrum and frons 160° to 180°. Occipital notch either deep and narrow, often closed, very shallow or absent. Occipital condyle conical, subacute, length subequal to basal width. Rostral spine generally absents. Carapace valve length ~1.3x valve breadth (umbone to margin). Carapace growth line intervals smooth or ornamented (scarring from algae often mistaken for ornamentation). Carapace typically dark brown, occasionally black, or with yellow markings, often with setae. Clasper endopod apically unarmed, or with a few setae, apical margin crenulate at most. Endite IV broadly transverse to cylindrical, bearing a dense, apical field of short spiniform setae. Thoracic segments smooth or with a central dorsoposterior projection and/or set of spines or setae. Eggs attaching to prolonged exopods of thoracopods IX and X. Thoracopod exopods lacking a triangular lamina. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not projecting. Each row has from 10 to 30 spines depending on species. Caudal filament originating between spine rows at fifth, sixth, or seventh spines from confluence. Caudal filament borne or not on projecting mound. Cercopods arcuate, occasionally sinuate, or straight with distal fourth to third bent dorsally. Cercopod with medial longitudinal setal row on proximal 40–60%. Setae plumose and either long or short. Setal row terminates with single spine. Cercopod with subapical, dorsal cirrus, extending from 60–40% of cercopod length. Eggs smooth, unornamented.

Comments: *Limnadia tetracerus* Krynicki, 1830 is the type species monotypy (Auduoin 1837). *Caenestheriella* was treated as a junior synonym based on morphological and developmental grounds by Margelef (1953), Straškraba (1965b), Wiltshire (1973), Forró and Brtek (1984), Sassaman (1995), Smith and Gola (2001) and Orridge (2011). Molecular results support this move (Schwentner et al. 2015 2020a). The character for separating the two genera was the form of the rostrum which was triangular in in *Caenestheriella*, but quadrate in at least male *Cyzicus* (Daday, 1913a). However, Wiltshire (1973) demonstrated that this was a matter of development at least in Nearctic species; younger animals have a triangular rostrum and older animals a quadrate rostrum, with both forms sexually reproductive.

Tiwari (1966) moved *Cyzicus indicus* and *C. boysii* into the fossil genus *Baidestheria* Raymond, 1946. *Baidestheria* species are diagnosed as having the carapace intervals bearing radial striae as opposed to punctae. Rogers and Padhye (2015) point out that carapace fine characters may not be diagnostic at genus level, as they are affected by epibiontic algal growth and probably by nutrition.

García and Pereira (2003) state that the Cyzicidae has not been reported from South America; Daday (1914) reported a specimen of *C. jonesi* from southern South America, and two *Cyzicus* nomina dubia were described from Brazil, both based on empty carapaces, so their actual placement is questionable.

Many *Cyzicus* taxa from Africa and Eurasia may be moved to *Ozesthehria* upon re-examination.

Attributed Species

Cyzicus aegyptiacus Daday, 1914: 290

Comments: Described from Cairo, Egypt, and not reported since. This species needs to be compared with *C. ehrenbergi*, *C. crinitus*, *C. donaciformis*, and *C. paradoxus*.

Cyzicus algericus Daday, 1914: 261

Comments: Algeria.

Cyzicus belfragei (Packard, 1871)

= *Estheria belfragei* Packard, 1871
= *Caenestheriella belfragei* (Packard, 1871)

Comments: Described from Waco, Texas, USA. Mattox (1957b) reported it from Kansas, Oklahoma and Texas. This species needs to be compared with *C. mexicanus*, *C. gynecia* and *C. morsei*. Donald's (1989) record from Wood-Buffalo National Park, Alberta, Canada needs to be re-examined.

Cyzicus bucheti (Daday, 1913a)

= *Caenestheriella bucheti* Daday, 1913a *nomen nudum*
= *Caenestheriella bucheti* Daday, 1914: 136

Comments: Morocco (Thiéry 1986, Van den Broeck et al. 2015).

Cyzicus californicus (Packard, 1874)

= *Estheria californicus* Packard, 1874
= *Cyzicus newcombii* (Baird, 1866)
= *Cyzicus setosus* (Pearse, 1912)

= *Estheria setosa* Pearse, 1912
= *Caenestheriella setosa* (Pearse, 1912) fide Schwentner et al. 2020a

Comments: Redescribed by Daday (1914: 249, 324). Central and northern México, western USA north to Oregon and South Dakota (Mattox 1957b; Maeda-Martínez et al. 2002). California, USA. Packard's (1874) description of *C. californicus* is not useful. The type locality for *C. setosa* is De Witt, Nebraska, USA. This species needs to be compared with *C. elongatus*.

Cyzicus crinitus (Thiele, 1900)

= *Estheria crinita* Thiele, 1900: 568
= *Caenestheriella crinita* (Thiele, 1900)
= *Caenestheria crinita* (Thiele, 1900)
= *Caenestheriella echinata* (Thiele, 1900)
= *Baidestheria crinita* (Thiele, 1900)
= *Baidestheria echinata* (Thiele, 1900)
= *Opsipolygrapta crinita* (Thiele, 1900)
= *Opsipolygrapta echinata* (Thiele, 1900)

Comments: This species was originally described from a pool in Tanzania, but has not since been reported from that part of Africa. Daday (1915), Gauthier (1939), and Monod (1969b) report this species from Chad (at Koussri, on the Cameroon Border), Niger, and Sudan. However, these additional localities seem oddly disjunct, separated from the Tanzanian locality by the wet tropical zone. This species needs to be compared with *C. ehrenbergi*, *C. donaciformis*, *C. aegyptiacus*, and *C. paradoxus*.

Cyzicus donaciformis (Baird, 1849)

= *Estheria donaciformis* Baird, 1849
= *Baidestheria donaciformis* (Baird, 1849)
= *Caenestheriella donaciformis* (Daday, 1913b)
= *Cyzicus echinatus* (Daday, 1913b)
= *Opsipolygrapta echinatus* (Daday, 1913b)

Comments: Sudan (Simon 1886). Figured by Daday (1914: 180). This species needs to be compared with *O. crinitus*, *C. ehrenbergi*, *C. aegyptiacus*, and *C. paradoxus*.

Cyzicus eductus (Daday, 1913b)

= *Caenestheriella eductus* Daday, 1914: 127
= *Caenestheriella deducta* Daday, 1914 *nomen imperfectum* in Vecchi 1922

Comments: Israel, Syria (Thiéry 1996). This species should be compared with *O. crinitus*, *C. tetracerus*, *C. gihoni*, *C. hierosolymitana*, *C. ehrenbergi*, *C. donaciformis*, *C. aegyptiacus*, and *C. paradoxus*.

Cyzicus ehrenbergi (Daday, 1913b)

= *Caenestheriella ehrenbergi* Daday, 1913b *nomen nudum*
= *Caenestheriella ehrenbergi* Daday, 1914: 152
= *Caenestheriella ehrenbergi* var. *dimorpha* Daday, 1914: 152
= *Caenestheriella ehrenbergi* var. *michaelseni* Daday, 1914: 155
= *Caenestheriella ehrenbergi* var. *michaelseni* Daday, 1914: 159
= *Cyzicus ehrenbergi* var. *dimorpha* Daday, 1914: 155
= *Cyzicus dimorphus* (Daday, 1913b)
= *Baidestheria dimorpha* (Daday, 1913b)
= *Baidestheria ehrenbergi* (Daday, 1913b)
= *Caenestheriella ehrenbergi* var. *fimbriata* Brehm, 1935
= *Cyzicus ehrenbergi* var. *fimbriata* Brehm, 1935
= *Cyzicus fimbriatus* (Brehm, 1935)
= *Cyzicus ehrenbergi* var. *michaelseni* (Daday, 1913b)
= *Baidestheria michaelseni* (Daday, 1913b)
= *Cyzicus michaelseni* (Daday, 1913b)

Comments: The type locality is given as Egypt, but Daday (1914) also mentions material from Australia (his form *michaelseni*), which is certainly an error in labelling or identification. This species needs to be compared with *O. crinitus*, *C. donaciformis*, *C. aegyptiacus*, and *C. paradoxus*.

Cyzicus elongatus Mattox, 1957b

Comments: California, USA. This species needs to be compared with *C. californicus*.

Cyzicus gifuensis (Ishikawa, 1895)

= *Estheria gifuensis* Ishikawa, 1895
= *Caenestheriella gifuensis* (Ishikawa, 1895)

Comments: Japan. The type locality is Mino, Gifu Province. Figured by Daday (1914: 125).

Cyzicus gihoni (Baird, 1859)

= *Estheria gihoni* Baird, 1859

Comments: Israel, Lebanon (Baird 1859, Simon 1886, Daday 1914: 300). This species should be compared with *C. tetracerus*, *C. grubei*, *C. hierosolymitana*, *C. paradoxus*, *C. ehrenbergi*, *C. donaciformis*, *C. aegyptiacus*, and *O. crinitus*.

Cyzicus grubei (Simon, 1886) *sensu* Alonso, 1996

= *Estheria grubei* Simon, 1886

= *Caenestheria syriaca nomen nudum* Daday, 1913b
= *Caenestheria syriaca* Daday, 1914: 62
= *Caenestheria grubei* Daday, 1914: 131
= *Eocyzicus syriacus* (Daday, 1914) (fide Brtek, 1997)

Comments: Mediterranean region (Daday 1913 1914; Alonso 1996; Machado et al. 1999; Perez-Bote 2004). Alonso (1996) redescribed this species, providing excellent drawings. The type locality for *C. grubei* is Spain, at Ciudad Real, and Alonso (1996) reports the species as endemic to arid regions of the Iberian Peninsula and the Balearic Islands. Daday (1915) gave records from modern Israel and Syria. This species should be compared with *C. gihoni* and *C. hierosolymitana.*

Cyzicus gynecius **(Mattox, 1950)**

= *Caenestheriella gynecius* Mattox, 1950

Comments: Massachusetts, New Jersey, New York, Ohio, and Pennsylvania USA (Schmidt and Kiviat 2007; Smith and Gola 2001; Orridge 2011). Apparently males are absent. This species needs to be compared with *C. mexicanus*, *C. belfragei* and *C. morsei*. The eggs are spiny (Smith and Gola 2001).

Cyzicus hierosolymitanus **(Fischer, 1860)**

= *Estheria hierosolymitanus* Fischer, 1860
= *Cyzicus hierosolymitanus* var. *rollei* Daday, 1914: 322 *nomen dubium*

Comments: Israel, Jerusalem (Simon 1886). Should be compared with *C. gihoni*. Both may be synonyms of *C. tetracerus*, which Daday (1914) says is very similar. Redescribed by Daday (1914: 312). Daday's form *rollei* (1914) was only known from empty carapaces.

Cyzicus jonesi **(Baird, 1862)**

= *Estheria jonesi* Baird, 1862

Comments: Cuba (Baird 1849; Daday 1914: 240), although Daday mentions one collection from "America Meridionalis", which is basically tropical and southernmost America. Packard (1874) had material given to him without locality data and suggested the specimens came from the southern USA or Central America. The types were deposited in the Berlin Museum.

Cyzicus ludhianatus **(Battish, 1981)**

= *Caenestheriella ludhianata* Battish, 1981

Comments: India: Punjab; reported once. Probably a synonym of *C. annandalei* (Rogers and Padhye 2015).

Cyzicus madagascarica **(Daday, 1914)**

= *Caenestheriella madagascarica* Daday, 1914
= *Pseudograpta madagascarica* (Daday, 1914)

Comments: Madagascar. See comments under *C. ruber*.

Cyzicus mexicanus **(Claus, 1872)**

= *Estheria mexicanus* Claus, 1872
= *Estheria culdwelli* Baird, 1862 (fide Simon, 1886)
= *Estheria dunkeri* Baird, 1862 (fide Packard, 1883)
= *Estheria clarki* Packard, 1874 (fide Simon, 1886)
= *Cyzicus seurati* Daday, 1914: 265 (fide Maeda-Martínez et al., 2002)

Comments: Central and northern México, central and eastern USA, and Canada in Alberta and Manitoba (Packard 1874; Daday 1914; Mattox 1957b; Wolfe 1982; Maeda-Martínez et al. 2002). Redescribed by Daday (1914: 252). Maeda-Martínez et al. (2002) state that *C. seurati* is a junior synonym. However, Daday (1914) states that the egg is covered in spines similar to that observed in *C. jonsei*. The types of *C. seurati* are in the Paris Museum and the eggs should be compared with those of *C. mexicanus* and *C. californicus*. Packard's *E. clarki* description is not useful, but material was deposited at the Chicago Museum, and thus is no longer extant. This species needs to be compared with *C. belfragei*, *C. gynecia* and *C. morsei*.

Cyzicus morsei **(Packard, 1871)**

= *Estheria morsei* Packard, 1871
= *Caenestheriella morsei* (Packard, 1871)

Comments: Described originally from Iowa, USA (Packard 1871). Other records come from Oklahoma, Nebraska (Mattox 1957b), and South Dakota (Packard 1874). Daday (1915: 140) provides a figure. This species needs to be compared with *C. mexicanus*, *C. gynecia* and *C. belfragei*. Packard's description is not useful.

Cyzicus nepalensis **Uéno, 1967**

Comments: Nepal. Uéno (1967) did not designate types, nor state where his material was deposited, but did suggest that his species may be conspecific with *C. annandalei*. However, the cercopods depicted in the original description appear distinct from those of other Indian species (Rogers and Padhye 2015).

Cyzicus politus **(Baird, 1849)**

= *Estheria polita* Baird, 1849

Comments: India. The type locality is given as: "India".

Cyzicus rubra **(Daday, 1913b)**

= *Caenestheriella rubra* Daday, 1913b *nomen nudum*
= *Caenestheriella rubra* Daday, 1914: 146
= *Caenestheriella rubra* var. *acanthoporus* Brehm, 1958
= *Cyzicus ruber* var. *acanthoporus* (Brehm, 1958)

Comments: Madagascar. This species needs to be compared closely with *C. madagascarica*, which Daday separates on differences of the carapace and abdominal dorsal spines.

Cyzicus sinensis **Hu, 1988b**

Comments: Described from a pool near Hefei, Anhui Province, China. Possibly a species of *Ozestheria*. Naganawa and Orgiljanova (2000) treat this species as a synonym of *C. gifuensis*, without any explanation.

Cyzicus tetracerus **(Krynicki, 1830) fide Auduoin, 1837**

= *Limnadia tetracerus* Krynicki, 1830
= *Estheria tetracera* (Krynicki, 1830)
= *Isaura cycladoides* Joly, 1842
= *Estheria cycladoides* (Joly, 1842)
= *Isaura tetracera* (Krynicki, 1830)
= *Cyzicus cycladoides* (Joly, 1842)
= *Cyzicus borceai* Daday, 1914: 257
= *Cyzicus chyzeri* Daday, 1913b: 40
= *Cyzicus dubiosus* Daday, 1913b: 292
= *Cyzicus fallax* Daday, 1914: 275
= *Cyzicus hungaricus* Daday, 1913: 25
= *Cyzicus intermedius* Daday, 1913: 36
= *Cyzicus romanus* Daday, 1914: 244
= *Cyzicus sibericus* Daday, 1913b: 296
= *Cyzicus simoni* Daday, 1914: 305
= *Caenestheriella variabilis* Daday 1913b: 17, fide Brtek & Thiéry, 1995
= *Caenestheriella cyrenaicus* Vecchi, 1922
= *Cyzicus cyrenaicus* (Vecchi, 1922)
= *Cyzicus ornatus* Smirnov, 1932

Comments: The type locality is in the vicinity of Kharkiv (Charkov), Ukraine. Widespread and common: Albania, Algeria, Armenia, Azerbaijan, Czech Republic, Egypt, France, Georgia, Hungary, Italy, Poland, Romania, Russia (east through Siberia and into the arctic circle), Serbia, Spain, Tunisia, Turkey, Ukraine, Uzbekistan; "Central Sahara" (Thiele 1900; Gurney 1909; Daday 1913b 1914; Gauthier 1938; Cottarelli 1971; Šrámek-Hušek et al. 1962; Vekhov 1974; Lebedeva 1982; Stoicescu 2004). Type species of the genus by monotypy (Mattox 1957b). Joly (1842) and Alonso (1996) provide excellent drawings. Daday (1914) states that *C. sibericus* is intermediate among several other taxa that were subsequently treated as synonyms of *C. tetracerus*. Daday (1914) reported *C. simoni* only from one locality in Lebanon (Beirut), but that it was very similar to *C. tetracerus*. *Cyzicus ornatus* was reported from Siberia. *Cyzicus variabilis* was redescribed by Stoicescu (2004) and presented as a valid species. However, it should be re-examined using modern standards.

Nomina dubia, nuda, and species inquirendae

Cyzicus boysii **(Baird, 1849)** ***nomen dubium*** **fide Rogers & Padhye 2015**

= *Estheria boysii* Baird, 1849
= *Caenestheriella boysii* (Baird, 1849) fide Daday 1914
= *Caenestheriella similis* (Baird, 1849) fide Daday 1914
= *Baidestheria similis* (Baird, 1849)
= *Pseudograpta boysii* (Baird, 1849)
= *Bairdestheria boysii* (Baird, 1849) in Tiwari 1996
= *Cyzicus similis* (Baird, 1849) fide Rogers & Padhye 2015
= *Estheria similis* Baird, 1849
= *Bairdestheria similis* (Baird, 1849)
= *Pseudograpta similis* (Baird, 1849)

Comments: The type locality is given as "India". Tiwari (1996) treats *C. annandalei* and associated synonyms, as well as *C. similis* all as junior synonyms of *C. boysii*. However, Rogers and Padhye (2015) reported that the types of *C. boysii* and *C. similis* are empty, dried carapaces; useless for determination. Furthermore, Daday (1914) was unable to differentiate between the two forms, and could not separate the types from any other Eurasian form, and treated both taxa as *species inquirendae*. Baird's description of these two species is entirely based on carapace characters, giving the type locality for both as "India".

Cyzicus brasiliensis **(Baird, 1849)** ***nomen dubium*** **fide Daday 1914: 327**

= *Estheria brasiliensis* Baird, 1849

Comments: "Brazil". Description based on empty carapace.

Cyzicus bravaisii Audouin, 1837 *nomen nudum* fide Todd, 1952

Comments: Audouin mentions this name once, but provides no description or data and does not refer to any specimens.

Cyzicus caldwelli (Baird, 1852) *nomen dubium* fide Daday 1914: 328

= *Estheria caldwelli* Baird, 1852

Comments: Lake Winnipeg, Canada. Description based on carapace.

Cyzicus dallasi (Baird, 1852) *nomen dubium* fide Daday 1914: 329

= *Estheria dallasi* Baird, 1852

Comments: "Brazil". Description based on carapace.

Cyzicus gubernator (Klunzinger, 1864) *species inquirenda* fide Daday 1914

= *Limnadia gubernator* Klunzinger, 1864
= *Caenestheriella gubernator* (Klunzinger, 1864)

Comments: Described from Egypt (Simon 1886). Daday (1914) states that the description is barely sufficient to place this taxon in *Caenestheriella* (among the taxa that were eventually moved to *Cyzicus*).

Cyzicus lofti (Baird, 1862) *nomen dubium* fide Daday 1914: 326

= *Estheria lofti* Baird, 1862

Comments: Type locality is Bagdad, Iraq. Description based on empty carapaces.

Cyzicus melitensis (Baird, 1849) *nomen dubium* fide Daday 1914: 325

= *Estheria melitensis* Baird, 1849

Comments: Malta, Sicily (Simon 1886). Description based on empty carapaces.

Cyzicus paradoxus (Daday, 1914) *nomen dubium*

= *Caenestheriella paradoxa* Daday, 1914: 110
= *Bairdestheria paradoxa* (Daday, 1914)
= *Baidestheria paradoxa* (Daday, 1914)

Comments: Description based on juvenile specimens. The type locality is given as the Niger River Valley in western Africa. Monod (1969b) reports one male and three females from Sanga, in southern Mali, but stated the determination was problematic. Barnard (1935) states that this taxon is a juvenile *Ozestheria australis*. However, *O. australis* is unknown outside of southern seasonally dry Africa.

Cyzicus politus (Baird, 1849) *nomen dubium* fide Daday 1914: 327

= *Estheria polita* Baird, 1849
= *Eocyzicus politus* (Baird, 1849)

Comments: Types are empty, dry carapaces and the description is based solely on carapace details.

Ozestheria Schwentner & Richter, in Schwentner, Just, & Richter, 2015

= *Caenestheria* Daday, 1914: 53 (pro partim)
= *Opsipolygrapta* Novojilov 1954 (pro partim)

Diagnosis: (modified from Schwentner et al. 2015). Populations composed of males and females; amplexus is venter to venter. Male and female rostrum triangular, rostral spine generally absent (sometimes present in *O. australis*). Ocular tubercle smoothly arcuate. Angle between rostrum and frons 150° to 170°. Occipital condyle either short and rounded or elongated and subacute. Carapace valve length ~1.5 times valve breadth (hinge to margin). Carapace with or without sculpturing between growth lines (scarring from algae often mistaken for sculpture). Carapace typically dark brown. Male thoracopod I with endopod bearing one or more transverse apical rows of flattened, broadly subtriangular denticles (claw-like scales). Endite IV broadly transverse to cylindrical, bearing a dense, apical field of short spiniform setae. Eggs attaching to prolonged exopods of thoracopods IX and X. Thoracopod exopods lacking a triangular lamina. Posterior trunk segments with several medial dorsoposterior spines per segment. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not projecting. Each row with 10 to 30 spines. Caudal filament originating between spine rows at fifth, sixth, or seventh spines from confluence. Caudal filament borne on projecting mound or not. Cercopods sinuate to curved. Cercopod with medial longitudinal setal row on proximal 40–60%. Setae plumose and either long or short. Setal row terminates with single spine. Cercopod with subapical, dorsal cirrus, extending from 40 to 60% of cercopod length.

Comments: *Ozestheria lutraria* (Brady, 1886) is the type species by designation. Until now the genus was thought limited to Australia. Review of material and original descriptions, plus the molecular analyses presented in Schwentner et al. (2020a), reveals that the genus extends into Asia and Africa. Many *Cyzicus* taxa from Africa and Eurasia may be moved to *Ozestheria* upon re-examination. *Ozestheria packardi* appears to be a complex of species (Schwentner et al. 2015).

Novojilov (1954) erected *Opsipolygrapta* designating *Caenestheriella packardi* as the type. Chen and Shen (1985) list *Opsipolygrapta* as an invalid name.

Attributed Species

Ozestheria altus (Shu, Rogers, Chen, & Yang, 2015) New Combination

= *Cyzicus altus* Shu, Rogers, Chen, & Yang, 2015

Comments: Yunnan Province, China. Known only from the type locality.

Ozestheria annandalei Daday, 1913b New Combination

= *Caenestheriella annandalei* Daday, 1913b
= *Cyzicus annandalei* (Daday, 1913b)
= *Baidestheria annandalei* (Daday, 1913b)
= *Caenestheriella roonwalli* Tiwari, 1962, fide Tiwari, 1996
= *Cyzicus roonwali* (Tiwari, 1962), fide Tiwari, 1996.
= *Caenestheriella misrai* Tiwari, 1962, fide Tiwari, 1996
= *Cyzicus misrai* (Tiwari, 1962) fide Tiwari, 1996

Comments: Temperate regions of northern India (Rogers and Padhye 2015). Figured by Daday (1915: 166) and Tiwari (1962: 184).

Ozestheria australis Lovén, 1847 New Combinataion

= *Caenestheria australis* (Lovén, 1847)
= *Caenestheriella australis* (Lovén, 1847)
= *Baidestheria australis* (Lovén, 1847)
= *Eocyzicus australis* (Lovén, 1847)
= *Estheria elizabethae* Sars, 1898a fide Wolf in Daday, 1914
= *Baidestheria elizabethae* (Sars, 1898a)
= *Caenestheriella joubini* Daday, 1913b *nomen nudum*, fide Barnard, 1929
= *Opsipolygrapta joubini* (Daday, 1913b)
= *Caenestheriella joubini* Daday, 1914: 148
= *Caenestheriella vidua* Daday, 1914: 122, fide Barnard, 1929

Comments: Widespread and very common in Botswana, Lesotho, Namibia, South Africa, Zimbabwe (Sars 1898a b; Gurney 1904; Daday 1914; Barnard 1935; Brehm 1958; Brendonck 1999; Nhiwatiwa et al. 2014; Mabidi et al. 2016; Milne et al. 2020). Figured in Sars (1898a) and Daday (1914: 99, 123, 176).

Ozestheria berneyi (Gurney, 1927)

= *Estheria berneyi* Gurney, 1927
= *Caenestheria berneyi* (Gurney, 1927)
= *Eocyzicus berneyi* (Gurney, 1927)

Comments: Australia: Queensland, and adjacent New South Wales and South Australia (Timms and Richter 2002).

Ozestheria dictyon (Spencer & Hall, 1896)

= *Caenestheria dictyon* Spencer & Hall, 1896

Comments: Australia: Northern Territory. Known only from the type locality at Palm Creek in the James Range (Timms and Richter 2002). Sayce (1903) suggested that this taxon was a juvenile form of *O. lutraria*.

Ozestheria elliptica (Sars, 1896)

= *Estheria elliptica* Sars, 1896
= *Caenestheria elliptica* (Sars, 1896)
= *Cyzicus ellipticus* (Sars, 1896)
= *Eocyzicus ellipticus* (Sars, 1896)

Comments: Australia: Western Australia. Only known from the type locality, at Roebuck Bay (Timms and Richter 2002). Refigured by Daday (1915: 97).

Ozestheria indica (Gurney, 1906) New Combination

= *Caenestheriella indica* Gurney, 1906
= *Cyzicus indicus* (Gurney, 1906)
= *Baidestheria indicus* (Gurney, 1906)
= *Opsipolygrapta indica* (Gurney, 1906)

Comments: Southern India and Sri Lanka. Briefly reviewed in Rogers and Padhye (2015). Figured by Daday (1915: 162).

Ozestheria lutraria (Brady, 1886)

= *Estheria lutraria* Brady, 1886
= *Caenestheria lutraria* (Brady, 1886)
= *Estheria dictyon* Spencer & Hall, 1896 (fide Sayce, 1903)
= *Cyzicus lutraria* (Brady, 1886)
= *Cyzicus dictyon* (Spencer & Hall, 1896)
= ?*Caenestheria dictyon* (Spencer & Hall, 1896)
= *Eocyzicus lutrarius* (Brady, 1886)

Comments: Australia: New South Wales, South Australia, Queensland. The type locality for *lutraria* is at Innaminka, South Australia, near the Queensland border. Originally described from an empty carapace. Figured by Daday (1915: 91).

Ozestheria mariae **(Olesen & Timms, 2005)**

= *Caenestheriella mariae* Olesen & Timms, 2005

Comments: Australia: Western Australia. This is a rock pool (gnamma) specialist. The type locality is Bushfire Rocks near Hyden.

Ozestheria packardi **(Brady, 1886)**

= *Estheria packardi* Brady, 1886
= *Cyzicus* (*Estheria*) *packardi* (Brady, 1886)
= *Caenestheriella packardi* (Brady, 1886)
= *Cyzicus packardi* (Brady, 1886)
= *Estheria packardi* var. *typica* Spencer & Hall, 1896
= *Caenestheriella packardi* var. *typica* (Spencer & Hall, 1896)
= *Cyzicus packardi* var. *typica* (Spencer & Hall, 1896)
= *Estheria packardi* var. *cancellata* Spencer & Hall, 1896
= *Caenestheriella packardi* var. *cancellata* (Spencer & Hall, 1896)
= *Cyzicus packardi* var. *cancellata* (Spencer & Hall, 1896)
= *Estheria packardi* var. *minor* Spencer & Hall, 1896
= *Caenestheriella packardi* var. *minor* (Spencer & Hall, 1896)
= *Cyzicus packardi* var. *minor* (Spencer & Hall, 1896)
= *Opsipolygrapta packardi* (Brady, 1886)
= *Baidestheria packardi* (Brady, 1886)
= *Baidestheria* var. *typica* (Spencer & Hall, 1896)
= *Baidestheria* var. *cancellata* (Spencer & Hall, 1896)

Comments: Arid and semiarid Australia. The type locality is Lake Bonney, SA, between Adelaide and the New South Wales border. Figured by Daday (1915: 118). Appears to represent a complex of at least 14 species (Schwentner et al. 2015).

Ozestheria pellucida **Timms, 2018**

Comments: Australia: Western Australia. Endemic to the Gardner Plateau. This species is a rock pool (gnamma) specialist.

Ozestheria pilosa **(Rogers, Thaimuangphol, Saengphan, & Sanoamuang, 2013)**

= *Cyzicus pilosus* Rogers, Thaimuangphol, Saengphan, & Sanoamuang, 2013

Comments: Laos, Myanmar, Thailand.

Ozestheria rubra **(Henry, 1924)**

= *Estheria rubra* Henry, 1924
= *Caenestheria rubra* (Henry, 1924)
= *Cyzicus rubra* (Henry, 1924)

Comments: Australia: southern Northern Territory, northern South Australia, and western portions of Queensland and New South Wales (Schwentner et al. 2015).

Ozestheria sarsii **(Sayce, 1903)**

= *Estheria sarsii* Sayce, 1903
= *Cyzicus sarsi* (Sayce, 1903)
= *Cyzicus sarsii* (Sayce, 1903)
= *Caenestheria sarsi* (Sayce, 1903)
= *Estheria sarsii* (Sayce, 1903)
= *Eocyzicus sarsii* (Sayce, 1903)

Comments: Australia: South Australia and Western Australia (Timms and Richter 2002, Schwentner et al. 2015). The type locality is given as Boulder City (near Kalgoorlie). Figured by Daday (1915: 57). No types were designated.

Species inquirenda

Ozestheria rufa **(Dakin, 1914)** ***species inquirenda***

= *Cyzicus* (*Estheria*) *rufa* Dakin, 1914
= *Caenestheria rufa* (Dakin, 1914)
= *Eocyzicus* sp. Brtek, 1997

Comments: Australia: Western Australia (Timms and Richter 2002). Based on two females and not collected since.

Eocyzicidae Schwentner, Rabet, Richter, Giribet, Padhye, Cart, Bonillo, and Rogers, 2020

= Caenestheriidae Daday, 1913b: 12 (pro partim)
= Baikalolkhoniinae Naganawa, 1999
= Baikalolkhoniidae Naganawa, 1999 **New Combination**

Diagnosis: (Modified from Rogers et al. 2017; and Schwentner et al. 2020a). Populations composed of males and females; amplexus is venter to venter. Rostrum typically sexually dimorphic. Rostrum subtriangular (usually females) to subquadrate (usually males) or rounded. Rostrum may or may not be armed with an apical spine (sometimes present in juveniles and rarely adults). Angle between rostrum and frons 170° to

190°. Occipital notch very shallow or absent. Occipital condyle low, rounded or absent, length half or less basal width. Carapace valve length ~1.5 times valve breadth (hinge to margin). Carapace growth line intervals smooth or ornamented (scarring from algae often mistaken for ornamentation). Carapace typically brown, occasionally black, sometimes with marginal setae. Clasper endopod apically with a transverse row of one to a few apical scales bearing a marginal fringe. Endite IV broadly transverse to cylindrical, bearing a dense, apical field of short spiniform setae. Thoracic segments smooth or with a central dorsoposterior projection and/or set of spines or setae. Eggs attaching to prolonged exopods of thoracopods IX and X. Thoracopod epipods lacking a triangular lamella. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not or slightly projecting. Each row has from six to 30 spines depending on species and gender. Females typically have more and smaller spines than males. Caudal filament originating between spine rows at fifth, sixth, or seventh spines from confluence. Caudal filament borne on projecting mound. Cercopods arcuate or straight. Cercopod with a dorsomedial longitudinal row of setae or spines on proximal 40 to 60%. Setae plumose and either long or short. Row terminates with single spine. Cercopod with subapical, dorsal cirrus, extending from 50 to 40% of cercopod length. Eggs smooth or with surface polygons.

Comments: Two genera are recognised. Naganawa (2001b) treated *Eocyzicus* as a junior synonym of *Cyzicus*, however this is not supported by molecular studies (Schwenter et al. 2009; Schwentner et al. 2020a).

Naganawa (1999) created Baikalolkhoniinae to accommodate a new species of cyzicid clam shrimp from Russia. Brtek (2002) elevated that taxon to family status with no explanation or justification.

Tiwari (1966) reported a rostral spine in some large adult *E. bouvieri*.

Eocyzicus Daday, 1914: 190 *sensu* Rogers et al., 2017

= *Caenestheria* Daday, 1913b *nomen nudum* pro partim
= *Eocyzicus* Daday, 1913b *nomen nudum*
= *Caenestheria* Daday, 1914 fide Brtek et al., 1984

Diagnosis: As for the family.

Comments: Daday described *Eocyzicus* in 1913b, but still presented the genus as new, with an updated description in 1914. Daday never designated a type species for the genus. However, the first species he mentions (1913a: 91) is *Eocyzicus orientalis* Daday, 1914, which was fixed as the type for the genus in Schwentner et al. (2020a). Naganawa (2001b) treats *Eocyzicus* as a synonym of *Cyzicus*, but this was generally ignored, and is not supported by molecular data (Schwentner et al. 2015 2020a). Rogers (2017) provided a review of the genus.

Attributed Species

Eocyzicus argillaquus Timms & Richter, 2009

= *Eocyzicus* sp. B Timms & Richter, 2002

Comments: Australia: New South Wales, Northern Territory, South Australia, Queensland, and Western Australia.

Eocyzicus armatus Tippelt & Schwentner, 2018

= *Eocyzicus* lineage Z Schwentner et al., 2013

Comments: Australia: New South Wales, Northern Territory, Western Australia.

Eocyzicus bouvieri (Daday, 1914: 201) fide Padhye & Rabet, 2017

= *Eocyzicus perrieri* Daday, 1913b *nomen nudum*
= *Eocyzicus perrieri* Daday, 1914: 214
= *Eocyzicus pellucidus* Tiwari, 1962, fide Tiwari, 1996
= *Eocyzicus maliricus* Qadri & Baqai, 1956, fide Tiwari, 1996
= *Eocyzicus acuta* Nayar, 1965 *nomen dubium* fide Tiwari, 1996
= *Eocyzicus* sp. Karande & Inamdar, 1965 fide Rogers & Padhye, 2015

Comments: Siberian Russia to Pakistan and northern India (Daday 1914; Rogers and Padhye 2015). Redescribed by Padhye and Rabet (2017). Originally reported from Himachal Pradesh, India (Daday 1913b), Daday later (1914: 104) stated in the description that this species is from Russia, specifically Tobolsk (just north of Kazakhstan) and Obdorsk, now called Salekhard, on the Arctic Circle. Padhye and Rabet (2017) re-examined the types. The description of *E. acutus* based upon juvenile females. It should be pointed out that *E. bouvieri* is not the same as *C. bouvieri*. This species should be compared with *E. orientalis* and *E. zugmayeri*.

Eocyzicus breviantennus Tippelt & Schwentner, 2018

= *Eocyzicus* lineage S Schwentner et al., 2013

Comments: South Australia, Australia. Known only from the type locality: 26°59'48.9"S, 133°24'55.2"E.

Eocyzicus careyensis Tippelt & Schwentner, 2018

= *Eocyzicus* lineage R Schwentner et al., 2013

Comments: Known only from the type locality. Australia: Western Australia, Lake Carey, 29°10'S, 122°20'E.

Eocyzicus consors (Daday, 1914)

= *Caenestheria consors* Daday, 1913b *nomen nudum*
= *Caenestheria consors* Daday, 1914: 66
= *Caenestheria immsi* Daday, 1913b *nomen nudum*
= *Caenestheria immsi* Daday, 1914: 78
= *Caenestheria skorikowi* Daday, 1913b *nomen nudum*
= *Caenestheria skorikowi* Daday, 1914: 82

Comments: The type locality for *consors* is modern Uzbekistan. This species should be compared with *E. sahlbergi* and *E. davidi*. This species is reported from Uzbekistan through northeastern India. Daday (1914) commented on the close similarity of all these forms; their differences appear to be very slight.

Eocyzicus davidi (Simon, 1886)

= *Caenestheria davidi* (Simon, 1886)
= *Caenestheria bouvieri* Daday, 1914: 100
= *Caenestheria bouvieri* Daday, 1914
= *Caenestheriella kawamurai* Uéno, 1926
= *Eocyzicus kawamurai* (Uéno, 1926)
= *Eocyzicus mongolianus* Uéno, 1927
= *Eocyzicus laiyangensis* Hu, 1985, fide Naganawa & Orgiljanova, 2000
= *Caenestheria shiquanicus* Hu, 1991, fide Naganawa & Orgiljanova, 2000
= *Eocyzicus shiquanicus* (Hu, 1991)

Comments: The type locality is given as "China, Peking" for both *E. davidi* and *E. kawamurai*. Additional records are from arid China (Tibet, Inner Mongolia) and Mongolia (Sars 1901; Gurney 1906; Hu 1993a). It is figured by Daday (1914: 73, 100) and Dong et al. (1982: 11). Brtek (1997) synonymised *E. bouvieri* with *E. davidi*; it should be pointed out that *C. bouvieri* is not the same as *E. bouvieri*. *Eocyzicus mongolianus* was described from two female specimens collected from near Mukden, now called Shenyang, in Liaoning Province (also partially figured in Dong et al. 1982), and *E. yanzhouensis*, *E. shiquanicus*, and *E. laiyangensis* are each only known from their respective type localities in Shandong Province. All four were reported from north eastern China, between Mongolia and the Korean Penninsula. *Eocyzicus laiyangensis* may be conspecific with *E. orientalis* based on general morphology (Rogers et al. 2017); however, Naganawa and Orgiljanova (2000) treated it as *E. davidi*, along with *E. kawamurai*, and *E. shiquanica*. However, it does not appear that any material was examined by them (Rogers et al. 2017). Simon (1886) and Sars (1901) separated *E. davidi* from *E. sahlbergi* using highly variable characters: carapace outline, growth line number, first antennae form, and second antennal flagellae number of antennomeres. This species needs to be closely compared with *E. orientalis*.

Eocyzicus dentatus Barnard, 1929: 261

Comments: Known from a single male specimen, collected from Cape Province, South Africa, from the same locality (possibly the same pool) as *E. obliquua*. Figured by Brendonck (1999). This form is very distinctive.

Eocyzicus digueti (Richard, 1895)

= *Estheria digueti* Richard, 1895
= *Eocyzicus vanhoeffeni* Daday, 1913b: 210
= *Estheria concava* Mackin, 1939 *nomen nudum*
= *Eocyzicus concavus* (Mackin, 1939) *sensu* Mattox, 1954b

Comments: Widespread and common in northern México, southwestern USA (Maeda-Martínez et al. 2002; Rogers and Hann 2016; Rogers et al. 2017). Figured by Daday (1914: 194). Mackin included *E. concavus* in an identification key, but never described the species as the specimens were lost. New topotype material was sent by Mackin to Mattox who subsequently described the taxon (1954b).

Eocyzicus gigas Barnard, 1924: 226

= *Estheria gigas* (Barnard, 1924)

Comments: Namibia, South Africa (Kalahari Desert and North Cape) (Barnard 1935; Brehm 1958; Milne et al. 2020). Should be compared with *E. obliquus*. More details are provided by Barnard (1929 1935) and Brehm (1958). Figured by Brendonck (1999).

Eocyzicus hutchinsoni Bond, 1934 species complex fide Rogers & Padhye, 2015

= *Eocyzicus deterrana* Bond, 1934
= *Eocyzicus deterranus* Bond, 1934
= *Eocyzicus kashmirensis* Qadri & Baqai, 1956 nomen dubium, fide Rogers and Padhye, 2015
= *Eocyzicus wulari* Das & Akhtar, 1971 nomen dubium, fide Rogers and Padhye, 2015

Comments: Northern India. Reviewed in detail in Rogers and Padhye (2015) and Padhye and Lazo-

Wasem (2018).

Eocyzicus inopinatus (Daday, 1914)

= *Caenestheria inopinata* Daday, 1913b *nomen nudum*
= *Caenestheria inopinata* Daday, 1914: 69

Comments: The type locality is given as "Jerusalem". It has not been reported since.

Eocyzicus irritans Daday 1914: 218

= *Eocyzicus irritans* Wolf (in litteris) Daday, 1914 *nomen dubium*
= *Cyzicus irritans* Wolf (in Daday, 1914)

Comments: The type locality is given as Sudan, but Daday (1914) says it occurs in equatorial Africa. Margalef (1948) reported this taxon from Western Sahara (Sahara Español). Wolf deposited material in the Vienna Museum, under the name "*Cyzicus irritans*", but never published a description (Daday 1914). This species should be compared with *E. saharica*, *E. latirostris*, *E. zugmayeri*, *E. klunzingeri*, and *E. orientalis*.

Eocyzicus klunzingeri Daday 1914: 197

= *Eocyzicus klunzingeri* Wolf (in litteris) in Daday, 1914 *nomen dubium*
= *Estheria klunzingeri* Wolf (in Daday, 1914)
= *Cyzicus klunzingeri* Wolf (in Daday, 1914)
= *Cyzicus lobatus* Wolf (in litteris) in Daday, 1914 *nomen nudum*

Comments: Sudan. Wolf deposited material in the Vienna Museum, under the names "*Cyzicus klunzingeri*" and "*Cyzicus lobatus*", but never published descriptions (Daday 1914). Monod (1969b) claimed to have material from Mauritania, on the opposite side of Africa from the only know locality for this taxon, stating that the determination was tentative. This species should be compared with *E. saharica*, *E. zugmayeri*, *E. latirostris*, *E. irritans*, and *E. orientalis*.

Eocyzicus latirostris Daday, 1914: 225

= *Eocyzicus latirostris* Daday, 1913 *nomen nudum*

Comments: Senegal. The types were deposited at the Paris Museum. This species should be compared with *E. saharica*, *E. irritans*, *E. zugmayeri*, *E. klunzingeri*, *E. mesopotamiensis*, and *E. orientalis*.

Eocyzicus mesopotamiensis Mohammad, 1985

Comments: Iraq. Known only from the type locality, north of Baghdad. This species should be compared with *E. orientalis*, *E. saharica*, *E. irritans*, *E. zugmayeri*, *E. klunzingeri*, and *E. latirostris*.

Eocyzicus occidentalis Tippelt & Schwentner, 2018

= *Eocyzicus* lineage Q Schwentner et al., 2013

Comments: Known only from the type locality: Muggon Claypan, near Carnavon, Western Australia.

Eocyzicus obliquus (Sars, 1905)

= *Estheria obliqa* Sars, 1905
= *Cyzicus obliquus* (Sars, 1905)

Comments: Southern Africa (Mabidi et al. 2016; Milne et al. 2020). The type locality is "Hanover, Cape Colony". Redescribed by Daday (1914: 222). Should be compared with *E. gigas*. Figured by Brendonck (1999).

Eocyzicus orientalis Daday, 1914: 205, *sensu* Dobrynina, 2004

= *Eocyzicus orientalis* Daday, 1913b: 90 *nomen nudum*
= *Eocyzicus yanzhouensis* Hu, 1993a, fide Naganawa & Orgiljanova, 2000
= *Eocyzicus paralayangensis* Hu, 1992, fide Naganawa & Orgiljanova, 2000

Comments: China, Arabia, Afghanistan, Armenia, Azerbaijan, Georgia, northern and central India, Iran, Moldova, Turkmenistan, Ukraine, Uzbekistan, southern Russia, Syria (Daday 1914; Hu 1993a; Dobrynina 2004). Redescribed by Dobrynina (2003 2004). Naganawa and Orgiljanova (2000) synonymized *E. paralayangensis* with *E. orientalis*. This species should be compared with *E. davidi*, *E. irritans*, *E. zugmayeri*, *E. latirostris*, *E. klunzingeri*, and *E. saharicus*. Dobrynina (2004) suggests that *E. orientalis* was introduced to the eastern European Steppe Zone by fish farming, through fish larvae imported from Transcaucasia. This species should be compared to *E. davidi* and *E. sahlbergi*. Rogers and Padhye (2015) suggest that Daday's (1915) *E. orientalis* record from tropical India may be a misidentification.

Eocyzicus parooensis Richter & Timms, 2005

= *Limnadia* sp. b, Timms, 1993
= *Eocyzicus* sp. a, Timms & Richter, 2002

Comments: New South Wales, Northern Territory, South Australia, Queensland, and Western Australia, Australia. The type locality is Gidgee Lake on Bells Creek, on Bloodwood Station. This species occurs in hyposaline basins.

Eocyzicus parvus **Tippelt & Schwentner, 2018**

= *Eocyzicus* lineage T Schwentner et al., 2013

Comments: Queensland, Australia. Known only from the type locality: 27°58'26.8"S, 144°18'34.9"E.

Eocyzicus phytophilus **Tippelt & Schwenter, 2018**

= *Eocyzicus* lineage Y Schwentner et al., 2013

Comments: Australia: New South Wales, South Australia, Queensland.

Eocyzicus plumosus **Royan & Sumitra, 1973**

= *Eocyzicus palpalis* Simhachalam & Timms, 2012

Comments: Southern India and Sri Lanka. Type locality for *E. plumosus* given as: India, Racharla Mandal, Prakasam District. Pool at Racharla (15°28'N, 78°58'E). Reviewed in Rogers and Padhye (2015): *Eocyzicus plumosus* is known only from the original description, which is inadequate, and no types were deposited. Both taxa are reported from the same region and the same saline habitat types, and the minor differences between the two forms are likely age dependant (Rogers and Padhye 2015).

Eocyzicus richteri **Tippelt & Schwentner, 2018**

= *Eocyzicus* lineage X Schwentner et al., 2013

Comments: Australia: New South Wales, South Australia, Queensland.

Eocyzicus saharica **(Gauthier, 1937)**

= *Estheria saharica* Gauthier, 1937
= *Eocyzicus saharaicus* (Gauthier, 1937)

Comments: Described from a pool near Agueraktem well, in Adrar Province, Mauritania (Gauthier 1937 1938). Gauthier later (1939) reported some possible subadults from eastern Chad. Thiéry (1986) reports this species from Morocco. This species should be compared with *E. irritans*, *E. zugmayeri*, *E. latirostris*, *E. klunzingeri*, and *E. orientalis*.

Eocyzicus sahlbergi **(Simon, 1886)**

= *Estheria sahlbergi* Simon, 1886
= *Estheria propinquus* Sars, 1901
= *Eocyzicus propinquus* (Sars, 1901)
= *Caenestheria sibericus* Daday, 1913b *nomen nudum*
= *Caenestheria sibericus* Daday, 1914: 59
= *Baidestheria siberica* (Daday, 1913b)
= *Eocyzicus sibericus* (Daday, 1914)

Comments: Reported (Sars 1901; Daday 1915: 86, 93) from Kazakhstan, Russia, Mongolia, and Himalayan India. The original description gives the distribution as "Sibiria septentrionalis", literally: northwest Siberia. The coordinates provided (70°, 20') are for Nicandrowsk Island, in the Brekhovsky Islands (actually 70°30'N, 82°45'E) in the Yenisei River where it enters the Kara Sea in the Russian Arctic. This area is frozen some nine months of the year. This would make this the most northern spinicaudatan species. Sars (1901) stated his Kazakhstan material came from a saline lake. This species should be compared with *E. consors*. Daday could not reliably separate *sahlbergi* and *propinquus*. Simon (1886) and Sars (1901) separated *E. sahlbergi* from *E. davidi* using highly variable characters: carapace outline, growth line number, first antennae form, and second antennal flagellae number of antennomeres. *Eocyzicus siberica* was described from a single female specimen collected in Kazakhstan (Daday 1915).

Eocyzcus spinifer **Durga-Prasad, Radhakrishna, Khalaf & Al-Jaafery, 1981**

Comments: Known only from the type locality: Zoafaraniyah, Baghdad, Iraq. This is a very distinctive species. Rogers et al. (2017) suggests that this taxon may represent a new genus, but until a detailed examination of material is conducted, no determination can be made.

Eocyzicus tadei **(Ocioszynska-Wolska, 1937)**

= *Caenestheria tadei* Ocioszynska-Wolska, 1937

Comments: Known only from the type locality: Pokrovskoye Villiage, Yarkovsky District, Tyumen Oblast, Russia, north of Kazakhstan. This species should be compared with *E. orientalis*.

Eocyzicus taiwanensis **Rogers, Chang, & Wang, 2017**

Comments: Taiwan. Widespread in flooded agricultural fields in Qigu District. This species is not known from natural habitat.

Eocyzicus timmsi **Tippelt & Schwentner, 2018**

= *Eocyzicus* lineage W Schwentner et al., 2013

Comments: Queensland, Australia.

Eocyzicus ubiquus **Tippelt & Schwentner, 2018**

= *Eocyzicus* lineage U Schwentner et al., 2013

Comments: Australia: New South Wales, Queensland, Western Australia.

Eocyzicus zugmayeri Daday, 1914: 228

Comments: The type locality is given as Liari, in southern Balutschistan Province, Pakistan, not too far northwest from Karachi. This species should be compared with *E. bouvieri* and *E. orientalis*.

Nomina dubia and species inquirendae

Eocyzicus afzali Bibi & Mahoon, 1985 *nomen dubium* fide Rogers & Padhye, 2015

Comments: Lahore, Pakistan. The description and figures are particularly poor. The head is depicted with two very different morphologies in different figures, and the carapace appears to belong to a member of Limnadiidae, rather than the Cyzicidae (Rogers and Padhye 2015). No type material was designated.

Eocyzicus chasuqinensis Han & Wang, 2004 *nomen nudum*

= *Eocycicos chasuqinensis* Han & Wang, 2004 *nomen nudum*

Comments: From Chasuqi, Tumute Zuoqi, near Hohhot City, Inner Mongolia Autonomous Region, China. Name presented in an abstract for a conference.

Eocyzicus dhilloni Battish, 1981 *species inquirenda* fide Rogers & Padhye, 2015

Comments: Recorded once from Punjab, India. The only differential diagnosis provided by Battish (1981) is the enigmatic "From all the species… *E. dhilloni* differs in one way or another." Rogers and Padhye (2015) suggest that this taxon may be conspecific with *E. bouvieri*.

Eocyzicus minor Brehm, 1958: 17, *nomen dubium* fide Durga-Prasad et al. (1981)

Comments: Apparently juveniles from a single pool in South Africa. The small size and the pitted nature of the carapace are the defining characters. However, Brehm (1958) reported that the carapaces were heavily encrusted with algae, and the pitted nature of the carapace surface may be due to the algal holdfasts.

Eocyzicus nanchangensis Han & Wang, 2004 *nomen nudum*

Comments: Reported as from near Nanchang, Jiangxi Province, China. Name presented in an abstract for a conference.

Eocyzicus swatiensis Chaudry, Ghauri, & Mahoon 1978 *nomen dubium*, fide Rogers & Padhye, 2015

Comments: "Pakistan". No type material was designated and the description and figures are poor.

Eocyzicidae Incertae sedis

Baikalolkhonia Naganawa, 1999 fide Galazy & Naganawa 2010 *genus inquirenda*

Diagnosis: (based on Naganawa 1999; and Galazy and Naganawa 2010) Rostrum with or without an apical spine. All thoracopods bearing a pre-epipodal, cylindrical, elongated, dorsally directed lobe; epipodites without a triangular lamella; pre-epipodites elongated on limbs I–VII. Males unknown.

Comments: This is the only genus I have not examined. *Baikalolkhonia tatianae* is the type species of the genus. Naganawa (1999 2001b) placed this genus initially in the Cyzicidae in its own subfamily, due to supposed shared characters between Cyzicidae and Leptestheriidae. Brtek (2002) raised the subfamily to family rank with no explanation or justification. This genus is remarkably superficially similar to *Eocyzicus* and may very well be a junior synonym of that genus, although information in the descriptions is lacking. *Baikalolkhonia* lacks the epipodital triangular lamella, as does *Eocyzicus* and all cyzicids. The pre-epipodital cylindrical extensions are found in leptestheriids, but apparently not in the same numbers as in *Baikalolkhonia*. Both character states described for *Baikalolkhonia* need to be verified.

The fact that two species in this genus are both endemic to Olkhon Island (some 720 km^2) (Galazy and Naganawa 2010), and the fact that Naganawa (1999) states that the type series of *B. tatianae* is immature, strongly suggest that both *Baikalolkhonia* are the same species.

Attributed Species

Baikalolkhonia tatianae Naganawa, 1999 *species inquirenda*

Comments: Russia; Olkhon Island, Lake Baikal.

Males are unknown, and the specimens used in the description are reported to be immature (Naganawa 1999). Types: ZMISU 960803-1.

Baikalolkhonia shmakini Naganawa in, Galazy & Naganawa, 2010 *species inquirenda*

Comments: Russia; Olkhon Island, Lake Baikal. Types: ZMISU 050801-1, -2. The fact that the first species described in the genus was based on juvenile material, and that both species come from the same island, suggests that this species might be a junior synonym of *B. tatianae*.

Leptestheriidae Daday, 1913a: 44

= Straskrabiidae Naganawa, 2001b, fide Rogers et al. 2020
= Sewellestheriidae Naganawa, 2001b

Diagnosis: (From Schwentner et al. 2020a) Cephalic fornices extending anteriorly to rostral apex. Rostrum variable, blunt to acute, long or short, generally triangular to subquadrate in lateral view. Rostrum with an apical spine (often broken off, look for scar). Compound eyes fused medially, sometimes projecting in smoothly arcuate ocular tubercle. Frontal organ sessile. Occipital notch present. Carapace thick, generally rounded. Carapace dorsal margin smooth, lacking carinae, hinge line straight. Carapace with or without pigmentation, growth lines obvious, projecting. Umbone present, projecting well above hinge line. Muscle scar rarely visible. Male first two thoracopods with endopod (*sensu* Olesen 2007) lacking an apical suctorial organ or modified tactile setae. Telson with or without a ventroposterior, posteriorly directed spiniform projection. Eggs 110–180 µm in diameter, spherical and generally lacking ornamentation.

Comments: The type genus is *Leptestheria* Sars, 1898a by designation (Schwentner et al. 2020a). Three genera are recognised. Sars (1898a) was particularly taken with the form of the egg bearing epipodite extensions, but both he and far more so Daday (1913a b 1914 1924), emphasised the presence of the lamina epipoditalis as the defining character of the family. Yet traditionally, regional authors have been primarily separated the Leptestheriidae from the other families based on the presence of a rostral spine. However, some eocyzicids and cyzicid species posses a rostral spine.

A list of the Leptestheriidae was provided in part by García and Pereira (2003). Naganawa (2001b) created Sewellestheriidae for *Sewellestheria*, but his diagnostic characters are not exclusive, and the taxon is not accepted here.

Eoleptestheria Daday, 1913b: 47

= *Isaura* Joly, 1842 (pro partim), *nomen praeoccupatum*
= *Estheria* Rüppell in Strauss-Durchheim, 1837 (pro partim), *nomen praeoccupatum*

Diagnosis: Populations composed of males and females; amplexus is venter to venter. Rostrum may be sexually dimorphic. Rostrum subtriangular (usually females) to rounded (usually males). Angle between rostrum and frons 150° to 190°. Occipital notch very shallow and broad, obsolete. Occipital condyle low, rounded, length half or less basal width. Carapace valve length ~1.5–2x valve breadth (umbone to margin). Carapace growth line intervals smooth or ornamented (scarring from algae often mistaken for ornamentation). Carapace typically brown, occasionally black, sometimes with marginal setae. Clasper endopod apically with distoventral scales. Endite IV subcylindrical, bearing a dense, apical field of short spiniform setae or scales. Thoracic segments smooth or with spines or setae, sometimes borne on projections. Eggs attaching to prolonged exopods of thoracopod X and XI or XI and XII. Thoracopod exopods bearing a triangular lamina. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not or slightly projecting. Each row has 30+ spines depending on species and gender. Females typically have more and smaller spines than males. Caudal filament originating between at spine row confluence to the fourth spine pair. Caudal filament base flat or borne on low mound. Cercopods arcuate. Cercopod with a dorsomedial longitudinal row of setae or spines on proximal 60–70%. Setae plumose and either long or short. Row terminates with row of 5–10 spines. Eggs smooth.

Comments: The type species is *Isaura ticinensis* Balsamo-Crivelli, 1859 by monotypy. Daday described this genus in 1913b, but still presented it as new, with an updated description in 1923. Naganawa (2001a b) treated *Eoleptestheria* as a synonym of *Leptestheria* but provided no explanation. This genus is in tremendous need of revision, and I suspect that the European and Chinese forms are distinct.

Attributed Species

Eoleptestheria sangziensis Zhang & Hu, 1992

Comments: Should be compared to the other Chinese forms. Naganawa and Orgiljanova (2000) treat all Chinese *Eoleptestheria* except this species as synonyms of *E. ticinensis*, without any mention of *E. sangziensis*.

Eoleptestheria ticinensis (Balsarno-Crivelli, 1859)

= *Isaura ticinensis* Balsamo-Crivelli, 1859
= *Leptestheria ticinensis* (Balsarno-Crivelli, 1859)
= *Estheria ticinensis* (Balsamo-Crivelli, 1859)
= *Eoleptestheria inopinata* Daday, 1913b: 90 *nomen nudum*
= *Eoleptestheria inopinata* Daday, 1923: 261
= *Eoleptestheria chinensis* Daday, 1923: 269, fide Brtek, 1997
= *Eoleptestheria variabilis* Botnariuc, 1947
= *Eoleptestheria spinosa* Marinček, 1978
= *Eoleptestheria spinosa tenuis* Marinček & Valvajter, 1979
= *Eoleptestheria spinosa magna* Marinček & Valvajter, 1982
= *Leptestheria chinensis* Daday, 1923, in Dong et al. 1982: 13
= *Eoleptestheria spinosa mira* Marinček & Petrov, 1983
= *Eoleptestheria dongpingensis* Hu, 1986b, fide Naganawa & Orgiljanova, 2000
= *Eoleptestheria yanchowensis* Shu, Han & Liu, 1990, fide Naganawa & Orgiljanova, 2000

Comments: Australia, Czech Republic, France, Hungary, Italy, Russia, Spain, Turkey to China (Šrámek-Hušek et al. 1962; Thiéry and Pont 1987; Scanabissi Sabelli and Tommasini 1990; Timms 2009b). Possibly northern Africa: Monod (1969b) figures specimens collected from Bandiagara, Mali. Thiéry and Pont (1987) provide a redescription form French material, and Scanabissi Sabelli and Tommasini (1990) provide SEMs of material from Italy. The Chinese forms need to be re-examined and directly compared with the western forms. The record from Australia (Timms 2009b) needs to be examined more closely and is probably something different.

Leptestheria Sars, 1898: 9 *sensu* Daday, 1913b: 44

= *Estheria* Rüppell in Strauss-Durchheim, 1837 (pro partim), *nomen praeoccupatum*
= *Isaura* Joly, 1842 (pro partim), *nomen praeoccupatum*
= *Leptestheriella* Daday, 1913a *nomen nudum*
= *Leptestheriella* Daday, 1923: 352 (fide Brtek, 1997)
= *Sewellestheria* Tiwari, 1966 **New Combination**
= *Brtekia* Naganawa, 2001b, fide Rogers et al., 2020
= *Straskrabia* Naganawa, 2001b, fide Rogers et al., 2020

Diagnosis: Populations composed of males and females; amplexus is venter to venter. Rostrum may be sexually dimorphic. Rostrum subtriangular (usually females) to rounded (usually males). Angle between rostrum and frons 150° to 190°. Occipital notch very shallow, broad. Occipital condyle low, rounded, acute or absent, length half or less basal width. Carapace valve length ~1.5–2x valve breadth (umbone to margin). Carapace growth line intervals smooth or ornamented (scarring from algae often mistaken for ornamentation). Carapace typically brown, occasionally black, sometimes with marginal setae. Clasper endopod apically with ventral scales. Endite IV subcylindrical, bearing a dense, apical field of short spiniform setae or scales. Thoracic segments smooth or with spines or setae. Eggs attaching to prolonged cylindrical exopods of thoracopod X and XI. Thoracopod exopods bearing a triangular lamina. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not or slightly projecting. Each row has 30+ spines depending on species and gender. Females typically have more and smaller spines than males. Caudal filament originating between at spine row confluence. Caudal filament base flat or borne on low mound. Cercopods arcuate. Cercopod with a dorsomedial longitudinal row of setae or spines on proximal 60–70%. Setae plumose and either long or short. Row terminates with row of 5–10 spines. Cercopod with subapical, dorsal cirrus, extending from 2–8% of cercopod length. Eggs smooth.

Comments: The type species for the genus is *Leptestheria siliqva* Sars, 1898b, now regarded as a junior synonym of *L. rubidgei* (Baird, 1862). *Isaura* Joly, 1842 was used to replace *Cyzicus* (see discussion under *Cyzicus*). However, *Isaura* Joly, 1842 is a homonym of *Isaura* Savingny, 1817 (Cnidaria) (Kobayashi and Huzita 1943). *Isaura* Joly, 1842 name was inexplicably used by Alonso (1996) and Dumont and Negrea (2002) for *Leptestheria*. Brtek (1997) reduced *Leptestheriella* to a synonym of *Leptestheria*, based on "… a series of changes between the two groups." but provided no data and did not elaborate. Preliminary molecular analysis (unpublished) supports this combination.

García and Pereira (2003) review *Leptestheria* for South America and provide a nearly complete checklist for the world. Rogers et al. (2020) review the genus for the Neotropics. Belk et al. (2002) provides some discussion on characters in new world *Leptestheria*. Padhye and Ghate (2016) give a table for separating the Indian species. Straškraba (1966) details the range of variation in several European forms.

Tiwari (1966) created the genus *Sewellestheria* for his *S. sambharensis*, stating that it differed from *Leptestheria* by the absence of the lamina epipoditalis found in all other leptestheriids, as well as in some aspects of the telson. However, Tiwari's (1966: 70) figure 2f depicts a small lamina epipoditalis on the female limb I. Tiwari (1966) stated there was no justification to move this taxon to a separate family. Brtek (2002) unaccountably presented this genus in the Cyzicidae, and suggested that this genus may belong in its own family, but provided no rationale or evidence. Naganawa (2001a) presented this species in an Appendix as belonging in an "undescribed independent family", but provided no explanation, and later (2001b) moved the genus to a new family Sewellestheriidae. Naganawa's (2001b) diagnosis is in no way exclusive of the Leptestheriidae. The fact that the lamina epipoditalis is present in Tiwari's own drawing, and that the remaining characters he used to define his genus are not exclusive, *Sewellestheria* is treated here as a junior synonym of *Leptestheria*.

Attributed Species

Leptestheria aethiopica (Daday, 1923)

= *Leptestheriella aethiopica* Daday, 1923: 376

Comments: Eastern Africa from Egypt and Ethiopia, to the Niger River Valley. Should be compared with *L. theilei*.

Leptestheria biswasi Tiwari, 1965

Comments: Rajasthan, India. Needs to be compared with *L. jaisalmerensis* (Rogers and Padhye 2015).

Leptestheria brasiliensis Van Weddingen & Rabet, 2020

Comments: Known only from a few pools in Palmas de Monte Alto municipality, Bahia State, Brazil.

Leptestheria brevirostris Barnard, 1924: 227

Comments: Damaraland, east of Otjiwarango, Namibia. Figured by Brendonck (1999). Known only from the type locality Tladi.

Leptestheria brevispina García & Pereira, 2003

Comments: Venezuela.

Leptestheria caeciliae (Gauthier, 1951)

= *Leptestheriella caeciliae* Gauthier, 1951

Comments: "Station 5 – Poull Bourgou" near Tambacounda, Senegal is the only known locality. Should be closely compared with *L. laurentii*, which is known from one pool in the same vicinity. The two taxa are separated primarily on carapace ornamentation, and are probably the same species.

Leptestheria calcarata (Wolf, in Daday, 1923)

= *Leptestheriella calcarata* Wolf in litteris, in Daday, 1923: 366

Comments: Botswana, Namibia, South Africa, (Barnard 1924 1929; Brendonck 1999). Figured in Barnard (1929) and Brendonck (1999).

Leptestheria compleximanus (Packard, 1877)

= *Eulimnadia compleximanus* Packard, 1877
= *Estheria compleximanus* (Packard, 1877)
= *Leptestheria pestai* Daday, 1923: 296, fide Maeda-Martínez et al., 2002
= *Leptestheria vanhoeffeni* Daday, 1913b, *nomen nudum*
= *Leptestheria vanhoffeni* Daday, 1923, fide Maeda-Martínez et al., 2002
= *Leptestheria vanhoeffeni* var. *variabilis* Daday, 1923, fide Maeda-Martínez et al., 2002

Comments: Northern México and the Great Plains and southern deserts of USA (Maeda-Martínez et al. 2002; Martin and Cash-Clark 1994; Rogers and Hann 2016). The type locality is Ellis, Kansas, USA. Gurney's (1931) record of *L. vanhoeffeni* from Paraguay is probably an error.

Leptestheria cristata García & Pereira, 2003

Comments: Venezuela.

Leptestheria dahalacensis (Rüppell, in Straus-Dürckheim 1837) fide Daday, 1913a

= *Estheria dahalacensis* Rüppell, in Straus-Dürckheim 1837
= *Isaura dahalacensis* (Rüppell, in Straus-Dürckheim 1837)
= *Estheria pesthinensis* Brühl, 1860
= *Estheria pestensis* (in error)
= *Leptestheria tenuis* Sars, 1901
= *Leptestheria dives* Daday, 1913b: 345
= *Leptestheria aegyptiaca* Daday, 1923: 333
= *Leptestheria dives* var. *securiformis* Botnariuc, 1947
= *Leptestheria rotundirostris* Daday, 1913: 56
= *Leptestheria intermedia* Botnariuc, 1947
= *Leptestheria xinjiangensis* Hu, 1987, fide Naganawa & Orgilijanova, 2000
= *Leptestheria saetosa* Marinček & Petrov, 1992

Comments: Armenia, Austria, Azerbaijan, Belgium, Croatia, Czech Republic, Egypt, Eritrea, Ethiopia, Georgia, Hungary, Iraq, Italy, Macedonia, Moldova, Mongolia, Romania, Russia (southern), Serbia, Sudan, Syria, Turkey, Ukraine (Simon 1886; Thiele 1900; Sars 1901; Daday 1913b 1923; Botnariuc 1947; Šrámek-Hušek et al. 1962; Marinček and Petrov 1985; Brendonck et al. 1989; Scanabissi Sabelli and Tommasini 1990; Miličić and Petrov 2007; Dobrynina 2010). Naganawa and Orgilijanova (2000) lumped *L. xinjiangensis* here, but without any explanation or evidence of material examined. Straškraba (1966) and Marinček and Petrov (1985 1991a b c) describe some of the variation in this taxon.

Leptestheria dumonti Subash Babu & Bijoy Nandan, 2010

Comments: Southern India. Padhye and Ghate (2016) provide differential diagnosis.

Leptestheria echinata (Mohammad, 1986)

= *Leptestheriella echinata* Mohammad, 1986

Comments: Iraq, apparently only known from the type locality, east of Baghdad. Should be compared with *L. iranica*. Separated from that species by spinulae along the carapace and growth line margins. The type is deposited at the British Museum (1984.192).

Leptestheria gurneyi Padhye & Ghate, 2016

Comments: Rock pool species from Maharashtra, India, known only from the type locality.

Leptestheria heterochaeta Daday, 1923: 293

Comments: Algeria. Should be compared with *L. mayeti*.

Leptestheria inermis (Barnard, 1929: 270)

= *Leptestheriella inermis* Barnard, 1929

Comments: North Cape Province and East Cape Province, South Africa (Mabidi et al. 2016). Should be closely compared to *L. rubidgei* and *L. setosa*. Figured by Brendonck (1999).

Leptestheria iranica (Uéno, 1967)

= *Leptestheriella iranica* Uéno, 1967

Comments: Iran; known only from the type locality. No types were designated, and the material examined may be lost. Should be compared with *L. echinata*.

Leptestheria jaisalmerensis Tiwari, 1962 (Tiwari, 1996)

= *Leptestheria longispinosa* Nayar, 1965, fide Tiwari, 1969
= *Leptestheria biswasi* Tiwari, 1965, fide Tiwari, 1969

Comments: Central and northern India. Reviewed by Rogers and Padhye (2015). Should be compared with *L. biswasi* and *L. dumonti*. Padhye and Ghate (2016) provide differential diagnosis.

Leptestheria kawachiensis Uéno, 1926

= *Leptestheria nanjingensis* Zhang & Shen, in Zhang et al. 1976, fide Naganawa & Orgilijanova, 2000

Comments: Japan. Originally described from "a shallow rice field at Koya, Tomorogimura, [Kawachi Province], near the south bank of the Yodo River", in modern day Osaka Province. Figured also in Dong et al. (1982: 12). Naganawa and Orgilijanova (2000) synonymised *L. nanjingensis*, but without any explanation or evidence of material examined.

Leptestheria kunmingensis Shu, Rogers, Chen, & Yang, 2015

Comments: Yunnan, China. Known only from the type locality, which has been destroyed by development.

Leptestheria laurentii (Gauthier, 1951)

= *Leptestheriella laurentii* Gauthier, 1951

Comments: Known only from "Station 4 - Poull Koz" near Tambacounda, Senegal. Should be closely compared with *L. caeciliae*, which is know from only one pool in the same area. The two taxa are separated primarily on carapace ornamentation, and are probably the same species. In the original description, Gauthier (1951) gives a key to the genus for western Africa, but omits this species.

Leptestheria mayeti (Simon, 1886)

= *Estheria mayeti* Simon, 1886
= *Estheria angulosa* Simon, 1886
= *Isaura mayeti* (Simon, 1886) in Alonso 1996
= *Leptestheria lybica* Colosi, 1921
= *Leptestheria cortieri* Daday, 1923: 324, fide Thiéry, 1996
= *Leptestheria* aff. *cortieri* in Cottarelli & Mura, 1983

Comments: Northern Sahara (Gauthier 1930 1938); Algeria, Balaeric Islands, Egypt, Libya, Mauritania, Morocco, Saudi Arabia, Sudan, Tunisia, Yemen, possibly Sicily (Simon 1886; Gauthier 1929; Alonso 1996; Thiéry 1986 1996; Roux and Thiéry 1988; Samraoui et al. 2006; Rabet et al. 2015; Van den Broeck 2015). Redescribed by Daday (1923: 288) and by Alonso (1996), who provided excellent figures. Gauthier (1938) describes some variation.

Leptestheria nobilis **Sars, 1900**

= *Leptestheriella nobilis* (Sars, 1900)
= *Leptestheria hendersoni* Sars, 1900, fide Simhachalam & Timms, 2012
= *Leptestheriella hendersoni* Sars, 1900, fide Simhachalam & Timms, 2012
= *Leptestheriella gigas* Karande & Inamdar, 1960, fide Simhachalam & Timms, 2012
= *Leptestheriella maduraiensis* Nayar & Nair, 1968, fide Simhachalam & Timms, 2012
= *Leptestheria maduraiensis* (Nayar & Nair, 1968), fide Simhachalam & Timms, 2012

Comments: India. Redescribed by Daday (1923: 358). Reviewed in Rogers and Padhye (2015). Should be closely compared with *L. simhadrii*. Padhye and Ghate (2016) provide differential diagnosis.

Leptestheria orientalis **Spandl, 1925**

Comments: Known from a single collection from Borneo, near Sarawak.

Leptestheria rubidgei **(Baird, 1862)**

= *Estheria rubidgei* Baird, 1862
= *Estheria macgillivrai* Baird, 1862
= *Leptestheria macgillivrayi* (Baird, 1862) fide Sars, 1899
= *Leptestheria siliqva* Sars, 1898b, fide Sars, 1899
= *Leptestheria braueri* Daday, 1923: 280 fide Barnard, 1929
= *Leptestheria gigantea* Wolf, in Daday, 1923 fide Barnard, 1929
= *Leptestheria siliqva* v. *gigantea* Wolf (in litteris), *nomen nudum* in Daday, 1923

Comments: Botswana, Lesotho, Namibia, South Africa, Zimbabwe (Barnard 1924 1929; Brendonck 1999; Nhiwatiwa et al. 2014; Mabidi et al. 2016; Milne et al. 2020). Figured in Sars (1898b) and Brendonck (1999). Sars (1899) provides some very good figures.

Leptestheria sambharensis **(Tiwari, 1966)**

= *Sewellestheria sambharensis* Tiwari, 1966

Comments: Known only from the type locality: Sambur Lake, Rajasthan, India. Probably extinct. Brief review in Rogers and Padhye (2015).

Leptestheria sarsi **(Daday, 1923) fide Padhye & Rabet, 2017**

= *Leptestheriella sarsi* Daday, 1923: 362

Comments: Northern India. Redescribed by Padhye and Rabet (2017). Padhye and Ghate (2016) provide differential diagnosis.

Leptestheria serracauda **Rogers, Dadseepai, & Sanoamuang, 2016a**

Comments: Rice paddies in Roi Et Province, Thailand. Known only from the type locality and one other adjacent rice paddy.

Leptestheria setosa **(Barnard, 1935)**

= *Leptestheriella setosa* Barnard, 1935: 489

Comments: Known from four specimens from a single location in the Kalahari Desert of South Africa. It is morphologically intermediate between *L. rubidgei* (the form *calcarata*) and *L. inermis*, and should be compared with those two forms closely. Figured by Brendonck (1999).

Leptestheria simhadrii **(Simhachalam & Timms, 2012)**

= *Leptestheriella simhadrii* Simhachalam & Timms, 2012

Comments: Known only from the vicinity of the type locality: India, Racharla Mandal, Prakasam District, Pool at Racharla (15°28'N, 78°58'E). Despite the great variability of the material examined and overlapping characters with *L. nobilis*, the authors presented this taxon as new (reviewed in Rogers and Padhye 2015).

Leptestheria striatoconcha **Barnard, 1924: 227**

Comments: Common in Southern Namibia and South Africa, reported also from Zimbabwe (Nhiwatiwa et al. 2014; Mabidi et al. 2016; Milne et al. 2020). Figured by Brendonck (1999).

Leptestheria thielei **(Daday, 1923)**

= *Leptestheriella thielei* Daday, 1923: 370

Comments: Tanzania. Should be compared with *L. aethiopica*.

Leptestheria titicacae Harding, 1940

= *Leptestheria tucumanensis* Halloy, 1979 fide Rogers et al. (2020)
= *Straskrabia titicacae* (Harding, 1940) fide Rogers et al. (2020)
= *Brtekia tucumanensis* (Halloy, 1979) fide Rogers et al. (2020)

Comments: Northern Argentina, Bolivia, and Peru (Rogers et al. 2020). Brtek, in his 1997 catalogue, had the following statement after both *L. titicacae* and *L. tucumanensis*: "(the pertinence to this genus is uncertain) – probably gen. nov." but provided no explanation as to his conclusion. Naganawa (2001b) following Brtek's (1997) lead, made the statement that he "agrees" with Brtek, after "reconfirming" the original records, and "… the fact that at present I have enough evidence to justify in establishing…" moving these taxa to new two genera *Brtekia* and *Straskrabia*, respectively. This move was criticised in Rogers et al. (2020) and the taxonomy revised based on examination of material.

Leptestheria venezuelica Daday, 1923: 313 *sensu* García & Pereira, 2003

Comments: Aruba, Chile, Venezuela (Daday 1923; Belk et al. 2002; García and Pereira 2003; Rogers et al. 2020).

Leptestheria villigera Thiele, 1907

= *Leptestheriella villigera* (Thiele, 1907)

Comments: Madagascar. Redescribed by Daday (1923: 381).

Nomina dubia and species inquirendae

Leptestheria longispinosa Nayar, 1965

Comments: Juveniles, fide Tiwari (1996).

Maghrebestheria Thiéry, 1988

Diagnosis: Populations composed of males and females; amplexus is venter to venter. Rostrum may be sexually dimorphic. Rostrum subtriangular (females) to rounded (males). Angle between rostrum and frons 170° to 190°. Occipital notch very shallow, broad. Occipital condyle low, truncated or acute, length half or less basal width. Carapace valve length ~1.5–1.75x valve breadth (umbone to margin). Carapace growth line intervals smooth (scarring from algae often mistaken for ornamentation). Carapace sometimes with marginal setae. Clasper endopod apically with ventral scales and apical transverse row of spatulate spines. Endite IV subcylindrical, bearing a dense, apical field of short spines and scales. Thoracic segments with dorsomedial spines or setae, posterior most segments with a medial projection bearing spines. Eggs attaching to prolonged exopods of thoracopod X through XV. Thoracopod exopods bearing a triangular lamina. Telson posterior margin posteriolateral spine rows confluent dorsally, with confluence not or slightly projecting. Each row has 50+ spines becoming apically setaform in the posterior most pairs. Females have a similar spine arrangement to males. Caudal filament originating between spine rows just posterior to confluence. Caudal filament base borne on low mound. Cercopods straight with apex bent dorsally. Cercopod with a dorsomedial longitudinal row of spines on proximal 95%, becoming longer in distal portion of cercopod. Cercopod without subapical, dorsal cirrus. Eggs smooth, subspherical, ~130 µm.

Comments: Naganawa (2001a b) and Brtek (2002) treated *Maghrebestheria* as a synonym of *Leptestheria* but provided no further explanation.

Attributed Species

Maghrebestheria maroccana Thiéry, 1988 *sensu* Alonso, 1996

= *Maghrebestheria maroçana* Thiéry, 1985 (in error?) in Thiéry, 1986 *nomen nudum*
= *Maghrebestheria maroccana* Thiéry, 1986b in Thiéry, 1986 *nomen nudum*

Comments: Morocco, Spain (Thiéry 1986 1988; Alonso 1996; Van den Broeck 2015). Redescribed by Alonso (1996), who contributed excellent figures. Thiéry (1986) provided a distribution map, and listed this species under the names "*M. maroçana* Thiéry, 1985" and *M. maroccana* Thiéry, 1986b, some two years before the actual description was published. However, the only citation in that reference for "Thiéry 1985" is the original description of an anostracan, and the citation "Thiéry, 1986b" was the actual description cited as in press, although it was not published until 1988.

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