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## **Identification guide to species in the scale insect tribe *Iceryini* (Coccoidea: Monophlebidae)**

CORINNE M. UNRUH & PENNY J. GULLAN



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## Identification guide to species in the scale insect tribe *Iceryini* (Coccoidea: Monophlebidae)

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### Abstract

We recently revised the scale insect tribe *Iceryini* (Coccoidea: Monophlebidae) based on a molecular phylogenetic hypothesis and supporting morphological evidence. As a result of this revision, we proposed new generic concepts that required significant reorganization of species in three of the five iceryine genera: *Crypticerya* Cockerell, *Gigantococcus* Pesson & Bielenin and *Icerya* Signoret. The other two genera, *Echinicerya* Morrison and *Gueriniella* Fernald, remain unchanged. Here we discuss taxonomic characters important for iceryine identification and provide a comprehensive review of all described iceryine species. We include keys to the genera and to the species of each genus of *Iceryini* based on features of the adult females. We present new diagnoses for all the species for which type material was available for examination and summarize original descriptions for species for which we were unable to examine material. We designate lectotypes for the following species names (valid name given in parentheses): *Llaveia abrahami* Newstead (*C. abrahami*), *Icerya brasiliensis* Hempel (*C. brasiliensis*), *Icerya colimensis* Cockerell (*C. colimensis*), *Icerya genistae* Hempel (*C. genistae*), *Icerya (Crypticerya) littoralis* Cockerell (*C. littoralis*), *Icerya littoralis mimosae* Cockerell (*C. littoralis*),

*Icerya littoralis tonilensis* Cockerell (*C. littoralis*), *Crypticerya rosae mexicana* Cockerell & Parrott (*C. mexicana*), *Icerya minima* Morrison (*C. minima*), *Icerya montserratensis* Riley & Howard (*C. montserratensis*), *Palaeococcus morrilli* Cockerell (*C. morrilli*), *Icerya palmeri* Riley & Howard (*C. palmeri*), *Icerya rileyi* Cockerell (*C. rileyi*), *Icerya rileyi larreae* Cockerell (*C. rileyi*), *Steatococcus tabernicolus* Ferris (*C. tabernicola*), *Icerya (Crypticerya) townsendi* Cockerell (*C. townsendi*), *Icerya (Crypticerya) townsendi pluchae* Cockerell (*C. townsendi*), *Icerya zeteki* Cockerell (*C. zeteki*), *Icerya seychellarum albolutea* Cockerell (*Gi. alboluteus*), *Crypticerya bicolor* DeLotto (*Gi. bicolor*), *Icerya brachystegiae* Newstead (*Gi. brachystegiae*), *Palaeococcus cajani* Newstead (*Gi. cajani*), *Palaeococcus caudata* Newstead (*Gi. caudatus*), *Icerya euphorbiae* Brain (*Gi. euphorbiae*), *Aspidoproctus gowdeyi* Newstead (*Gi. gowdeyi*), *Icerya longisetosa* Newstead (*Gi. longisetosus*), *Icerya nigroareolata* Newstead (*Gi. nigroareolatus*), *Icerya sulfurea pattersoni* Newstead (*Gi. pattersoni*), *Palaeococcus theobromae* Newstead (*Gi. theobromae*), *Crossotosoma aegyptiacum* Douglas (*I. aegyptiaca*), *Icerya rosae australis* Maskell (*I. australis*), *Icerya crocea* Green (*I. crocea*), *Icerya formicarum* Newstead (*I. formicarum*), *Icerya jacobsoni* Green (*I. jacobsoni*), *Icerya koebelei* Maskell (*I. koebelei*), *Icerya minor* Green (*I. minor*), *Icerya (Crypticerya) nuda* Green (*I. nuda*), *Icerya nudata* Maskell (*I. nudata*), *Icerya hyperici* Froggatt (*I. nudata*), *Palaeococcus dymocki* Froggatt (*I. nudata*), *Icerya pilosa* Green (*I. pilosa*), *Icerya purchasi citriperda* Hempel (*I. purchasi*), *Icerya purchasi crawii* Cockerell (*I. purchasi*), *Icerya purchasi maskelli* Cockerell (*I. purchasi*), and *Icerya schrottkyi* Hempel (*I. schrottkyi*).

**Key words:** *Crypticerya*, *Echinicerya*, *Gigantococcus*, *Gueriniella*, *Icerya*

## Introduction

The tribe Iceryini was erected by Cockerell (1899c) with *Icerya* as the type genus. Morrison (1928) placed Iceryini in the Monophlebinae (now Monophlebidae) and included just five genera split into two groups: Group 1 comprised only *Gueriniella* Fernald and Group 2 included *Auloicerya* Morrison, *Crypticerya* Cockerell, *Icerya* Signoret and *Steatococcus* Ferris. *Echinicerya* Morrison and *Gigantococcus* Pesson & Bielenin were added to the tribe in 1930 and 1966, respectively (Morrison, 1930; Pesson & Bielenin, 1966). We published a molecular phylogeny of the scale insect tribe Iceryini recently in which four of the previously recognized genera were not monophyletic (Unruh & Gullan, 2008). Our hypothesis of relationships was supported by morphological characters of the adult females, especially features of the wax-exuding cuticular pores, and we recovered groups that reflected biogeography. Consequently, we redescribed genera and reorganized the species of Iceryini. The genera *Auloicerya* and *Steatococcus* were recognised as junior synonyms of *Icerya* and *Crypticerya*, respectively, and we expanded the concepts of *Crypticerya*, *Gigantococcus* and *Icerya* based on pore structure and species' distributions. The concepts of *Gueriniella* and *Echinicerya* remain unchanged. We now recognise 74 described species of Iceryini in five genera: *Crypticerya*, *Echinicerya*, *Gigantococcus*, *Gueriniella* and *Icerya*. Unruh & Gullan (2008) provided a review of the taxonomic history and justification of the revised generic concepts.

Several authors have discussed the importance of pore structure and distribution in identification of adult females of Iceryini (Morrison, 1928; Rao, 1951a, b). Rao (1951a, b) was the first to compare pore types comprehensively among species in the Indomalayan region and he attempted to classify the different pore types he observed. Our recent revision of the tribe also recognised the utility of pore structure as a taxonomic tool and we categorised and illustrated the range of pore types present in the Iceryini (Unruh & Gullan, 2008).

Here we summarise the main morphological characteristics of the adult females of 74 species of Iceryini and for each species we provide original diagnoses or adaptations of descriptions based either on the original description or on a subsequent description based on type material. We provide keys to the genera of Iceryini and to the species of each genus of Iceryini, all based on adult females. We include illustrations of diagnostic pore types, distributed by body region, for most iceryine species. We give detailed type material information for all species and designate lectotypes for 45 species names.

## Material and methods

The following abbreviations are for institutions or collections where specimens are held or will be deposited: ANIC, Australian National Insect Collection, CSIRO Entomology, Canberra, Australia; ASCU, Agricultural Scientific Collections Unit, Orange Agricultural Institute, New South Wales Agriculture, Orange, New South Wales, Australia; BME, The Bohart Museum of Entomology, University of California, Davis, California, USA; BMNH, The Natural History Museum, London, England, UK; CMNZ, Canterbury Museum, Christchurch, New Zealand; CSCA, California State Collection of Arthropods, California Department of Food & Agriculture, Sacramento, California, USA; CZLP, Coleções do Centro de Zoologia do Instituto de Investigação Científica Tropical, Lisbon, Portugal; EISC, Entomological Institute, Shanxi Agricultural University, Shanxi, China; IFSP, Departamento de Entomologia e Zoologia Agrária "Filippo Silvestri", Università di Napoli Federico II, Portici, Italy; INPC, Division of Entomology, National Pusa Collections, Indian Agricultural Research Institute, New Delhi, India; ITLJ, Insect Taxonomy Laboratory, National Institute of Agricultural Environmental Sciences, Konnon-dai, Yatabe, Tsukuba-shi, (I. Kuwana), Ibarakiken, Japan; MNHN, Muséum national d'Histoire naturelle, Paris, France; MZSP, Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil; NYSM, New York State Museum, Albany, New York, USA; NZAC, New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand; QDPI, Queensland Department of Primary Industries and Fisheries, Brisbane, Queensland, Australia; SANC, South African National Collection of Insects, Pretoria, South Africa; SAPO, Instituto Biológico de São Paulo, São Paulo, Brazil; UCEC, Entomology and Arachnology Collection, University of Colorado, Boulder, Colorado, USA; USNM, United States National Entomological Collection, U.S. National Museum of Natural History, Washington, D.C., USA; ZMAS, Zoological Museum, Academy of Science, St. Petersburg, Russia; ZMB, Museum für Naturkunde der Humboldt-Universität zu Berlin, Berlin, Germany.

The NZAC follows the principle that primary type material should reside in the country of origin of the species, if suitable repositories exist (Deitz & Tocker, 1980), and thus when lectotypes are designated for Maskell specimens collected in Australia, such as *I. acaciae*, *I. koebelei* and *I. nudata*, these can be deposited in the ANIC, as we do here.

We were unable to examine type material that Ben-Dov (2005) believed to be housed in the following institutions: CZLP, EISC, IFSP, INPC, ITLJ, NYSM, SANC, SAPO and ZMAS. We contacted Dr V. V. Ramamurthy at the Division of Entomology, Indian Agricultural Research Institute, New Delhi, India, and Dr J. Poorani at the Project Directorate of Biological Control, Bangalore, India, concerning V. P. Rao's type material but it was not found in either institution.

Information listed under "Type data" for each species is from the original description. Data listed under "Type material" are from slide labels and/or labelled dry material. All type material has been examined unless otherwise noted. Dr. Imre Foldi (MNHN) is working on a revision of the type species of the family Monophlebidae and therefore we do not designate lectotypes from type material housed at MNHN.

The term "adult female" will be used for the hermaphroditic adults of *I. purchasi* and other hermaphroditic iceryine species, even though they are not strictly female. These species are considered gynomonocious as the adult hermaphrodite is externally similar to an adult female, but forms an ovotestis and is self-fertilizing (Hughes-Schrader, 1925, 1963; Hughes-Schrader & Monahan, 1966; Hughes-Schrader & Tremblay, 1966).

The voucher number (*i.e.* CMU023 or CMU080) refers to material used as part of a molecular analysis [refer to Unruh & Gullan (2008)] and stored at BME. For freshly collected material, the slide-mounting and mensural techniques described by Gullan (1984) were used. Measurements were made using an ocular micrometer attached to a compound microscope. The measurements and figures of the pores are based on more than one slide-mounted specimen (unless only a single specimen was available), including type specimens if available. Measurements are expressed as the range and are given in millimetres (mm) and micrometres ( $\mu\text{m}$ ). Measurements of length and width are maximum dimensions. Illustrations of pores were prepared

using a Nikon Coolpix S10 camera and modified in the Adobe programs Photoshop 6.0 and Illustrator CS.

#### *Type material and lectotypification*

The ICZN (1999) requires lectotypes designated after 1999 to 'contain an express statement of deliberate designation' (amended Article 74.7.3). 'Here designated' is used to fulfil this requirement. Lectotypes have been designated where a name lacks a holotype, neotype or lectotype and unambiguous syntypes have been identified. The purpose is to provide stability of nomenclature and is done so in a revisionary context in agreement with the amended Recommendation 74G of Article 74.7.3.

A summary of available type material for all iceryine species, including lectotypes designated in this paper, together with depository information, is provided in Table 1.

#### **Features of the adult female**

The morphological terms for Monophlebidae of Rao (1951a, b), Bhatti (1990), Bhatti & Gullan (1990) and Unruh & Gullan (2008) are used. Below we describe the taxonomically informative structures that form the basis of the diagnoses.

**Head.** Adult females most often have 11 antennal segments, although some species can have as few as eight segments (*i.e. Icerya pilosa*). Each segment is elongate, the apical segment is longest and basal segment is broadest. Hair-like setae are present on each segment and are longest on the apical segment. Simple, dark, conical eyes are found at the base of the antennae. All iceryine species possess a labium that is three-segmented. *Gueriniella* species have an elongate labium relative to that of other iceryine species. The monotypic genus *Echinicerya* has a relatively short labium because the first two segments are very narrow making the labium appear one-segmented, as stated by Morrison (1930). The basal segment of the labium is always very narrow but bears 2 or 3 pairs of short setae; the medial segment has 2 or 3 pairs of hair-like setae and is narrow in some species; the apical segment has several pairs of hair-like setae with acute apices and, at the very apex, several blunt-tipped or spatulate setae. For more information on the structure of the labium in iceryine genera see Koteja (1974).

**Thorax.** Thoracic spiracles in the Iceryini never have multilocular pores present in the atrium, but pores are often found lining the derm just outside of the atrial opening. The posterior pair of spiracles is slightly larger than the anterior pair; this size difference is exaggerated in several *Gigantococcus* species, especially *Gi. maximus* (Newstead).

Iceryine legs are relatively robust and covered with hair-like setae and are of typical monophlebid form (Morrison, 1928: 15). At least on adult females, the setae on inner (ventral) face of the tibia and tarsus of all legs are often more robust than setae elsewhere on the legs and are spine-like in some species [*e.g. Icerya acaeciae* (Morrison & Morrison)]. Each face of each trochanter has 4 campaniform sensilla, the function of which is unknown. The forelegs of some species are much smaller than the midlegs and hindlegs [*e.g. Crypticerya rosae* (Riley & Howard)], whereas for most species this size difference is not especially noticeable [*e.g. Gueriniella serratulae* (Fabricius)]. The claw digitules are mostly very fine and always appear either acute or very slightly knobbed at the apex (distinctly knobbed claw digitules are apparent in third-instar females). The digitules, however, are delicate and easily damaged and so the condition of digitule apex is usually difficult to assess.

**Abdomen.** The adult female of iceryine species has an ovisac band, a marsupial band or neither on the venter. The ovisac band and marsupial band are homologous structures formed by concentrations of setae and pores. Similar pores are found on the submarginal abdomen of species that form neither an ovisac nor a marsupium. An ovisac band is present on species that form an ovisac that extends from the posterior abdomen. The ovisac band is formed by simple multilocular pores and setae arranged in a large circle on the ventral abdomen; the anterior edge is posterior to the hind coxae and the lateral and posterior edges extend to the abdominal margin. The marsupial band is present on species that form an internal brood chamber or marsupium. The marsupial band is formed by setae and multilocular pores arranged in a circle, semi-circle or V-

**TABLE 1.** List of type material and depositories for the world iceryine species. The original name and synonyms are listed below the emboldened valid name. Holotypes and lectotypes are slide-mounted. In some cases, the holotype or lectotype is slide-mounted with other specimens. When this occurs, the total number of slides listed after the paratype or paralectotypes includes the slide with the holotype or lectotype. Emboldened material has been examined by the authors. H=holotype; P=paratype(s); L=lectotype; PL=paralectotype(s); S=syntype(s); ♀=adult female; ♂=adult male; p♂=pupal male; 3rd=third-instar nymph; 2nd=second-instar nymph; 1st=first-instar nymph; im=immature; sl=slide-mounted; dm=dry material; em=embryo; eggs=eggs; ad mat?=possibly additional type material at depository.

Species	Type material
<i>C. abrahami</i> (Newstead 1917)	
<i>Llaveia abrahami</i>	<b>L: ♀ (BMNH)</b> <b>PL: 7-♀, 16 em (5 sl incl. L) (BMNH)</b>
<i>C. brasiliensis</i> (Hempel 1900)	
<i>Icerya brasiliensis</i>	<b>L: ♀ (USNM)</b> <b>PL: 2-♀, 6-3rd, 1-2nd, 8-1st (5 sl); 5 boxes (dm) (USNM)</b> PL: ad mat? (MZSP) (Ben-Dov, 2005: 193)
<i>C. colimensis</i> (Cockerell 1902b)	
<i>Icerya colimensis</i>	<b>L: ♀ (USNM)</b> <b>PL: 1-♀, 1 em (2 sl) (USNM)</b> PL: ca. 30 em ♀ eggs (1 sl) (BME)
<i>C. flava</i> (Hempel 1920)	
<i>Icerya flava</i>	S: ♀, 1st, egg (MZSP)
<i>C. flocculosa</i> (Hempel 1932)	
<i>Icerya flocculosa</i>	S: ♀, 1st (SAPO)
<i>C. genistae</i> (Hempel 1912)	
<i>Icerya genistae</i>	<b>L: ♀ (MZSP)</b> <b>PL: 4-♀ (1 sl incl. L); 1st?, eggs? (MZSP)</b>
<i>C. littoralis</i> (Cockerell 1898a)	
<i>Icerya (Proticerya) littoralis</i>	<b>L: ♀ (USNM)</b> <b>PL: 6-♀, 14-2nd, 55-1st, 2 em (8 sl); 4 boxes (dm) (USNM)</b> <b>PL: 2-♀ (1 sl) (BME)</b>
<i>Icerya littoralis mimosae</i> Cockerell 1898a	<b>L: ♀ (USNM)</b> <b>PL: 2-♀, 30-1st (5 sl); 3-♀, 1-3rd (2 boxes dm) (USNM)</b>
<i>Icerya littoralis tonilensis</i> Cockerell 1902b	<b>L: ♀ (USNM)</b> <b>PL: 2-♀ (1 box dm) (USNM)</b>
<i>C. luederwaldti</i> (Hempel 1918)	
<i>Icerya luederwaldti</i>	S: ♀ (SAPO)
<i>C. mexicana</i> Cockerell & Parrott 1899b	
<i>Crypticerya rosae mexicana</i>	L: 3rd (USNM) PL: ca. 30-1st ♀ em (2 sl incl. L); dm (USNM) PL: 9-1st (1 sl) (BME)
<i>C. minima</i> (Morrison 1919)	
<i>Icerya minima</i>	<b>L: ♀ (USNM)</b> <b>PL: 5-♀, 24-1st (5 sl incl. L); 2-♀ (1 box dm) (USNM)</b>

- C. montserratensis* (Riley & Howard 1890b)  
*Icerya montserratensis* **L: partially destroyed ♀ (USNM)**  
**PL: ♀♀ body parts, 11-3rd, 2-2nd, 11-1st, 14 eggs (7 sl incl. L); ca. 30 ♀, ca. 20-3rd (8 boxes dm) (USNM)**
- C. morrilli* (Cockerell 1914a)  
*Palaeococcus morrilli* **L: ♀ (USNM)**  
**PL: 1-♀, 55-1st, 6 em (4 sl incl. L) (USNM)**  
**PL: 1-♀, 6-1st (3 sl) (BME)**
- C. palmeri* (Riley & Howard 1890b)  
*Icerya palmeri* **L: 2nd (USNM)**  
**PL: 1-2nd (? sl); dm (USNM)**
- C. pimentae* (Newstead 1917)  
*Llaveia primitiva pimentae* **S: ♀, 3rd, 2nd, 1st (BMNH)**
- C. rileyi* (Cockerell 1895)  
*Icerya rileyi* **L: ♀ (USNM)**  
**PL: 3-♀, 5-1st (3 sl); 18-♀, several-1st (4 boxes dm) (USNM)**  
*Icerya rileyi larrae* Cockerell 1902b **L: ♀ (USNM)**  
**PL: 1-1st, 1 em, body parts of several-1st (2 sl); dm (USNM)**  
**PL: 3-♀ (sl) (BMNH)**
- C. rosae* (Riley & Howard 1890a)  
*Icerya rosae* **L (Unruh ♀ Gullan, 2008: 30): ♀ (USNM)**  
**PL: 6-♀, 9-3rd, 7-2nd, 32-1st, 6 eggs (12 sl incl. L); several ♀♀ 3rd (3 boxes dm) (USNM)**
- C. similis* (Morrison 1927)  
*Icerya similis* **H: ♀ (USNM)**  
**P: 7-♀, 24-1st, 1 em (8 sl); 15-♀, 12 im. (4 boxes dm) (USNM)**
- C. subandina* (Leonardi 1911)  
*Icerya subandina* **S: ♀, 1st (IFSP)**
- C. tabernicola* (Ferris 1921)  
*Steatococcus tabernicolus* **L: ♀ (BME)**  
**PL: 1-2nd (sl) (BME)**
- C. townsendi* (Cockerell 1896b)  
*Icerya (Crypticerya) townsendi* **L: ♀ (USNM)**  
**PL: 3-♀, ca. 80-1st (9 sl); 2-♀ (1 box dm) (USNM)**  
**PL: 1-♀, 11-1st (2 sl) (BME)**  
*I. (Crypticerya) townsendi plucheae* Cockerell 1896b **L: ♀ (USNM)**  
**PL: 2-♀ (2 sl); 6-♀ (2 boxes dm) (USNM)**
- C. tuberculata* (Morrison 1941)  
*Steatococcus tuberculatus* **H: ♀ (USNM)**  
**P: 2-♀, 11-1st (4 sl); 20-♀ (6 boxes dm) (USNM)**
- C. zeteki* (Cockerell 1914b)  
*Icerya zeteki* **L: ♀ (BME)**

	<b>PL: 3-♀, 3-1st (3 sl); 2-♀ (dm) (BME)</b>
	<b>PL: 5-♀ (2 boxes dm) (USNM)</b>
	<b>PL: body parts of 3-♀ and 3 em (1 sl) (UCEC)</b>
	PL: dm (NYSM)
<i>E. anomala</i> Morrison, 1930	
<i>Echinicerya anomala</i>	<b>L (Unruh ♀ Gullan, 2008: 36): ♀ (USNM)</b>
	<b>PL: 1-♀, 1-♂, 2-2nd, 2-1st (4 sl) (USNM)</b>
<i>Gi. alboluteus</i> (Cockerell 1898b)	
<i>Icerya seychellarum albolutea</i>	<b>L: ♀ (USNM)</b>
	<b>PL: 1-♀ (1 box, dm) (USNM)</b>
<i>Gi. bicolor</i> (Newstead 1917)	
<i>Crypticerya bicolor</i>	<b>L: ♀ (BMNH)</b>
	<b>PL: 1 p♂, 1-3rd, 3-2nd (2 sl); 1-♀, 3-3rd, 5-2nd (1 box dm) (BMNH)</b>
<i>Gi. bimaculatus</i> (DeLotto 1959)	
<i>Icerya bimaculata</i>	H: ♀ (BMNH)
	<b>P: 1-♀ (sl) (USNM)</b>
	P: ♀♀ (sl) (Kenya?)
<i>Gi. brachystegiae</i> (Hall 1940)	
<i>Icerya brachystegiae</i>	<b>L: ♀ (BMNH)</b>
	<b>PL: 1-♀, 12-1st (3 sl) (BMNH)</b>
<i>Gi. cajani</i> (Newstead 1917)	
<i>Palaeococcus cajani</i>	L: 3rd (BMNH)
<i>Gi. caudatus</i> (Newstead 1917)	
<i>Palaeococcus caudata</i>	<b>L: ♀ (BMNH)</b>
	<b>PL: 3-♀, 1-3rd, 1-2nd (3 sl incl. L) (BMNH)</b>
<i>Gi. euphorbiae</i> (Brain 1915)	
<i>Icerya euphorbiae</i>	<b>L: ♀ (USNM)</b>
	<b>PL: 1-♀, 6-1st (2 sl) (USNM)</b>
	PL: ♂?, ad mat? (SANC)
<i>Gi. ewarti</i> (Newstead 1896)	
<i>Icerya ewarti</i>	S: ♀, ♂, 2nd, 1st (missing)
<i>Gi. gowdeyi</i> (Newstead 1920)	
<i>Aspidoproctus gowdeyi</i>	L: 3rd (BMNH)
	<b>PL: 8-2nd (3 sl); dm (BMNH)</b>
	PL: 1-3rd, 1-2nd (1 sl); dm (BME)
<i>Gi. longisetosus</i> (Newstead 1911)	
<i>Icerya longisetosa</i>	<b>L: ♀ (ZMB)</b>
<i>Gi. madagascariensis</i> (Mamet 1951)	
<i>Steatococcus madagascariensis</i>	<b>S: 2-♀ (1 sl) (BMNH)</b>
	<b>S: 1-♀ (sl), ad mat? (MNHN)</b>

<i>Gi. maximus</i> (Newstead 1914)	
<i>Icerya maxima</i>	S: ♀, 1st (missing)
<i>Icerya corticalis</i> Vayssière 1926	S: ♂ (sl), ad mat? (MNHN)
<i>Gi. nigroareolatus</i> (Newstead 1917)	
<i>Icerya nigroareolata</i>	<b>L: ♀ (USNM)</b> <b>PL: 2-♀, 1-2nd (2 sl incl. L); dm (USNM)</b> PL: ? (BMNH)
<i>Icerya maynei</i> Vayssière 1926	<b>S: 2-♀ (2 sl) (BMNH)</b> <b>S: 2-♀ (1 sl), ad mat? (MNHN)</b>
<i>Gi. pattersoni</i> (Newstead 1917)	
<i>Icerya sulfurea pattersoni</i>	<b>L: ♀ (BMNH)</b> <b>PL: 1-♀, 1-3rd (1 sl); ♀ (dm) (BMNH)</b>
<i>Gi. rodriguezi</i> (Castel-Branco 1952)	
<i>Crypticerya rodriguezi</i>	S: ♀, 1st (CZLP)
<i>Gi. schoutedeni</i> (Vayssière 1926)	
<i>Icerya schoutedeni</i>	<b>S: 5-♀, 1-3rd (3 sl) (BMNH)</b> <b>S: 1-♀ (sl), ad mat? (MNHN)</b>
<i>Icerya tremae</i> Vayssière 1926	<b>S: 1-♀ (1 sl) (BMNH)</b> <b>S: 2-♀ (1 sl), ad mat? (MNHN)</b>
<i>Gi. splendidus</i> (Lindinger 1913)	
<i>Icerya splendida</i>	S: ♀, 1st (lost)
<i>Gi. sulfureus</i> (Lindinger 1913)	
<i>Icerya sulfurea</i>	S: ♀, 1st (lost)
<i>Gi. theobromae</i> (Newstead 1908b)	
<i>Palaeococcus theobromae</i>	<b>L: ♀ (BMNH)</b> <b>PL: 2-♀, 3-2nd (3 sl incl. L) (BMNH)</b> <b>PL: 1-♀, 1-2nd, 1-1st, ca. 15 em (3 sl); 2-♀, several imm (2 boxes dm) (USNM)</b>
<i>Gu. decorata</i> Borchsenius 1949	
<i>Gueriniella decorata</i>	<b>S: 3-♀ (BMNH)</b> S: ad mat (ZMAS) (Ben-Dov, 2005: 182)
<i>Gu. serratulae</i> (Fabricius 1775)	
<i>Coccus serratulae</i>	S: ♀ lost (Zimsen, 1964: 341)
<i>Coccus picridis</i> Boyer de Fonscolombe 1834	S: ♀ lost (Ben-Dov, 2005: 182)
<i>Coccus fabae</i> Guérin-Ménéville 1852	S: ♀ (MNHN)
<i>I. acaciae</i> (Morrison & Morrison 1923)	
<i>Auloicerya acaciae</i>	<b>H: ♀ (USNM)</b> P: 1-1st (sl) (USNM)
<i>I. aegyptiaca</i> (Douglas 1890)	
<i>Crossotosoma aegyptiacum</i>	<b>L: ♀ (BMNH)</b> PL: half an antenna and a single leg (1 sl incl. L) (BMNH)
<i>Icerya tangalla</i> Green 1896	L (Williams & Watson, 1990: 21): ♀ (BMNH)

<i>I. assamensis</i> (Rao 1951b)	
<i>Steatococcus assamensis</i>	H: ♀ (INPC)
<i>I. australis</i> Maskell 1894	
<i>Icerya rosae australis</i>	<b>L: ♀ (ANIC)</b> PL: 2-♀, 1-3rd, 19-1st (5 sl); &, nymphs (dm) (NZAC) <b>PL: 1-♀, 1-2nd, 11-1st (5 sl) (USNM)</b>
<i>I. callitri</i> (Froggatt 1923)	
<i>Llaveia callitri</i>	S: ♀ (missing)
<i>I. clauseni</i> (Rao 1951b)	
<i>Crypticerya clauseni</i>	<b>H: ♀ (USNM)</b> <b>P: 2-♀ (1 sl incl. H) (USNM)</b>
<i>I. crocea</i> Green 1896	
<i>Icerya crocea</i>	<b>L: ♀ (BMNH)</b> PL: ? (BMNH)
<i>I. formicarum</i> Newstead 1897	
<i>Icerya formicarum</i>	L: 2nd (BMNH) PL: 1-1st (sl) (BMNH)
<i>I. hanoiensis</i> Jashenko & Danzig 1992	
<i>Icerya hanoiensis</i>	H: ♀ (ZMAS)
<i>I. imperatae</i> Rao 1951a	
<i>Icerya imperatae</i>	<b>H: ♀ (USNM)</b> <b>P: 4-♀, 1-2nd, 11-1st, 11 em (11 sl incl. H); 19-1st (4 boxes dm) (USNM)</b> <b>P: 1-♀ (sl) (BME)</b>
<i>I. jacobsoni</i> Green 1913	
<i>Icerya jacobsoni</i>	<b>L: ♀ (BMNH)</b> <b>PL: 2-♀, 3-1st (1 sl incl. L) (BMNH)</b>
<i>I. jaihind</i> (Rao 1951b)	
<i>Crypticerya jaihind</i>	H: ♀ (INPC) P: 1 ♀ (sl) (INPC)
<i>I. koebelei</i> Maskell 1892	
<i>Icerya koebelei</i>	<b>L: ♀ (ANIC)</b> PL: body parts of ad ♂, 1-2nd, 5-1st (5 sl) (NZAC) PL: 2-1st (1 sl) (USNM)
<i>I. kumari</i> (Rao 1951b)	
<i>Crypticerya kumari</i>	H: ♀ [possibly 3rd] (INPC)
<i>I. mangiferae</i> (Tang & Hao 1995)	
<i>Crypticerya mangiferae</i>	H: ♀ (EISC) P: 13-♀ (sl) (EISC)
<i>I. menoni</i> Rao 1951a	
<i>Icerya menoni</i>	H: ♀ (INPC) P: 1-♀ (sl) (INPC)

<i>I. minor</i> Green 1908	
<i>Icerya minor</i>	<b>L:</b> ♀ (BMNH)
	<b>PL:</b> 2-♀, 1 ♂ (2 sl incl. L) (BMNH)
	S: ♀ lost (Ben-Dov, 2005: 201)
<i>I. morrisoni</i> Rao 1951a	
<i>Icerya morrisoni</i>	<b>H:</b> ♀ (USNM)
	<b>P:</b> 1-♀ (USNM)
<i>I. natalensis</i> (Douglas 1888)	
<i>Ortonia natalensis</i>	S: ♀, 1st (BMNH & USNM?)
<i>I. nuda</i> Green 1930	
<i>Icerya (Crypticerya) nuda</i>	<b>L:</b> ♀ (BMNH)
	PL: 28 em (3 sl) (BMNH)
	PL: 10 em (1 sl) (USNM)
<i>I. nudata</i> Maskell 1896	
<i>Icerya nudata</i>	<b>L:</b> ♀ (ANIC)
	PL: 5 em (1 sl incl. L) (ANIC)
	<b>PL:</b> 3-♀, 1-1st (4 sl) (NZAC)
	<b>PL:</b> 1-♀, 9-1st (2 sl) (BMNH)
<i>Icerya hyperici</i> Froggatt 1919	<b>L:</b> ♀ (ANIC)
	PL: 2-2nd, 2-1st (1 sl) (ASCU)
<i>Palaeococcus dymocki</i> Froggatt 1921	<b>L:</b> ♀ (ASCU)
	PL: 12-1st (2 sl) (ASCU)
	<b>PL:</b> 2-♀, 2-1st (3 sl) (ANIC)
<i>I. pilosa</i> Green 1896	
<i>Icerya pilosa</i>	<b>L:</b> ♀ (BMNH)
	<b>PL:</b> 3-♀, 3-2nd, 3-1st (2 sl incl. L) (BMNH)
	PL: dm (USNM)
<i>Icerya seychellarum nardi</i> Green 1922	<b>H (by monotypy):</b> ♀ (BMNH)
<i>I. pulchra</i> (Leonardi 1907)	
<i>Palaeococcus pulcher</i>	S: ♀, ♂, 1st (IFSP)
<i>I. purchasi</i> Maskell 1897	
<i>Icerya purchasi</i>	L (Morales 1991: 57): ♀ (NZAC)
	PL: 1-♀, 1-1st (2 sl) (NZAC)
	PL: 2-♀, 1 intermediate ♀, 1-1st (4 sl) (CMNZ)
<i>Icerya purchasi citriperda</i> Hempel 1920	<b>L:</b> ♀ (MZSP)
	<b>PL:</b> 3-♀ (1 sl incl. L), ad mat? (MZSP)
<i>Icerya purchasi crawii</i> Cockerell 1897	<b>L:</b> ♀ (USNM)
	<b>PL:</b> 9-1st (1 sl); 6-♀ (1 box dm) (USNM)
	<b>PL:</b> ♀ (sl) (BME)
	PL: 2-1st, 6 eggs (1 sl incl. PLs of <i>I. purchasi maskelli</i> ) (BMNH)
<i>Icerya purchasi maskelli</i> Cockerell 1897	<b>L:</b> ♀ (USNM)
	<b>PL:</b> 1-♀, 11-1st (2 sl incl. L); 16-♀ (1 box dm) (USNM)

	<b>PL: 1-♀, 4-1st, 10 eggs (2 sl, incl. PLs of <i>I. purchasi crawii</i>) (BMNH)</b>
<i>I. samaraia</i> (Morrison 1927)	
<i>Steatococcus samaraius</i>	<b>H: ♀ (USNM)</b> <b>P: 5-♀, 8-1st, body parts of several-♀, 1st (4 sl incl. H); ca. 12-♀ (2 boxes dm) (USNM)</b>
<i>I. schrottkyi</i> Hempel 1900	
<i>Icerya schrottkyi</i>	<b>L: ♀ (USNM)</b> PL: dm (USNM) <b>PL: 28-1st (sl), ad mat? (MZSP)</b>
<i>I. seychellarum</i> (Westwood 1855)	
<i>Dorthisia seychellarum</i>	S: ♀ lost (Unruh & Gullan, 2008: 43)
<i>Coccus sacchari</i> Guérin-Ménéville, 1867	S: ♀ lost (Ben-Dov, 2005: 219)
<i>Icerya candida</i> Cockerell, 1905	<b>L (Unruh &amp; Gullan, 2008: 43): &amp; (USNM)</b> <b>PL: 2-♀ (1 sl incl. L) (USNM)</b> PL: uncleaned 2 <sup>nd</sup> , body parts of several 1st (1 sl) (BME)
<i>Icerya okadae</i> Kuwana 1907	S: ♀ (ITLJ)
<i>Icerya seychellarum cristata</i> Newstead 1908a	<b>S: 1-♀ (dm) (ZMB)</b>
<i>I. sumatrana</i> Rao 1951b	
<i>Icerya sumatrana</i>	<b>H: ♀ (USNM)</b> <b>P: 8-♀, 2-3rd, 72-1st (13 sl incl. H) (USNM)</b> <b>P: 2-♀, 1-1st (1 sl) (BME)</b>
<i>I. travancorensis</i> Rao 1951b	
<i>Icerya travancorensis</i>	H: ♀ (INPC) P: ♀ (sl); ♀ (dm) (INPC) <b>P: 1-♀, dozens-1st (8 sl) (USNM)</b>
<i>I. zimmermanni</i> Green 1932	
<i>Icerya zimmermanni</i>	S: ♀ (sl); dm (BMNH)
<i>incertae sedis</i>	
<i>Coccus hirticornis</i> Boyer de Fonscolombe 1834	
<i>Coccus hirticornis</i>	H (by monotypy): ♂ lost (Ben-Dov, 2005: 182)
<i>I. chilensis</i> Hempel 1920	
<i>Icerya chilensis</i>	S: ♀ ♀, 3rd (MZSP)
<i>I. insulans</i> Hempel 1932	
<i>Icerya insulans</i>	S: 2-2nd (1 sl), several immatures (dm) (MZSP)
<i>I. paulista</i> Hempel 1920	
<i>Icerya paulista</i>	S: ♀ (MZSP)

shape on the ventromedial abdomen posterior to the hind coxae. The cuticle around the pores and setae in the marsupial band becomes sclerotized with age and forms a complete circle (*Crypticerya* species), incomplete circle (*Icerya* and *Gigantococcus* species) or V-shape [*Gigantococcus theobromae* (Newstead)]. The vulvar opening and cicatrices are present in the marsupium.

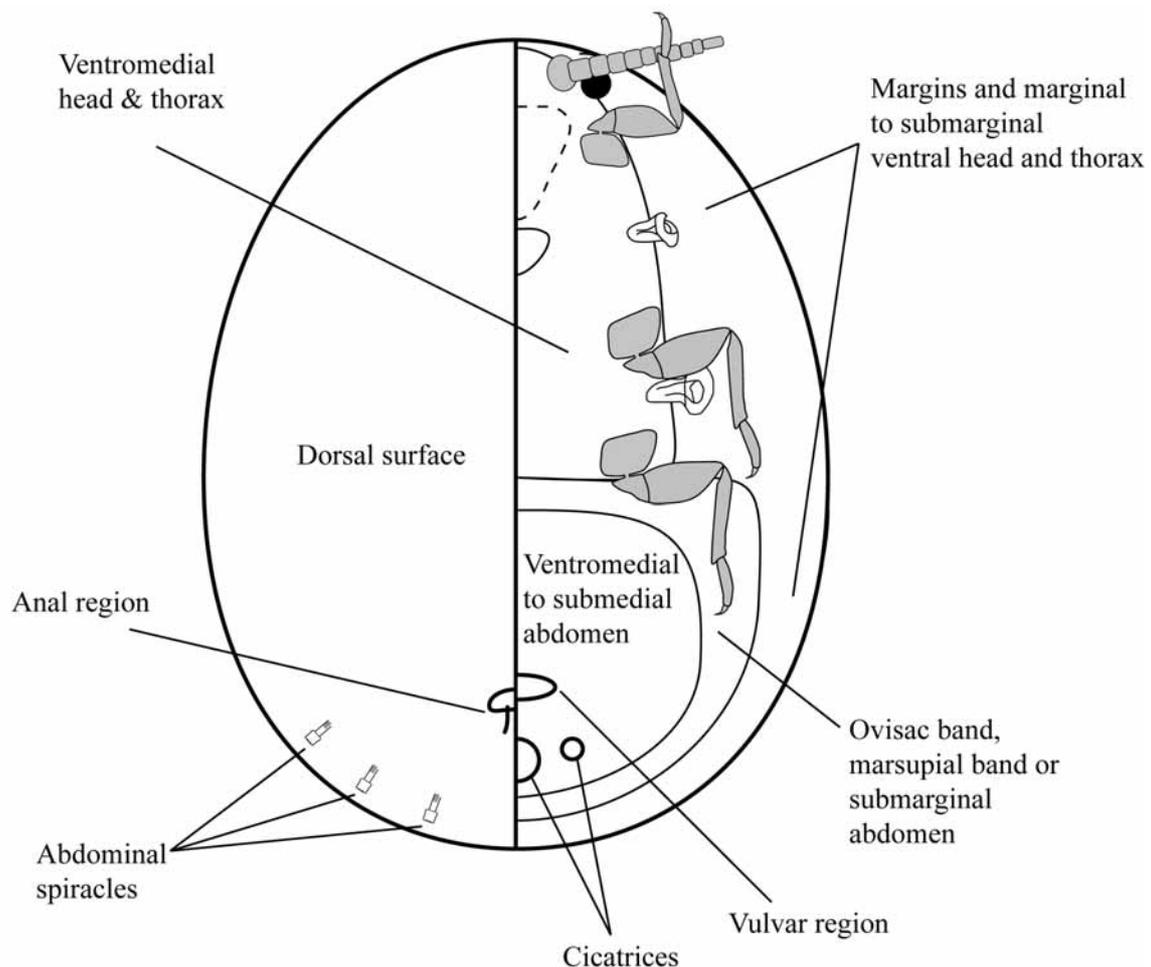
The vulvar opening is a simple opening surrounded by specialized multilocular pores and sparsely scat-

tered hair-like and flagellate setae. Cicatrices are papillose structures that form a transverse row or semicircle on the ventromedial abdomen posterior to the vulvar opening and, if numerous, extending anteriorly onto the lateral abdomen (Fig. 1). These structures vary in shape and appear round, oval, reniform or hourglass-shaped. Most iceryines have 1 or 3 cicatrices, but more cicatrices are present on Neotropical *Crypticerya* species, undescribed *Icerya* species, and *Echinicerya* has >30 cicatrices forming 1 or 2 semi-circles on the ventral abdomen. Cicatrices are present in an odd number only as there is always a single medial cicatrix posterior to the vulva.

Iceryines have a reduced number of abdominal spiracles compared to other monophlebids, which typically have seven pairs. Abdominal spiracles of iceryines are present on the posterior abdominal segments only. The number of abdominal spiracles present in the Iceryini varies from 2 to 4 pairs. Only species in the genus *Gueriniella* have four pairs of spiracles and only *Icerya* species in the informal “Pericerya” group have two pairs.

The anal tube opens at the dorsal posterior abdomen in iceryine species. The shape of the anal tube takes two forms in the tribe Iceryini. The first form, present only in *Gueriniella* species, is a very well-developed tube with a band of sclerotized polygonal pores at the inner end and two or three rows of simple multilocular pores within the tube at the opening. The second form, present in every other iceryine species, is a chitinized ring and simple tube with no pores present. The anal opening is surrounded by specialized multilocular pores and robust hair-like setae. The derm around the anal opening can become sclerotized in some species.

Tubercles are horn-like extensions of the derm found in longitudinal rows on the dorsal surface and margin of some New World species.

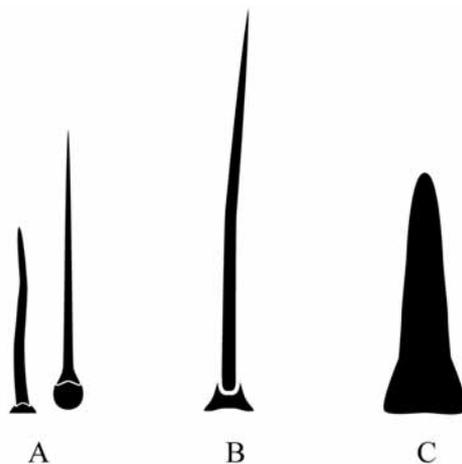


**FIGURE 1.** Diagram of a generalized iceryine showing body regions referred to in the diagnoses.

**Chaetotaxy.** Three types of setae are seen in Iceryini: hair-like, flagellate and spiniform (Fig. 2). Hair-like setae are slender with an acute apex and have a basal collar and socket, and vary greatly in length, from 35–1100  $\mu\text{m}$ . Flagellate setae are shorter, finer with an acute apex and a rounded socket with an indistinct basal collar. Spiniform setae (50–90  $\mu\text{m}$ ) are robust with a rounded apex; these setae appear to lack a basal collar, but the base is apparently fused to the seta, giving a spine-like appearance.

**Pores.** Morrison (1928: 20) offered a word of caution which we echo here: the appearance of the shape and structure of pores varies depending on the quality of the slide preparation and resolution and quality of the microscope. Drawings and descriptions of the pores represent a generalized structure based on examined material. Illustrations of pores for each species group and unplaced species are depicted in Table 2.

Four pore types present on the derm of iceryines were defined by Unruh & Gullan (2008: 13–14): simple multilocular pores, compound multilocular pores, open-centre pores, and micropores. Simple multilocular pores are found on the derm of every iceryine species and most commonly have a bilocular or trilocular centre (sometimes quadrilocular or quinquelocular) with 6–10 outer loculi. The pore centre can vary in shape (often appearing triangular, cruciform or star-shaped) and outer loculi often vary in number. In some *Icerya* species (*I. assamensis*, *I. jacobsoni*, *I. jaihind* and *I. zimmermanni*), the simple multilocular pores on the dorsum and margins appear stalked in profile, such that the pore appears to sit on a thick, rounded base with a “tongue” (that may or may not be visible) projecting out from the centre (refer to the pores of the above-mentioned species as illustrated in Table 2). Simple multilocular pores with a bilocular or trilocular (often appearing elongate) centre (these pores in *Gi. maximus* have a quadrilocular centre) and 8–16 elongate outer loculi are found in the vulvar and anal regions of every iceryine species and on the derm of certain Australasian species. These pores appear bluish when stained with acid fuchsin and the outer loculi appear half-white and half-blue. Vulvar pores typically have more outer loculi than pores surrounding the anal opening.



**FIGURE 2.** Setal types in Iceryini. A, Flagellate seta; B, Hair-like seta; C, Spiniform seta.

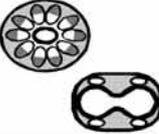
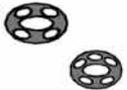
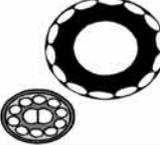
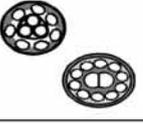
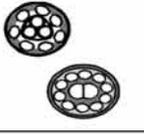
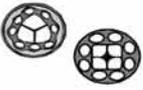
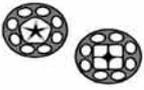
Compound multilocular pores vary greatly in structure and are typically large (10–20  $\mu\text{m}$ , usually 15–20  $\mu\text{m}$ ) with varying shapes and sizes of the pore centre and outer loculi. Open-centre pores have a large central opening with a thick rim formed by a variable number of loculi. These pores are tubular and are responsible for producing the waxy-glass filaments seen in many *Icerya* species. Micropores have a central opening, lack outer loculi and may have a thickened rim. Neither compound pores nor open-centre pores are found on first-instar nymphs of any species.

The subheadings below correspond to headings in Table 2 and refer to specific body regions as defined in Figure 1. Identification of iceryine species requires examination of pore types in each of several body regions in addition to other features, such as setae and cicatrices.

**TABLE 2.** Pore types on the derm of iceryine species (excluding *C. flocculosa*, *C. luederwaldti*, *Gi. rodriguessi*, *Gi. sulfureus*, *Gi. splendidus*, *I. mangiferae* and *I. nuda*). Pores drawn in proportion to one another.

	Dorsal surface	Margins	Marginal to submarginal ventral head and thorax	Ovisac/marsupial band or submarginal abdomen	Ventromedial head & thorax	Ventromedial to submedial abdomen
<b><i>Crypticerya littoralis</i> group</b>						
<i>C. littoralis</i> <i>C. palmeri</i>						
<i>C. genistae</i>						
<i>C. minima</i>						
<b><i>Crypticerya mexicana</i> group</b>						
<i>C. mexicana</i>						?
<i>C. tuberculata</i>						
<b><i>Crypticerya montserratensis</i> group</b>						
<i>C. brasiliensis</i> <i>C. flava</i> <i>C. montserratensis</i> <i>C. similis</i> <i>C. subandina</i> <i>C. zeteki</i>						
<b><i>Crypticerya rileyi</i> group</b>						
<i>C. colimensis</i> <i>C. rileyi</i>						
<i>C. morrilli</i> <i>C. tabernicola</i>						
<i>C. townsendi</i>						
<b><i>Crypticerya rosae</i> group</b>						
<i>C. abrahami</i> <i>C. pimentae</i> <i>C. rosae</i>						
<b><i>Echinicerya</i></b>						
<i>E. anomala</i>						
<b><i>Gigantococcus alboluteus</i> group</b>						
<i>Gi. alboluteus</i> <i>Gi. pattersoni</i> <i>Gi. schoutedeni</i>						

	Dorsal surface	Margins	Marginal to submarginal ventral head and thorax	Ovisac/marsupial band or submarginal abdomen	Ventromedial head & thorax	Ventromedial to submedial abdomen
<b><i>Gigantococcus ewarti</i> group</b>						
<i>Gi. bicolor</i> <i>Gi. cajani</i> <i>Gi. caudatus</i> <i>Gi. euphorbiae</i> <i>Gi. ewarti*</i> <i>Gi. gowdeyi</i> <i>Gi. longisetosus</i> <i>Gi. madagascariensis</i>						
<b>unplaced <i>Gigantococcus</i> species</b>						
<i>Gi. bimaculatus</i>						
<i>Gi. brachystegiae</i>						
<i>Gi. maximus</i>						
<i>Gi. nigroareolatus</i>						
<i>Gi. theobromae</i>						
<b><i>Gueriniella</i></b>						
<i>Gu. decorata</i> <i>Gu. serratulae</i>						
<b><i>Icerya aegyptiaca</i> group</b>						
<i>I. aegyptiaca</i>						
<i>I. schrottkyi</i>						
<b><i>Icerya jacobsoni</i> group</b>						
<i>I. assamensis</i>						
<i>I. jacobsoni</i> <i>I. jaihind</i>						

	Dorsal surface	Margins	Marginal to submarginal ventral head and thorax	Ovisac/marsupial band or submarginal abdomen	Ventromedial head & thorax	Ventromedial to submedial abdomen
<b><i>Icerya jacobsoni</i> group cont.</b>						
<i>I. zimmermanni</i>						
<b><i>Icerya natalensis</i> group</b>						
<i>I. clauseni</i>						
<i>I. natalensis</i>						
<i>I. travancorensis</i>						
<b><i>Icerya nudata</i> group</b>						
<i>I. nudata</i>						
<i>I. samaraia</i>						
<b><i>Icerya pilosa</i> group</b>						
<i>I. kumari</i> *						
<i>I. pilosa</i>						
<b><i>Icerya pulchra</i> group</b>						
<i>I. minor</i> <i>I. morrisoni</i> <i>I. pulchra</i>						
<b><i>Icyera seychellarum</i> group</b>						
<i>I. crocea</i>						

	Dorsal surface	Margins	Marginal to submarginal ventral head and thorax	Ovisac/marsupial band or submarginal abdomen	Ventromedial head & thorax	Ventromedial to submedial abdomen
<b><i>Icerya seychellarum</i> group cont.</b>						
<i>I. formicarum</i>						
<i>I. hanoiensis</i> *				?	?	?
<i>I. menoni</i> *						
<i>I. seychellarum</i>						
<b>"Pericerya" group</b>						
<i>I. callitri</i>						
<i>I. koebelei</i> <i>I. purchasi</i>						
<i>I. sumatrana</i>						
<b>unplaced <i>Icerya</i> species</b>						
<i>I. acaciae</i>						
<i>I. australis</i>						
<i>I. imperatae</i>						

**Dorsal surface.** The density of pores on the dorsal surface ranges from a sparse scattering to a dense covering. Typically, one or two types of simple multilocular pores are present, and in some species, open-centre pores or compound multilocular pores form transverse bands on the head and thorax. Pores are often arranged

in a medial to submedial longitudinal row on the head and thorax which also may have marginal clusters. Smaller pores are typically found on the abdomen and outside of clusters on the dorsal head and thorax.

**Margin and marginal to submarginal venter.** The region extends from the margins of both surfaces to the submarginal venter and extends to the derm at the atrial opening of the thoracic spiracles. For species that form a marsupium, this region extends to the outer lateral and posterior edge of the marsupial band. Pores in this region typically resemble pores on the dorsal surface and often form marginal clusters on each body segment. Open-centre pores are found in marginal clusters for most species that possess them and often have large bilocular pores associated with them. Some species of *Icerya* and *Gigantococcus* have specialized simple multilocular pores or compound multilocular pores that form submarginal bands around the ventral surface.

**Ventromedial head and thorax.** In most species, one or two pore types are scattered between the antennae, around the mouthparts and typically extend to the derm between the legs. In many cases, these pores resemble pores present on the ventromedial abdomen, but have a more reduced appearance, *i.e.* the outer loculi are smaller, fewer and widely spaced.

**Ovisac band/marsupial band or submarginal abdomen.** The ovisac band is often made up of two types of pores. The first type, forming the inner band, is a simple multilocular pore with bilocular, trilocular, quadrilocular or quinquelocular centre and 6–12 outer loculi. The outer ovisac band is formed by simple multilocular pores in *Crypticerya* and *Icerya* species or by compound multilocular pores in some *Gigantococcus* species. The width of the inner and outer bands varies across species. The marsupial band is formed by simple multilocular pores with a bilocular or trilocular centre and 4–8 outer loculi. Some species also have a second pore type scattered outside of the marsupial band.

**Ventral medial to submedial abdomen.** For species that form a marsupium, we consider the area within the marsupial band as the ventromedial to submedial abdomen. For species that form an ovisac, we consider the area within the ovisac band as the ventromedial to submedial abdomen. For most species, the pores present in this region resemble the vulvar pores and have a bilocular centre and 4 or 5 outer loculi (some species have a trilocular centre and 4–8 outer loculi). Pores typically begin to resemble the vulvar pores as they near the vulvar opening. A few *Gigantococcus* species have unusual pores in this region that are found on no other species.

## Taxonomy

We recognize several informal groups of species with similar pore structure and distribution and other morphological features. These groups do not reflect a classification system, have no nomenclatural validity, and should be used only to assist with identifying species.

Only abbreviated genus name synonymies are provided; for more detailed information refer to Unruh & Gullan (2008). The list of available names and authors listed below each species name includes major nomenclatural actions only (*i.e.* changes of combination, synonymy). Refer to the World Catalogue (Ben-Dov, 2005) for complete taxonomic information.

The tribes of the family Monophlebidae have undergone significant change in genus and species composition since the last revision of the group (Morrison, 1928). The relationships among genera are not well understood and no existing keys function to distinguish the existing tribes based on currently recognized genera. Below, we provide a statement of the diagnostic features of the tribe Iceryini to assist in distinguishing iceryines from other monophlebid.

## Tribe Iceryini Cockerell

### Description of adult female

*Slide-mounted specimens.*—Body oval to elliptical. Antenna 8 to 11 segmented, basal segment widest, apical segment elongate; each segment with varying number of hair-like setae. Eyes circular, at base of antennae. Labium 3 segmented with spatulate setae on apex, hair-like setae anteriorly. Legs well developed; forelegs shorter than mid- and hindlegs; each trochanter with a long distal trochanteral seta on the apical margin and 4 campaniform sensilla on each face; tibia with robust setae towards apex; tarsus curved ventrally, with an inner longitudinal band of robust setae; tarsal setae increasing in length towards apex; claw with one pair of digitules, acute and shorter than claw apex or slightly knobbed and extending beyond claw apex. Thoracic spiracles with elongate peritremes; multilocular pores absent from atrium, but sometimes clustered on derm at opening. Ovisac band either present or absent, if present formed by setae and multilocular pores arranged in a large circle on ventral abdomen, anterior edge of band posterior to hind coxae, lateral and posterior edge on submarginal abdomen. Internal marsupium either present or absent, if present, on ventral abdomen posterior to hind coxae; marsupial band of simple multilocular pores and sparse setae forming a complete or incomplete circle or V-shape, becoming sclerotized at maturity; vulvar opening and cicatrices present in marsupium. Vulvar opening on ventromedial abdomen, surrounded by setae and multilocular pores with bilocular or trilocular centre and 10–24 outer loculi; these pores stain bluish in acid fuchsin. Cicatrices each circular to elliptical, on venter only, posterior to vulvar opening and arranged in a transverse row or semicircle, but in *Echinicerya* also in 1 or 2 lateral longitudinal rows on each side of ventral abdomen. Abdominal spiracles in 2–4 pairs on abdominal segments V–VIII; multilocular pores absent from atrium but sometimes clustered on derm at each spiracular opening. Anal opening dorsal, with 2 lateral apodemes, typically surrounded by robust setae and multilocular pores similar to vulvar pores; anal ring simple, sclerotized, except for *Gueriniella* with anal tube having inner sclerotized ring of polygonal pores and external opening with 2 or 3 rings of multilocular pores. Elongate tubercles present in some *Crypticerya* spp. only, marginally on venter and on dorsum in longitudinal rows.

*Dorsum.*—Hair-like setae scattered across all body segments, typically longest marginally, sometimes in clusters around margin. Flagellate setae scant, scattered. Spiniform setae present in *Echinicerya* only, scattered on head and thorax, distributed in distinct segmental clusters on abdomen. Simple multilocular pores of varying types found across all body segments in all genera. Compound multilocular pores present in *Gigantococcus* only, arranged on all body segments. Open-centre pores present in some *Icerya* spp. only, arranged in marginal clusters and clusters and transverse rows across head and thorax.

*Venter.*—Hair-like setae scattered medially to submarginally on head and thorax, and marginally and submarginally on abdomen. Flagellate setae scattered. Spiniform setae present in *Echinicerya* only, dense marginally and submarginally, scattered on head, less dense between mid- and hindlegs. Simple multilocular pores of varying types found across all body segments in all genera. Compound multilocular pores present in *Gigantococcus* only, found across all body segments. Open-centre pores present in some *Icerya* spp. only, arranged in marginal clusters.

### Description of first-instar nymph

*Slide-mounted specimens.*—Body elliptical. Antennae 6 segmented, apical segment elongate; hair-like setae present on each segment, apical segment with long setae. Eyespots conical, near antennal bases. Sensory pores, 5–6  $\mu\text{m}$  in diameter, in cluster of 2 or 3 at each antennal base. Labium with spatulate setae at apex, hair-like setae anteriorly. Legs well developed; each trochanter with a long distal trochanteral seta on apical margin and with 2 campaniform sensilla on each face; claw with a pair of knobbed digitules extending beyond claw apex. Thoracic spiracles with elongate peritremes; pores absent from atrium, but usually with 1 or 2 pores positioned at opening. Cicatrix circular, on posteroventral abdomen. Abdominal spiracles in 2–4 pairs; pores

absent from atrium. Anal tube with inner sclerotized ring of polygonal pores and external opening with ring of 6–9 multilocular pores each with circular centre and 5 or 6 outer loculi; opening surrounded by hair-like setae. Compound multilocular pores and open-centre pores are absent from first-instar nymphs of all species.

*Dorsum*.—Each side of head, prothorax and mesothorax with: (i) scattered hair-like and flagellate setae; (ii) scattered multilocular pores, and (iii) 1 marginal pair of hair-like setae on each segment. Each side of metathorax and each abdominal segment with: (i) 1 marginal pair of hair-like setae (one long, one short); (ii) a submarginal cluster of 1–3 multilocular pores; (iii) a submarginal cluster of 1–3 setae - one hair-like seta on either side of a flagellate seta (flagellate seta always present), and with a multilocular pore on either side of cluster; (iv) a submedial row of 1–5 multilocular pores, and (v) a medial group of 1 hair-like seta and 1 or 2 multilocular pores, with each group of seta and pore(s) closely abutting that on opposite side of body. Simple multilocular pores with bilocular and/or trilocular centre and 4–6 outer loculi.

*Venter*.—Each side of head and thorax with: (i) sparsely scattered hair-like and flagellate setae; (ii) one marginal seta on each segment and (iii) sparsely scattered multilocular pores. Each side of most abdominal segments with: (i) one marginal pair of hair-like setae, with one long, one short; (ii) one marginal multilocular pore; (iii) one submarginal short hair-like seta; (iv) one submarginal or submedial multilocular pore and (v) one submedial short hair-like seta. Apex of abdomen with 2–6 pairs of long hair-like setae. Multilocular pores with bilocular centre and 2–4 outer loculi.

**Taxonomic notes.**—The adult female of species in the tribe Iceryini is defined by the following combination of features: (i) ventral cicatrices always present on abdomen only, (ii) 2–4 pairs of abdominal spiracles, and (iii) absence of spines in all life stages.

### Key to the adult females of the genera of Iceryini

- 1 Abdominal spiracles in 4 pairs ..... *Gueriniella*
- Abdominal spiracles in 2 or 3 pairs ..... 2
- 2 Derm densely covered with spiniform setae; flagellate and hair-like setae present but scattered, scant. With more than 30 ventral cicatrices forming 2 semicircles on abdomen..... *Echinicerya*
- Derm lacking spiniform setae; with only flagellate and hair-like setae present. Ventral cicatrices numbering 1–13 in a single transverse row or semicircle ..... 3
- 3 Compound multilocular pores present..... *Gigantococcus*
- Compound multilocular pores absent ..... 4
- 4 Open-centre pores present. Abdominal spiracles in 2 or 3 pairs ..... 5
- Open-centre pores absent. Abdominal spiracles in 3 pairs only..... 6
- 5 Abdominal spiracles in 3 pairs ..... *Icerya* (part)
- Abdominal spiracles in 2 pairs ..... “Pericerya” group of *Icerya*
- 6 Ovisac band, if present, with or without dense mass of setae. If lacking setae in ovisac band, head and thorax with dorsal submedial and ventral marginal clusters of small pores, each with a cruciform or star-shaped centre. Marsupial band, if present, made of pores each with a bilocular or trilocular centre, together forming a completely sclerotized circle. If ovisac or marsupium not formed, pores on dorsum each with mostly a bilocular or trilocular centre that lacks a tongue-like projection. Simple multilocular pores on dorsal surface without a very thickened outer rim. Pores with a quinquelocular centre absent. Tubercles present or absent. Cicatrices numbering 1 to 13 ..... *Crypticerya*
- Ovisac band, if present, without a dense mass of setae. Head and thorax without clusters of small pores each with a star-shaped centre. Marsupial band, if present, made of pores each with a bilocular centre only, not forming a completely sclerotized circle. If ovisac or marsupium not formed, each pore on dorsum with a bilocular or trilocular centre, or with a trilocular centre with a tongue-like projection. Simple

multilocular pores on dorsal surface with or without a very thickened outer rim. Pores with a quinquelocular centre absent or present. Tubercles absent. Cicatrices numbering 1 or 3 only..... *Icerya* (part)

### ***Crypticerya* Cockerell**

*Icerya* (*Crypticerya*) Cockerell, 1895: 15. Type species: *Icerya rosae* Riley & Howard. Elevated to genus by Cockerell (1899b: 4).

*Icerya* (*Proticerya*) Cockerell, 1895: 15. Type species: *Icerya rileyi* Cockerell. Synonymy by Unruh & Gullan (2008: 24).

*Steatococcus* Ferris, 1921: 69. Type species: *Palaeococcus morrilli* Cockerell. Synonymy by Unruh & Gullan (2008: 24).

*Crypticerya* is the second largest genus in the tribe comprising 22 species found only in the New World. The genus is defined by the absence of both open-centre and compound multilocular pores. The adult female of most species forms an ovisac, but in several species restricted to North America, the adult female forms a marsupium. The adult female of only three *Crypticerya* species clusters the eggs in an ovisac beneath the body.

#### Generic description of adult female and first-instar nymph of *Crypticerya*

In life, adult female clustering eggs beneath the body, or forming a waxy ovisac or an internal marsupium. Slide-mounted adult female oval to elliptical, 2.2–7.2 mm long, 1.2–4.6 mm wide, often broadest across abdomen. Eyes, mouthparts and legs as for tribe. Antennae 9 to 11 segmented. Setal distribution as for tribe. Simple multilocular pores with bilocular or trilocular centre and 6–12 outer loculi, scattered over entire surface. Simple multilocular pores with trilocular, quadrilocular or quinquelocular centre (appearing triangular, cruciform or star-shaped) and 6–8 outer loculi in submedial clusters on dorsal head and thorax, and marginal clusters of ventral head and thorax of some Neotropical species. Ovisac band absent, or if present, with or without dense setae. Marsupium absent, or if present, marsupial band forming a complete circle of setae and multilocular pores with bilocular or trilocular centre, derm becoming sclerotized with maturity. Vulvar opening surrounded by hair-like setae and multilocular pores with round, bilocular or trilocular centre and 12–20 outer loculi. Cicatrices each circular to elliptical, 1–11 arranged in a transverse row or semicircle. Abdominal spiracles in 3 pairs on abdominal segments VI–VIII; simple multilocular pores with bilocular or trilocular centre sometimes in a cluster on derm outside each spiracular opening. Anal opening and anal ring as for tribe. Tubercles absent, or if present, on ventral margins and on dorsum in transverse and midventral rows.

Slide-mounted first-instar nymph as for tribe except in the following features: abdominal spiracles in 3 pairs; anal tube with 6–8 pores at opening; dorsal submedial row of 1–3 multilocular pores on each side of metathorax and most abdominal segments, and long hair-like setae at abdominal apex in 2 or 3 pairs.

### ***Crypticerya* species groups**

#### ***Crypticerya montserratensis* group**

Seven species belong to this group: *C. brasiliensis*, *C. flava*, *C. montserratensis*, *C. similis*, *C. subandina*, *C. zeteki* and an undescribed species from Colombia. These seven species differ from other *Crypticerya* species by the presence of small multilocular pores with triangular, cruciform or star-shaped centre and 6–8 outer loculi on the ventral margin and mid-dorsal head and thorax.

*Crypticerya similis* and *C. zeteki* are almost identical to each other and to *C. brasiliensis*, *C. flava* and *C. montserratensis* and differ by the number of ventral cicatrices (the undescribed species has 11–13, *C. similis* has seven, *C. zeteki* has five, the remaining three species have three cicatrices). *Crypticerya brasiliensis*, *C.*

*flava* and *C. montserratensis* appear identical to one another and differ only by the size of the adult female (*C. montserratensis* and *C. flava* are smaller than *C. brasiliensis*), the length and density of the marginal long, hair-like setae (*C. brasiliensis* has fewer clusters of setae than *C. montserratensis* or *C. flava*) and the density of pores in the ovisac band (this feature might depend on the size of the adult female; *C. flava* has the least dense ovisac band). Morrison believed *C. brasiliensis* and *C. montserratensis* were probably identical (1928: 211), but we found them to be genetically distinct (Unruh & Gullan, 2008) and the two species look different in life (T. Kondo, UCD, pers. comm.).

*Crypticerya subandina* differs greatly from the other species in this group as it has very sparse hair-like setae and sparsely scattered multilocular pores across all body segments. The pore types, however, are identical.

### ***Crypticerya littoralis* group**

Four Neotropical species belong to this informal group: *C. littoralis*, *C. genistae*, *C. minima* and *C. palmeri*. All of these species form an ovisac and the ovisac band has dense flagellate setae and pores with trilocular centre and 6–8 outer loculi. *Crypticerya palmeri* is easily distinguished from the other species in this group by the presence of a single cicatrix (the other three species have three cicatrices) and *C. minima* has a single pore type (trilocular centre) in the ovisac band and all other species have two types (bilocular and trilocular centre). *Crypticerya littoralis* and *C. genistae* look very similar and differ by the shape of the pores in the outer ovisac band and by the shape of the bases of the setae found in the ovisac band. *Crypticerya littoralis* and *C. palmeri* are found in Mexico, and *C. genistae* and *C. minima* probably are native to South America. *Crypticerya genistae* has been discovered recently as a pest in Florida (Hodges, 2006).

### ***Crypticerya mexicana* group**

Two described species, *C. tuberculata* and *C. mexicana*, and an undescribed Mexican species belong to this group. All species form an internal marsupium and the marsupial band of these species differ from other marsupium-forming *Crypticerya* species by the presence of dense hair-like setae and bilocular pores only (other species have pores with bilocular and trilocular centres). A distinctive feature of *C. tuberculata* is the presence of very elongate tubercles in dorsal longitudinal rows and around the margin. The undescribed Mexican species also has elongate tubercles, but differs from *C. tuberculata* and *C. mexicana* in other ways that will not be discussed here. Unfortunately, *C. mexicana* is very rare and we have only been able to examine a limited number of specimens, but the dorsal surface of *C. mexicana* is covered with very dense, short, robust setae, which is unlike any other *Crypticerya* species.

### ***Crypticerya rileyi* group**

This group includes five Nearctic species: *C. colimensis*, *C. morrilli*, *C. rileyi*, *C. tabernicola* and *C. townsendi*. The adult females of *C. rileyi* and *C. colimensis* form long ovisacs and the adult female of each of the remaining three species forms a marsupium. *Crypticerya colimensis* and *C. rileyi* have identical pores and setae that form the ovisac band, but differ by the number of cicatrices (*C. colimensis* has a single cicatrix, *C. rileyi* has three cicatrices). *Crypticerya morrilli* and *C. tabernicola* have similar derm pores, mostly with a bilocular centre, whereas *C. townsendi* has more pores with trilocular centres. These three species also differ by the shape of the marsupial band. Although the marsupial band of all three species forms a completely sele-

rotized circle as the adult female matures, the anterior edge of the marsupial band of *C. tabernicola* is formed by a very sparse row of multilocular pores, whereas the anterior edge of the band in *C. townsendi* is formed by 3 or 4 dense rows of pores and the anterior edge of the band in *C. morrilli* is formed by 3 or 4 dense rows with 2 submedial patches bare of pores and setae. These species are scattered in the deserts of the southwestern United States and northern Mexico.

### ***Crypticerya rosae* group**

Three species of *Crypticerya*, *C. abrahami*, *C. pimentae* and *C. rosae*, differ from all other species because the adult females form neither an ovisac nor a marsupium. Adult females typically do not have elaborate waxy secretion on the dorsal surface and the derm is often very dark in colour and becomes very convex and sclerotized with age. These species are morphologically identical, but have a wide geographic range and are not genetically identical (Unruh & Gullan, 2008).

### **Key to the adult females of *Crypticerya* (not including *C. flocculosa* or *C. luederwaldti*)**

- 1 Clusters of simple multilocular pores with a quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 4–8 outer loculi absent submarginally and marginally on head and thorax. Ovisac band present, lacking a dense mass of flagellate setae. Marsupium absent ..... 13
- Clusters of simple multilocular pores with a quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 4–8 outer loculi present marginally and submarginally on head and thorax. Ovisac band absent or, if present, with a dense mass of flagellate setae. Marsupium present or absent ..... 2
- 2 Clusters of setae and pores absent around margin. Neither ovisac nor marsupium present .....  
..... *C. abrahami*, *C. pimentae* and *C. rosae*  
(these three species are apparently morphologically identical in the adult stage, but differ genetically and are found in different geographic regions)
- Clusters of setae and pores present or absent around margin. Either ovisac or marsupium present ..... 3
- 3 Tubercles on derm very long, covered with robust setae. Ovisac band absent. Marsupium present .....  
..... *C. tuberculata*
- Tubercles on derm very reduced or absent. Either an ovisac band or a marsupium present ..... 4
- 4 Marsupium present; ovisac band absent ..... 5
- Ovisac band present; marsupium absent ..... 8
- 5 Dorsal surface covered with a dense covering of robust hair-like setae ..... *C. mexicana*
- Dorsal surface with scattered slender hair-like setae ..... 6
- 6 Anterior edge of marsupial band formed by a single sparse row of simple multilocular pores, without submedial bare patches ..... *C. tabernicola*
- Anterior edge of marsupial band composed of 3 or 4 contiguous rows of multilocular pores, with or without submedial bare patches ..... 7
- 7 Anterior edge of marsupial band without submedial bare patches. Simple multilocular pores with a bilocular or trilocular centre equally frequent on dorsal surfaces and in marginal clusters ..... *C. townsendi*
- Anterior edge of marsupial band with submedial bare patches. Almost all simple multilocular pores on dorsal surfaces and in marginal clusters with a bilocular centre, rarely with a trilocular centre.. *C. morrilli*
- 8 With 1 cicatrix present ..... 9

- With 3 cicatrices present ..... 10
- 9 Derm with clusters of hair-like setae on medial to submedial areas of head and thorax..... *C. colimensis*
- Derm lacking clusters of hair-like setae on head and thorax ..... *C. palmeri*
- 10 Body very small (length <2.5 mm). Setae and pores on dorsal surface very sparse, not forming a dorsal medial longitudinal row ..... *C. minima*
- Body not especially small (>2.5 mm). Setae and pores on derm not sparse, with those medially forming a dorsal longitudinal row ..... 11
- 11 Each simple multilocular pore forming outer ovisac band with a bilocular (rarely trilocular) centre. Setae in ovisac band very fine, with slightly flattened bases ..... *C. littoralis*
- Each simple multilocular pore forming outer ovisac band with a bilocular or trilocular centre. Setae in ovisac band robust, with very rounded, elongate bases ..... 12
- 12 Hair-like setae and simple multilocular pores sparsely scattered on dorsal surface of head and thorax, forming a medial longitudinal row. Hair-like setae short (25–85 µm long) and scattered throughout, longest (up to 250 µm long) in marginal clusters. Setae in ovisac band with visible collars ..... *C. rileyi*
- Hair-like setae and simple multilocular pores densely covering dorsal surface, but densest in both medial and submarginal longitudinal rows. Hair-like setae very long (up to 450 µm long) around margin and on dorsal surface, not as long elsewhere. Setae in ovisac band with very rounded bases, collars not visible ...  
..... *C. genistae*
- 13 With 3 cicatrices present ..... 14
- With 5 or more cicatrices present ..... 17
- 14 Long hair-like setae sparsely scattered on posterior abdomen, not forming marginal clusters. Simple multilocular pores sparsely scattered on all surfaces ..... *C. subandina*
- Long hair-like setae forming marginal clusters and scattered across derm. Simple multilocular pores densely covering all surfaces ..... 15
- 15 Simple multilocular pores forming inner ovisac band 6–8 pores wide ..... *C. flava*
- Simple multilocular pores forming inner ovisac band >8 pores wide ..... 16
- 16 Long hair-like setae in clusters of 3–5 around entire margin ..... *C. brasiliensis*
- Long hair-like setae in clusters of 1–3 around entire margin ..... *C. montserratensis*
- 17 With 5 cicatrices present ..... *C. similis*
- With 7 or more cicatrices present ..... *C. zeteki*

### ***Crypticerya abrahami* (Newstead)**

*Llaveia abrahami* Newstead, 1917: 1.

*Crypticerya abrahami* (Newstead); Vayssière (1926: 313).

**Unmounted material.** In alcohol, adult female buff-yellow, humped dorsally, flattened ventrally with distinct segmentation on both surfaces and mealy wax deposited in hollows between the segments (adapted from Newstead, 1917).

**Slide-mounted material.** Adult female elongate to oval (lectotype 6.3 mm long, 5.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 8–10 simple multilocular pores with bilocular centre and 4–8 outer loculi. Short hair-like setae evenly scattered across all body segments; long setae with large sockets longitudinal band around ventral margin. Flagellate setae as for genus. Simple multilocular pores, 9–10 µm in diameter, with bilocular or trilocular centre scattered across all body segments on dorsal surface and associated with long setae on ventral margin. Ovisac absent. Marsupium absent. Simple multilocular pores with bilocular or trilocular centre and 4–8 outer loculi, scattered on ventromedial surface, similar to vulvar pores, appearing slightly bluish when stained. Vul-

var opening as for genus, surrounded by typical multilocular pores each 11–13 µm in diameter with trilocular centre (appearing elongate) and 10–14 elongate outer loculi. Cicatrices oval to round, numbering three, central cicatrix slightly larger than lateral cicatrices. Abdominal spiracles as for genus. Anal tube as for genus; anal opening surrounded by hair-like setae and typical multilocular pores each 8–10 µm in diameter with very round centre and 8–12 outer loculi.

First-instar nymph 0.9–1.0 mm long. Antennae 6 segmented, terminal segment with longest (500 µm) setae. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Marginal setae long, 0.7–0.8 mm long. Setae at abdominal apex in 4 pairs, the median setae longest, 1.1–1.2 mm. Dorsal surface covered in long fine setae and numerous pores. (Diagnosis of first-instar nymph adapted from original description.)

**Type data.** GUYANA [=BRITISH GUIANA]: North West District, Issororo, ex bark of *Sapium jenmani*, 3.vi.1915 (A.A. Abraham).

**Type material.** **Lectotype** here designated: ad ♀, “I.B.E. Coe 49/~~Issororo~~ Issororo, N.W. District/Brit Guiana A.A./Abraham, 3.vi.15/Per G. E. Bodkin No 42.”/“BM 1945, 121/Llaveia/abrahamii/Nest./Cotype ♀♀/ (Type ♀)/R.N.” (BMNH). **Paralectotypes:** 1 ad ♀ (same slide as lectotype); 2 ad ♀ (one slide), “I.B.E. Coc. 49./Issororo, N.W./Dist. British Guiana/3.vi.15 A.A. Abraham [another word crossed out]/per. G.E. Bodkin. 42)/B.M.N.H. 1916 –158.”/“Llaveia/abrahamii, Newst/Cotype ♀♀/Co-type [round sticker]/R.N./B.M.N.H. 1916-158.” (BMNH); 4 ad ♀♀ (one slide), “I.B.E. Coc. 49./Issororo, N.W./Dist. Brit. Guiana/3.vi.15. (A.A. Abraham/per G.E. Bodkin 42)/B.M. 1945, 121”/“Llaveia/abrahamii/Newst/Cotype ♀♀/R.N.” (BMNH); 11 embryos (one slide), “I.B.E. Coc 49/Issororo, N.W. Dist./British Guiana./3.vi.15 (A.A. Abraham/per. G.E. Bodkin No 42./B.M.N.H. 1916 -158”/“Co-type [round sticker]”/“Llaveia/abrahamii, Newst/Co-type larvae - /from body of parent./B.M.N.H. 1916 - 158” (BMNH); 5 embryos (one slide), “I.B.E. Coc. 49./Issororo, N.W./Dist. Brit. Guiana./3.vi.15 (A.A. Abraham/per G.E. Bodkin. 42)”/“Llaveia/abrahamii/Newst/Cotype larvae/BM/R.N. 1945, 121” (BMNH).

**Taxonomic notes.** Refer to the *C. rosae* group for discussion of similar species.

The lectotype is on the right side of the slide when the slide is held to read the label on the left. Type material is not labelled with a host plant, but Newstead’s original description (1917) states, “inhabiting indentations in the bark of a rubber-producing tree (*Sapium jenmani*); attended by ants which construct coverings over the Coccids, (A. A. Abraham, per G.E. Bodkin).” The original description described 4 pairs of setae at the abdominal apex of the first-instar nymph. We were unable to examine first-instar nymphs of this species, so we cannot corroborate this claim.

### ***Crypticerya brasiliensis* (Hempel)**

*Icerya brasiliensis* Hempel, 1900: 370.

*Crypticerya brasiliensis* (Hempel); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female pink, entirely covered in white secretion; one elongate waxy tuft present on end of body, these tufts often striated, each tuft flanked by two slightly smaller tufts; shorter rounded tufts present in submarginal row and medial longitudinal row; ovisac creamy white, fluted, distal end curved upward, with one or two longitudinal slits on middorsal surface through which first-instar nymphs escape (adapted from Hempel, 1900).

**Slide-mounted material.** Adult female oval (lectotype 5.4 mm long, 4.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered across all segments, longest marginally, between antennae and at abdominal apex. Flagellate setae as for genus. Simple multilocular pores, each 10–12 µm in diameter with trilocular (rarely quadrilocular) centre and 6–8 outer loculi covering dorsal surface, densest around submargin and forming a medial longitudinal row on

head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi present in segmental clusters of 6–14 on submedial dorsal head and thorax and submarginal ventral head and thorax. Simple multilocular pores, each 8–9 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 3–5 outer loculi, scattered on ventromedial head and thorax. Ovisac band made of two types of simple multilocular pores present on dorsal surface: (i) slightly larger pores forming inner band 6–8 pores wide, each pore 10–12 µm in diameter with trilocular to quadrilocular centre and 6–8 outer loculi, and (ii) smaller pores (appearing bluish when stained) forming outer ovisac band 3 or 4 pores wide, each pore 9–10 µm in diameter, with triangular, cruciform or star-shaped centre and 10–12 outer loculi. Simple multilocular pores each 8–9 µm in diameter, with bilocular centre and 4–6 outer loculi scattered in transverse rows on ventromedial abdomen. Vulvar opening as for genus. Cicatrices circular to oval, numbering 3. Abdominal spiracles as for genus. Anal ring and anal opening as for genus, surrounded by long hair-like setae.

**Type data.** BRAZIL: São Paulo State, Mandado do Iguape, ex *Codiaeum* sp.; Ypiranga, ex *Ficus*, Rosa and other plants.

**Type material.** **Lectotype** here designated: ad ♀, “*Icerya/brasiliensis* Hemp./Co-type/Sao Paulo, Brazil./Hempel, Coll.” (USNM). **Paralectotypes:** ad ♀ (same data as lectotype) (USNM); ad ♀, “*Icerya brasiliensis*/Hempel/São Paulo, Brazil./A. Hempel, Coll./Jan. 26m 1899/#8477” (USNM); 2 3<sup>rd</sup>-instar nymphs, 1 2<sup>nd</sup>-instar nymph (one slide), “8577/*Icerya/brasiliensis* [sic]/Hempel/A. Hempel (316)/São Paulo, Brazil /Jan. 26. 99” (USNM); 4 3<sup>rd</sup>-instar nymphs (one slide), “8477./*Icerya/brasiliensis*/Hempel/A. Hempel (316)/São Paulo, Brazil /Jan. 26. 99” (USNM); 8 1<sup>st</sup>-instar nymphs (one slide), “*Icerya/brasiliensis*/Hemp./larvae/São Paulo, Brazil./A. Hempel, Coll./Jan. 26, 1899/#8477” (USNM); dry material (USNM); additional material at MZSP (Ben-Dov, 2005: 193) (not examined).

**Taxonomic notes.** Refer to *C. montserratensis* group for a discussion of similar species.

We were able to borrow some of Hempel's iceryine specimens from MZSP but there were no specimens of *I. brasiliensis* among them.

### ***Crypticerya colimensis* (Cockerell)**

*Icerya colimensis* Cockerell, 1902b: 81.

*Crypticerya colimensis* (Cockerell); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female plus ovisac about 10 mm long, ovisac 6 mm long, slightly striated, wax of inner ovisac light yellow; dorsal surface covered with wax secretion; margin with white short wax tassels (adapted from Cockerell, 1902b).

**Slide-mounted material.** Adult female elongate to oval (lectotype 5.2 mm long, 3.8 mm wide). Apex of head, including antennae and eyes, missing from lectotype. Mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 6–8 simple multilocular pores each 9–10 µm in diameter with bilocular centre and 6–8 outer loculi. Hair-like setae distributed as for genus; longest setae found around margin; robust hair-like setae, similar to setae in ovisac band, in segmental clusters on dorsal head and thorax and marginal thorax and abdomen. Flagellate setae distributed as for genus. Simple multilocular pores, each 10–12 µm in diameter, with bilocular or trilocular (sometimes quadrilocular) centre, scattered across dorsal surface and marginal to submarginal venter. Ovisac band present, formed by robust, slender hair-like setae, 75–100 µm long with visible sockets and flattened bases, and multilocular pores of two types: (i) larger pores forming inner ovisac band 5–7 pores wide, each pore 10–11 µm in diameter, with trilocular (sometimes bilocular) centre and 6–8 outer loculi, and (ii) smaller pores, forming outer ovisac band 2–5 pores wide, each pore

8–10 µm in diameter, with bilocular or trilocular centre and 4–8 outer loculi, appearing slightly bluish when stained. Simple multilocular pores, each 9–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial to submedial thorax; similar pores each 8–9 µm in diameter with bilocular centre and 4 or 5 outer loculi, scattered on ventromedial to submedial abdomen. Vulvar opening as for genus, surrounded by typical multilocular pores 10–12 µm in diameter. Cicatrix round, 290 µm wide. Abdominal spiracles with atrium 30–33 µm wide. Anal ring and anal opening missing from lectotype.

**Type data.** MEXICO: Colima, Manzanillo, ex undetermined shrub, 18.vii.1902 (*C.H.T. Townsend*).

**Type material. Lectotype** here designated: ad ♀, “*Icerya/colimensis/Ckll. TYPE/Manzanillo,/Colima Mex/July 18, 1902/(Town.)*” (USNM). **Paralectotypes:** 2 1<sup>st</sup>-instar nymphs (one slide), 1 embryo “*Type/Icerya/colimensis Ckll./Manazillo,/Colima, Mex./C.H.T. Townsend, Coll./July 18, 1902*” (USNM); ca. 28 embryos and eggs (one slide) “8706 [encircled]/*Icerya colimensis/Ckll TYPE/Manzanillo/in Colima/July 18./ (Town.)/870.6 [encircled]*” (BME); dry material (USNM).

**Taxonomic notes.** *Crypticerya colimensis* and *C. palmeri* are the only described *Crypticerya* species that possess a single cicatrix. These two species differ by the presence of clusters of robust hair-like setae on the dorsal surface of the adult female of *C. colimensis* that are absent from the derm of *C. palmeri*. These two species also differ by the shape of the base of the setae in the ovisac band: the setae of *C. palmeri* have slightly more rounded bases than the flattened setal bases of *C. colimensis*. Refer to the *C. rileyi* group for further discussion of similar species.

Cockerell (1902b) distinguished this species from *C. palmeri* by the shape of the antennae of the first-instar nymph, but only a single embryo of *C. colimensis* was available for examination. Based on his original description, it appears that Cockerell did not examine slide-mounted material.

### *Crypticerya flava* (Hempel)

*Icerya flava* Hempel, 1920: 334.

*Crypticerya flava* (Hempel); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female red, covered in yellow wax forming medial row with one large tuft and two smaller tufts, submarginal rows of smaller tufts and marginal row of thick tufts; one large tuft at each end of body; ovisac yellow and striated, inner ovisac smooth and white (adapted from Hempel, 1920).

**Slide-mounted material.** Adult female elongate to oval, 5.6 mm long, 4.0 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 4–9 simple multilocular pores with bilocular or trilocular centre and 6–10 outer loculi. Hair-like setae distributed as for genus; dense on ventral head and thorax and longest around margin and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 12–13 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, scattered on dorsal surface and marginal to submarginal venter. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi, present in segmental clusters of 6–14 on submarginal ventral head and thorax. Ovisac band made of simple multilocular pores of two types: (i) pores forming inner ovisac band 7 or 8 pores wide, each pore 12–13 µm in diameter, with trilocular centre and 6–9 outer loculi, and (ii) smaller pores (appearing bluish when stained) forming outer band 1 or 2 pores wide, each pore 9–10 µm in diameter, with triangular, cruciform or star-shaped centre and 10–12 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with quinquelocular (sometimes trilocular or quadrilocular) centre and 4–6 outer loculi, scattered on ventromedial to submedial head and thorax. Simple multilocular pores, similar to vulvar pores, each 11–12 µm in diameter, with bilocular centre and 6–10 outer loculi, scattered across ventromedial to submedial abdomen. Vulvar opening

as for genus; surrounded by typical multilocular pores, each 10–12 µm in diameter, with bilocular or trilocular centre and 8–10 outer loculi. Cicatrices oval to pyriform, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal ring as for genus; anal opening as for genus, surrounded by typical multilocular pores, each 10–11 µm in diameter, with bilocular centre and 8–10 outer loculi.

**Type data.** BRAZIL: São Paulo, Cantareira near São Paulo, ex bark of indigenous trees 'cambara preta' [=black *Gochnatia*] and 'sucara'.

**Type material. Syntypes:** ad ♀♀, 1<sup>st</sup>-instar nymphs, eggs (MZSP) (not examined).

**Material examined.** ad ♀, "Icerya/flava/Hempel" (MZSP).

**Taxonomic notes.** Refer to the *C. montserratensis* group for a discussion of similar species.

Hempel described first-instar nymphs and eggs of this species, but we were unable to examine this material, which presumably is located at MZSP. We do not consider the material we examined from MZSP to be type material because there is not enough information provided on the slide label to relate it to the type series.

### *Crypticerya flocculosa* (Hempel)

*Icerya flocculosa* Hempel, 1932: 312.

*Crypticerya flocculosa* (Hempel); Unruh & Gullan (2008: 26).

**Diagnosis (adapted from Hempel, 1932).** Adult female yellow, body almost entirely hidden by thick layer of white wax arranged in tufts or thick, twisted ribbons; margin with 18–20 thick tufts, longest at anterior and posterior ends, these tufts also fluted and can be very long; thick tufts present on middorsum. Ovisac striated and truncated, turned upwards at end. Adult female oval, 4 mm long, 3.5 mm wide. Antennae 11 segmented. Legs as for tribe. Thoracic spiracles as for genus. Derm covered in setae, longest (0.5 mm) arranged around margin. Multilocular pores of two types present on the derm: (i) each 6 µm in diameter with triangular or square centre and 8 or 9 outer loculi, densest around margin and head, and (ii) each 10 µm in diameter, with triangular, square or pentagonal centre and large number of outer loculi, arranged in transverse rows on dorsal abdomen. Ventral cicatrices oval to round, numbering 3, central cicatrix largest. Abdominal spiracles as for genus.

**Type data.** BRAZIL: São Paulo, Cotia, ex *Citrus* and cultivated chestnut, v.1931 (*Z. Vaz*).

**Type material. Syntypes:** ad ♀♀, 1<sup>st</sup>-instar nymphs (SAPO).

**Taxonomic notes.** We were unable to examine material of this species. Hempel believed this species could be distinguished from other iceryines by the abundance of white secretion and its arrangement in tufts and ribbons. Hempel's descriptions of pore types are unlike any other *Crypticerya* species examined. The description of pores sounds similar to the pores of species in the *Icerya pulchra* group.

### *Crypticerya genistae* (Hempel)

*Icerya genistae* Hempel, 1912: 55.

*Crypticerya genistae* (Hempel); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female light brown, yellowish at anterior margin; antennae, legs and eyes dark brown, nearly black. Waxy secretion covering dorsal surface; wax tufts forming medial, submarginal and marginal longitudinal rows; tufts longest in middle and ends of each row; ovisac slightly striated and tapers towards posterior end (adapted from Hempel, 1912).

**Slide-mounted material.** Adult female elliptical, 3.0–3.7 mm long, 2.3–2.6 mm wide (lectotype of 3.5 mm long, 2.4 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as

for genus; derm at atrial opening with 3–6 simple multilocular pores, each 10–11 µm in diameter, with bilocular centre and 8–10 outer loculi. Hair-like setae sparsely scattered on dorsal surface; longest setae forming submedial longitudinal row on dorsal surface, marginal clusters on each segment and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre, forming dorsal medial longitudinal row on head and thorax; similar pores, each 10–11 µm in diameter, with bilocular centre (less often trilocular) and 6–9 outer loculi, scattered on rest of dorsal surface and marginal to submarginal venter. Ovisac band present, formed by flagellate setae, each 90–120 µm long, with very round bases and by multilocular pores of two types: (i) pores forming inner ovisac band 7–9 pores wide, each pore 10–11 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi, and (ii) pores forming outer band 3 or 4 pores wide, each pore 9–10 µm in diameter, with bilocular or trilocular centre and 3–8 outer loculi and appearing slightly bluish when stained. Multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre and 4 or 5 outer loculi, scattered on ventromedial to submedial head and thorax. Simple multilocular pores, similar to vulvar pores and appearing slightly bluish when stained, each 12–13 µm in diameter, with bilocular centre and 4–8 outer loculi, scattered across medial to submedial abdomen. Vulvar opening as for genus, surrounded by typical multilocular pores each 12–13 µm in diameter. Cicatrices oval to round, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal ring as for genus; anal opening as for genus, surrounded by hair-like setae and typical multilocular pores each 11–12 µm in diameter.

**Type data.** BRAZIL: São Paulo State, Campinas, in garden of Instituto Agronomico, ex *Genista scoparia*, *Lespedeza striata* and *Fragaria* sp.

**Type material. Lectotype** here designated: ad ♀, “*Icerya/genistae*/no. 88 n.sp./Campinas,/Brasil./Feb. 26, 1903./Type. Hempel.” (MZSP). **Paralectotypes:** 3 ad ♀♀ (same slide as lectotype); additional material (MZSP).

**Taxonomic notes.** Three species (*C. genistae*, *C. palmeri* and *C. rileyi*) look very similar to one another, both macro- and microscopically, but they differ in two ways. First, they differ from one another by the shape of the pores forming the outer edge of the ovisac band. Specifically, those pores in *C. littoralis* generally have a bilocular centre and 4–6 outer loculi. In contrast, the pores of *C. rileyi* and *C. genistae* generally have a trilocular centre, but differ by the number of outer loculi: *C. rileyi* has 6–10 and *C. genistae* has 8–12. Second, they differ by the shape of the flagellate setae present in the ovisac band. The setae of *C. genistae* are dense, robust and have very rounded bases. In contrast, the setae of *C. rileyi* are shorter and stouter with slightly flattened bases and those of *C. littoralis* are very fine with completely flattened bases. Refer to *C. littoralis* group for further discussion of similar species.

The lectotype is the adult female on the upper left part of the slide when it is held to read the original label on the right side. The lectotype has a single hindleg and complete antennae. Hempel also described first-instar nymphs and eggs of this species, but we were unable to examine this material, which presumably is located at MZSP.

### ***Crypticerya littoralis* (Cockerell)**

*Icerya (Proticerya) littoralis* Cockerell, 1898a: 429.

*Icerya (Proticerya) littoralis mimosae* Cockerell, 1898a: 430.

*Icerya littoralis tonilensis* Cockerell, 1902b: 81.

*Icerya littoralis* Cockerell; Morrison (1928: 208).

*Icerya littoralis littoralis* Cockerell; Ben-Dov (2005: 198).

*Crypticerya littoralis* (Cockerell); Unruh & Gullan (2008: 26).

**Unmounted material.** Mature adult female dark purple, dorsal surface almost denuded of wax, some waxy tassels projecting from anterior and posterior apices. Ovisac smooth, very long, about 2 or 3 times as long as

the body of the female (adapted from Cockerell, 1898a).

**Slide-mounted material.** Adult female elliptical, 3.9–5.4 mm long, 2.3–3.8 mm wide (lectotype of *I. (Proticerya) littoralis* 5.4 mm long, 3.8 mm wide; lectotype of *I. littoralis mimosae* 5.1 mm long, 3.3 mm wide; lectotype of *I. littoralis tonilensis* 3.9 mm long, 2.3 mm wide). Antennae 9 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 3–6 simple multilocular pores, each 10–11 µm in diameter, with bilocular centre and 9–12 outer loculi. Hair-like setae distributed as for genus; longest setae forming marginal clusters on each segment and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 12–13 µm in diameter, with bilocular or trilocular centre, forming dorsal medial longitudinal row on head and thorax and marginal clusters on venter; similar pores, each 10–12 µm in diameter, with bilocular centre (less often trilocular) and 6–9 outer loculi, scattered on rest of dorsal surface and marginal to submarginal venter. Ovisac band present, formed by dense setae, each 75–100 µm long, with round to flattened bases and by multilocular pores of two types: (i) larger pores forming inner band 7–9 pores wide, each pore 11–13 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi, and (ii) smaller pores forming outer band 3–5 pores wide, each pore 9–10 µm in diameter, with bilocular centre and 3–8 outer loculi, appearing slightly bluish when stained. Multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre and 2–5 outer loculi, scattered on ventromedial to submedial head and thorax; similar pores, each 12–13 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered across medial to submedial abdomen. Vulvar opening as for genus, surrounded by typical multilocular pores, each 12–13 µm in diameter. Cicatrices oval to round, numbering 3, centre cicatrix larger than lateral cicatrices. Abdominal spiracles as for genus. Anal ring as for genus; anal opening as for genus, surrounded by hair-like setae and typical multilocular pores each 11–12 µm in diameter.

First-instar nymph as for genus, except each dorsal abdominal segment with one submarginal pore, two submedial pores and one medial pore; dorsal head and thorax with dense multilocular pores; long hair-like setae at abdominal apex in three pairs.

**Type data.** *Icerya (Proticerya) littoralis*: MEXICO: El Faro, near Frontera, “on the sea-beach, on the sandy ridges just beyond the reach of ordinary surf”, ex Croton [= *Codiaeum* sp.], 16.v.1897 (Townsend). *Icerya littoralis mimosae*: MEXICO: Las Minas, near Frontera, ex “Sarsa” [= *Mimosa* sp.], 4.vi.1897 (Townsend). *Icerya littoralis tonilensis*: MEXICO: Jalisco, Tonila, “on cultivated tree”, 2.viii.1902 (Townsend).

**Type material.** Lectotype of *Icerya (Proticerya) littoralis* here designated: ad ♀, “*Icerya littoralis*/Ckll./On Croton/Frontera, Mex./C.H.T. Townsend, Coll./May 16, 1897” (USNM). **Paralectotypes** of *Icerya (Proticerya) littoralis*: 7 1<sup>st</sup>-instar nymphs (one slide), 7 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype) (USNM); 2 ad ♀♀ (one slide), 1 2<sup>nd</sup>-instar nymph, “*Icerya/littoralis*/Ckll/Type/On Croton/Frontera, Mex./C.H.T. Townsend, Coll./May 16, 1897” (USNM); 4 ad ♀♀ (one slide), 13 2<sup>nd</sup>-instar nymphs, 32 1<sup>st</sup>-instar nymphs (nymphs on one slide), “*I. littoralis*/Croton./Frontera, Mex./May 16, ‘97/(Townsend)”/“7636”/“162/1” (USNM); 6 1<sup>st</sup>-instar nymphs (one slide), 9 1<sup>st</sup>-instar nymphs, 2 embryos (nymphs and embryos on one slide), “*Icerya/littoralis*/Ckll./Type/larvae/On Croton/Frontera, Mex./C.H.T. Townsend, Coll./Ckll. Coll.” (USNM); 2 ad ♀♀ (one slide) “*Icerya/littoralis*, Ckll./TYPE” (BME); dry material (USNM).

**Lectotype** of *Icerya (Proticerya) littoralis mimosae* here designated: ad ♀, “*Icerya littoralis/mimosae*/On Sarsa/Mexico/C.H.T. Townsend, Coll./June 4, 1897” (USNM). **Paralectotypes** of *Icerya littoralis mimosae*: 9 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype) (USNM); ad ♀, 9 1<sup>st</sup>-instar nymphs (nymphs on one slide), “*Icerya littoralis/var. mimosae* Ckll./Co-Type/On “Sarsa”/Mexico/C.H.T. Townsend, Coll./June 4, 1897” (USNM); ad ♀, 12 1<sup>st</sup>-instar nymphs (nymphs on one slide), “*Icerya/littoralis/var mimosae* Ckll./cotype larvae/on “Sarsia” [sic]/?/C.H.T. Townsend, Coll.” (USNM); ad ♀, 9 1<sup>st</sup>-instar nymphs (USNM); dry material (USNM).

**Lectotype** of *Icerya littoralis tonilensis* here designated: ad ♀, “*Icerya littoralis/var. tonilensis* Ckll./

CoType/on cultivated tree/Tonila, Jalisco, Mex/T.+B. Cy/Rec'd July 1903/Cut #10539 #78" (USNM). **Paralectotypes** of *Icerya littoralis tonilensis*: dry material (USNM).

**Taxonomic notes.** Refer to the taxonomic notes of *C. genistae* and the *C. littoralis* group for a discussion of similar species.

We examined the type material of the two subspecies, *I. littoralis mimosae* and *I. littoralis tonilensis* and found no difference between those specimens and specimens of *I. (Proticerya) littoralis*. The World Catalogue provided incorrect type data for *Icerya littoralis littoralis* (Ben-Dov, 2005: 198). The correct type data are provided above.

### ***Crypticerya luederwaldti* (Hempel)**

*Icerya luederwaldti* Hempel, 1918: 197.

*Crypticerya luederwaldti* (Hempel); Unruh & Gullan (2008: 26).

**Diagnosis (adapted from Hempel, 1918).** Adult female yellow, entirely covered with waxy secretion forming several tassels on dorsum around margin and one at anterior end and one very long tassel at posterior end; tassels may be irregularly arranged. Length of ovisac equal to length of adult female; ovisac striated, curving downward at apex. Antennae 10 or 11 segmented. Legs as for genus, digitules filiform. Derm covered with long setae and small multilocular pores.

**Type data.** BRAZIL: São Paulo, Santos, ex leaves of "salt loving plant" (*H. Luederwaldt*).

**Type material. Syntypes:** ad ♀♀ (SAPO).

**Taxonomic notes.** We were unable to examine material of this species.

### ***Crypticerya mexicana* Cockerell & Parrott**

*Crypticerya rosae mexicana* Cockerell & Parrott in Cockerell (1899b: 4).

*Palaeococcus mexicanus* (Cockerell & Parrott); Cockerell (1902a: 233).

*Steatococcus mexicanus* (Cockerell & Parrott); Ferris (1921: 69) [not Morrison (1928: 218) as in Ben-Dov (2005: 272)].  
*Crypticerya mexicana*; Unruh & Gullan (2008: 26).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female elliptical to oval, 5.1–7.7 mm long, 3.6–5.5 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 5–15 multilocular pores with bilocular centre and 6–8 outer loculi. Dense robust hair-like setae, 60–80 µm long, covering dorsal surface and slightly finer setae covering ventral marginal to submarginal head and thorax and scattered across ventral abdomen; longest robust hair-like setae forming marginal clusters and longest at posterior. Flagellate setae as for genus. Multilocular pores, each 12–14 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi, scattered across dorsal surface, forming marginal clusters and scattered on ventral marginal to submarginal head and thorax and across ventral abdomen. Marsupium present, shaped as for genus; marsupial band formed by dense, short, robust hair-like setae, each 50–80 µm long, and by simple multilocular pores with bilocular or trilocular centre and 6–9 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with bilocular (sometimes trilocular) centre and 4–6 outer loculi, scattered on ventromedial to submedial head and thorax. Vulvar opening as for genus, surrounded by typical multilocular pores, each 12–13 µm in diameter, with elongate or bilocular centre and 8–12 outer loculi. Cicatrices oval to hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus; derm around atrial opening with cluster of 6–10 multilocular pores, each 12–13 µm in diameter, with bilocular or

trilocular centre and 8–12 outer loculi. Anal ring as for genus; anal opening surrounded by robust hair-like setae and typical multilocular pores, each 10–11 µm in diameter, with elongate centre and 8–12 outer loculi.

First-instar nymph as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore, and antennae with short setae.

**Type data.** MEXICO: Aguas Calientes, ex *Prosopis* sp., 1.v.1898 (*Townsend*).

**Type material. Lectotype** here designated: 3<sup>rd</sup>-instar nymph, “*Palaeococcus/mexicanus* Ckll./On *Prosopis*/(mesquite)/Aguas Calientes,/Mexico/Townsend-Barber/Gentary #61, 74/Rec’d July 1903” (USNM).

**Paralectotypes:** 3 1<sup>st</sup>-instar nymphs (same slide as lectotype); ca. 30 1st-instar nymphs and embryos (1 slide, same data as lectotype, except “75” instead of “74”) (USNM); 9 1<sup>st</sup>-instar nymphs (one slide), “*Icerya/mexicana*/Ckll./at/Aguascalientes/on *Prosopis* [sic]/May 1 ‘Tounsend’ [sic]” (BME); dry material (USNM).

**Other material examined.** ad ♀, 3<sup>rd</sup>-instar nymph, 2<sup>nd</sup>-instar nymph, MEXICO: Aguas Calientes, ex *Acacia* 12.ii.1909 (*E.A. Schwartz*) (ad ♀ at USNM, 3<sup>rd</sup>-instar & 2<sup>nd</sup>-instar at BME); ad ♀, Cusulta, ex *Mimosa* (Koebele Collection Coccidae, No. 1612) (BME).

**Taxonomic notes.** *Crypticerya mexicana* is easily distinguished from other *Crypticerya* species by the presence of dense, robust short setae on the dorsal surface. Refer to the *C. mexicana* group for a discussion of similar species.

Cockerell and Parrott originally placed this species in the genus *Crypticerya* because they did not see an ovisac. In many cases, immature specimens were placed in *Crypticerya sensu* Cockerell because of the apparent absence of an ovisac or marsupium. The lectotype of this species is partially destroyed and we cannot see the posterior abdomen, but there are no signs of a marsupium. The legs, antennae, apical setae and marginal setae are broken on the paralectotype first-instar nymphs. This description of the adult female and that of the antennae, legs and setal length of the first-instar nymph are based on non-type material. We believe the specimens we examined are conspecific because they were collected at the same locality as the original material.

### ***Crypticerya minima* (Morrison)**

*Icerya minima* Morrison, 1919: 64.

*Crypticerya minima* (Morrison); Unruh & Gullan (2008: 26).

**Unmounted material.** Dried adult female very dark reddish to blackish red, dorsum covered with faint whitish powdery and cottony secretion. Dorsum strongly and irregularly wrinkled transversely (adapted from Morrison, 1919).

**Slide-mounted material.** Adult female elongate, oval, 2.0–2.5 mm long, 1.5 mm wide (lectotype 2.4 mm long, 1.5 mm wide), typically broadest across posterior. Antennae 9 segmented. Robust setae of varying length (up to 200 µm long) sparsely scattered on dorsum, longest marginally, shortest on ventral surface, tips of setae with blunt apices. Flagellate setae distributed as for genus. Simple multilocular pores, each 10 µm in diameter, with very small bilocular or trilocular centre and 5–8 outer loculi, sparsely scattered on venter and forming medial clusters on dorsum. Ovisac band present, with flagellate setae, 55–60 µm long with blunt apices and rounded bases, and simple multilocular pores forming ovisac band 5–7 pores wide, each pore 9–10 µm in diameter, with trilocular centre and 5–7 outer loculi. Simple multilocular pores with bilocular centre and 4–6 outer loculi, very sparsely scattered on ventromedial abdomen. Vulvar opening as for genus, surrounded by typical multilocular pores with trilocular centre and 10–12 outer loculi. Cicatrices oval to reniform, numbering 3, central cicatrix longest. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae and typical multilocular pores with 6–8 outer loculi.

**Type data.** ARGENTINA: Mendoza, 1911, collection number 148a. (*P. Jorgensen*).

**Type material. Lectotype** here designated: ad ♀, “*Icerya/minima* nsp./on ♀ *Suada divaurata*/Mendoza/

Argentina./P. Jorgensen./#148a. 1911?" (USNM). **Paralectotypes:** ad ♀ (same slide as lectotype); 3 ad ♀♀ (one slide, same data as lectotype) (USNM); ad ♀, "*Icerya/minima* n.sp./Mendoza/Argentina #148a/P. Jorgensen/1911?/On *Suada divaurata*" (USNM); 13 1<sup>st</sup>-instar nymphs (one slide), "*Icerya/minima* n.sp./On ? *Suada divaurata*/Mendoza./Argentina./Jorgensen/# 148a 1911." (USNM); 11 1<sup>st</sup>-instar nymphs (one slide), "*Icerya/minima*/n.sp./on ? *Suada divaurata*/Mendoza./Argentina./P. Jorgensen./#148a. 1911?" (USNM); dry material (USNM).

**Taxonomic notes.** *Crypticerya minima* differs from other *Crypticerya* that form an ovisac band with dense flagellate setae by its very small size and by the presence of a single pore type in the ovisac band. Refer to the *C. littoralis* group for further discussion of similar species.

The lectotype female is on the right side of the slide with the original label on the left. The host plant is not indicated in the description, but on the slide labels, *Suada divaurata* [sic] has been added as the host in different handwriting from the original writing. The World Catalogue also incorrectly cited the original description as providing the host plant *Suaeda divaurata* (Ben-Dov, 2005: 201, cited under "HOST PLANTS"), but Morrison explicitly stated, "There is no information as to...the name of the host" (Morrison, 1919: 66). The World Catalogue also provided holotype data (Ben-Dov, 2005: 201), but Morrison did not designate a holotype in his original description.

Morrison (1919) described 5 small irregularly-shaped clear cicatrices in the ovisac band immediately posterior to the hindlegs and 3 cicatrices on the ventral abdomen of the adult female. We did not see the 5 small clear cicatrices in the ovisac band on any of the adult females from the type material.

### ***Crypticerya montserratensis* (Riley & Howard)**

*Icerya montserratensis* Riley & Howard, 1890b: 99.

*Crypticerya montserratensis* (Riley & Howard); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female reddish-yellow, somewhat convex, dorsal surface covered in waxy secretion, arranged in double row of tufts around margin; two long extensions of wax present at anterior and posterior ends, reaching up to 20 mm long; ovisac about twice as long as adult female, fluted, tending to turn downwards at apex (adapted from Riley & Howard, 1890b).

**Slide-mounted material.** Adult female oval (lectotype 5.4 mm long, 4.0 mm wide). Antennae 10 or 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered across all segments, longest marginally, between antennae and at abdominal apex. Flagellate setae as for genus. Simple multilocular pores, each 10–12 µm in diameter, with trilocular (rarely quadrilocular) centre and 6–8 outer loculi, covering dorsal surface, densest around submargin and forming a medial longitudinal row on head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi, present in segmental clusters of 6–14 on submedial dorsal head and thorax and submarginal ventral head and thorax. Simple multilocular pores, each 8–9 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 3–5 outer loculi, scattered on ventromedial head and thorax. Ovisac band made of two types of simple multilocular pores: (i) slightly larger pores forming inner band 6–8 pores wide, each pore 10–12 µm in diameter, with trilocular to quadrilocular centre and 6–8 outer loculi, and (ii) smaller pores (appearing bluish when stained) forming outer band 3 or 4 pores wide, each pore 9–10 µm in diameter, with triangular, cruciform or star-shaped centre and 10–12 outer loculi. Simple multilocular pores, each 8–9 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered in transverse rows on ventromedial abdomen. Vulvar opening as for genus. Cicatrices circular to oval, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal ring and anal opening as for

genus, surrounded by long, hair-like setae.

**Type data.** MONTSERRAT: ex *Chrysophyllum* sp. (*H. de C. Hamilton*).

**Type material. Lectotype** here designated: partially destroyed ad ♀, “*I. montserratensis/Chrysophyllum./*Montserrat, W.I/July 14. ’90./(Hamilton)”//“4708”//“38/4” (USNM). **Paralectotypes:** body parts of ad ♀ ♀ (same slide as lectotype); 2 1<sup>st</sup>-instar nymphs, 14 eggs (all on one slide) (same data as lectotype, except “38/1”) (USNM); 7 3<sup>rd</sup>-instar nymphs, 2 2<sup>nd</sup>-instar nymphs, 3 1<sup>st</sup>-instar nymphs (all nymphs on one slide) (same data as lectotype, except “Type” written in pencil on large label and “38/5”) (USNM); parts of 1 ad ♀ (one slide) (same data as lectotype, except “Type” written in pencil on large label, an additional label, “4708/adult ♀/with/egg-sack” and “38/6”) (USNM); half an ad ♀ (same data as lectotype, except “Type” written in pencil on large label, an additional label, “4708/adult ♀/with/egg-sack” and “38/7”) (USNM); 6 1<sup>st</sup>-instar nymphs (same data as lectotype, except “38/3”) (USNM); 4 3<sup>rd</sup>-instar nymphs (same data as lectotype, except “38/2”) (USNM); dry material (USNM).

**Taxonomic notes.** Refer to the *C. montserratensis* group for a discussion of similar species.

This species was reported originally as a pest of lime trees, cocoa, banana and forest trees in Montserrat, West Indies (Riley & Howard, 1890b: 100). Riley and Howard were contacted by the Montserrat Company of Birmingham in England asking to be sent *Vedalia cardinalis* (now *Rodolia cardinalis* (Mulsant)) for use in extermination of a population of a scale related to *Icerya purchasi* that was attacking the lime orchards. Riley and Howard asked to see specimens of the scale as they believed that vedalia beetles fed only on *I. purchasi*, but when they received specimens, the insects were on leaves of *Chrysophyllum* and not on the lime leaves, stems and fruit in the same package (Riley & Howard, 1890b: 99–100). The World Catalogue (Ben-Dov, 2005: 202) did not provide the collector’s name, but the name of the collector (Mr H. de C. Hamilton) was provided in the original description.

### *Crypticeria morrilli* (Cockerell)

*Palaeococcus morrilli* Cockerell, 1914a: 110.

*Steatococcus morrilli* (Cockerell); Ferris (1921: 69).

*Crypticeria morrilli* (Cockerell); Unruh & Gullan (2008: 26).

**Unmounted material.** Adult female dark red to purplish-gray; antennae, legs and eyes brownish-black; dorsal surface covered in mealy white secretion; waxy tufts forming middorsal and marginal longitudinal rows (adapted from Cockerell, 1914a).

**Slide-mounted material.** Adult female elliptical to oval, widest across abdomen, 6.8–7.4 mm long, 5.0–5.3 mm wide (imperfect lectotype 5.2 mm long, 4.6 mm wide). Antenna 10 or 11 segmented; segments V and VI fused. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Derm with bare patches on submedial head and thorax. Hair-like setae sparsely scattered on dorsal surface, denser on ventromedial surface; longest setae forming marginal clusters and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi, clustered in dorsal medial to submedial longitudinal row and ventral marginal clusters on each segment. Simple multilocular pores, each 11–12 µm in diameter, with bilocular centre and 6–8 outer loculi, scattered across all body segments. Marsupium present, marsupial band shaped as for genus, except for two submedial bare patches on anterior edge, formed by sparse short hair-like setae and multilocular pores, with trilocular (sometimes bilocular or quadrilocular) centre and 6–10 outer loculi, forming band 7–9 pores wide. Simple multilocular pores, each 11–12 µm in diameter, with bilocular centre and 4–12 outer loculi and appearing slightly bluish when stained, scattered on medial to submedial head and thorax; similar pores scattered within marsupium, each 9–11 µm in diameter, with bilocular centre and 4–8 outer loculi. Vulvar opening as for genus, sur-

rounded by hair-like setae and typical multilocular pores, each 13–15 µm in diameter, with trilocular centre and 10–12 outer loculi. Cicatrices, oval to reniform, numbering 3, central cicatrix hourglass shaped, lateral cicatrices reniform. Abdominal spiracles as for genus. Anal ring as for genus; anal opening surrounded by robust hair-like setae and typical multilocular pores, each 12–13 µm in diameter, with elongate or bilocular centre and 8–10 outer loculi. Very small tubercles present in submarginal longitudinal row on dorsal head and thorax; each tubercle with few short, robust hair-like setae.

First-instar nymph as for genus, except each abdominal segment with one submarginal pore, one submedial pore and one medial pore, long hair-like setae in each submarginal cluster very long and long hair-like setae at abdominal apex in 2 pairs.

**Type data.** USA: Arizona, Verde Valley, near Jerome, ex plant "superficially just like *Viborquia spinosa*" (A. W. Morrill).

**Type material. Lectotype** here designated: ad ♀, "Palaeococcus/morrilli Ckll./Type No. 18050 U.S.N.M."/"Palaeococcus/morrilli Ckll./Type/Arizona" (USNM). **Paralectotypes:** 1 ad ♀, 6 embryonic larvae (same slide as lectotype); ca. 18 1<sup>st</sup>-instar nymphs (one slide), ca. 20 1<sup>st</sup>-instar nymphs (one slide), ca. 17 1<sup>st</sup>-instar nymphs (one slide), "Palaeococcus/morrilli/Ckll./Type/Arizona/Type #18050" (USNM); ad ♀, "Palaeococcus morrilli Ckll./From ?/ Jerome, Arizona/From T.D.A. Ckll./Entomological Laboratory/Stanford University/Type material"/"TYPE/MATERIAL" (BME); 3 1<sup>st</sup>-instar nymphs (one slide), 3 1<sup>st</sup>-instar nymphs (one slide) "Palaeococcus morrilli Ckll./From ?/ Jerome, Arizona/From T.D.A. Ckll./1st. stage larva/Entomological Laboratory/Stanford University/Type material" (BME).

**Taxonomic notes.** Refer to the *C. rileyi* group for discussion of similar species.

The lectotype female is on the left side of the slide when the slide is held with the red label to the left. The red label on the lectotype slide has the words "Type No. 18050 U.S.N.M" typed on it. The slide with the first-instar nymphs also has the word "Type" written on it. We chose the female designated here as lectotype from USNM although she is in poorer condition than a paralectotype housed at BME. We compared the writing on the slide-label of the lectotype with handwritten letters from Cockerell housed at BME and found the handwriting to be identical. Ferris's handwriting is on the BME slide labels. We chose the lectotype from USNM material with Cockerell's handwriting as we assume he examined that material when describing the species.

### ***Crypticerya palmeri* (Riley & Howard)**

*Icerya palmeri* Riley & Howard 1890b: 103.

*Crypticerya palmeri* (Riley & Howard); Unruh & Gullan (2008: 26).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female elliptical, 3.7–6.2 mm long, 2.8–5.0 mm wide. Antennae 9 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae distributed as for genus; longest setae forming marginal clusters and between antennae. Flagellate setae as for genus, densest around mouthparts. Multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi, slightly clustered on dorsal median and scattered across dorsum, forming marginal clusters and scattered on ventral margin and submargin. Ovisac band present, formed by flagellate setae with slightly flattened bases, each 55–100 µm long, and simple multilocular pores of two types: (i) large pores, each 10–12 µm in diameter, with bilocular or trilocular centre, forming inner band 5–7 pores wide, and (ii) smaller pores, appearing slightly bluish when stained, each 8–10 µm in diameter, with bilocular or trilocular centre and 8–10 outer loculi, forming outer band 1–3 pores wide. Simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4 or 5 outer loculi and appearing slightly bluish when stained, scattered on ventromedial head and thorax; similar pores, each 8–9 µm in diameter, with bilocular centre and 4 or 5 outer

loculi, scattered across medial to submedial abdomen. Vulvar opening surrounded by multilocular pores, each 12–14 µm in diameter, with elongate centre and 10–12 outer loculi, and by hair-like setae, each 60–125 µm long. Cicatrix elongate to hourglass-shaped. Abdominal spiracles as for genus. Anal ring as for genus; anal opening surrounded by robust hair-like setae, each 100–138 µm long.

First-instar nymph as for genus, except each dorsal abdominal segment with one submarginal pore, one submedial pore and one medial pore, and 3 pairs of long, hair-like setae at abdominal apex.

**Type data.** MEXICO: Sonora, San José de Guaymas, 9 miles [14 km] North of Guaymas, ex Muscat of Alexandria grapevine [= *Vitis vinifera*], 30.vii.1887 (*E. Palmer*).

**Type material. Lectotype** here designated: 2<sup>nd</sup>-instar nymph, “4274 *Icerya/palmeri* R.+H./On Grape/San Jose de Guamas [sic]/Mexico/Rec'd July 20, 1887/22/6” (USNM). **Paralectotypes:** 2<sup>nd</sup>-instar nymphs (several slides) “4274 *Icerya/palmeri*/Grape/San Jose de Guay-/mas Mex./Recd. July 30, 87” (USNM).

**Other material examined.** MEXICO: 2 ad ♀♀, Guaymas, 4.v.1897 (*Koebele*) (1 slide at USNM, 1 slide at BME); 3 ad ♀♀, La Paz, ex *Acacia* sp., 17.i.1962 (*F. Raney*) (BME); 1 ad ♀, 1<sup>st</sup>-instar nymph, Baja California, San Jose del Cabo, ex undetermined host, vii.1919 (*G.F. Ferris*) (BME).

**Taxonomic notes.** Refer to the taxonomic notes of *C. colimensis* and the *C. littoralis* group for a discussion of similar species.

This species was described from immature specimens, but adult females were collected by Koebele in 1897 from the type locality and the present diagnosis is based on that material and the other material listed above.

### ***Crypticerya pimentae* (Newstead)**

*Llaveia primitiva pimentae* Newstead, 1917: 2.

*Crypticerya primitiva pimentae* (Newstead); Vayssière (1926: 316).

*Crypticerya pimentae* (Newstead); Morrison (1928: 226).

**Unmounted material.** Adult female convex dorsally, hollow ventrally, with distinct segmentation visible on dorsal surface; entire body covered with dusky white mealy secretion, dense in hollows formed by segmentation, and in ventral cavity (adapted from Newstead, 1917).

**Slide-mounted material.** Adult female elongate to oval, 4.2–4.4 mm long, 3.0–3.4 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 8–10 simple multilocular pores, each with bilocular centre and 4–8 outer loculi. Short hair-like setae evenly scattered across all body segments; long setae with large sockets in longitudinal band around ventral margin. Flagellate setae as for genus. Simple multilocular pores, each 9–10 µm in diameter, with bilocular or trilocular centre, scattered across all body segments on dorsal surface and associated with long setae on ventral margin. Ovisac absent. Marsupium absent. Simple multilocular pores similar to vulvar pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–8 outer loculi and appearing slightly bluish when stained, scattered on ventromedial surface. Vulvar opening as for genus, surrounded by simple multilocular pores, each 11–13 µm in diameter, with trilocular centre (appearing elongate) and 10–14 elongate outer loculi. Cicatrices oval to round, numbering three, central cicatrix slightly larger than lateral cicatrices. Abdominal spiracles as for genus. Anal tube as for genus; anal opening surrounded by hair-like setae and typical multilocular pores, each 8–10 µm in diameter, with very round centre and 8–12 outer loculi.

**Type data.** JAMAICA: ex 'pimento' [= *Pimenta officinalis*], 1916 (*A.H. Ritchie*).

**Type material. Syntypes:** ad ♀, 3<sup>rd</sup>-instar nymph, 2<sup>nd</sup>-instar nymphs, 1<sup>st</sup>-instar nymph (BMNH).

**Material examined.** 2 ad ♀♀, JAMAICA: Ochos Rios, Shaw Park Gardens, ex *Psidium* sp. under bark, 5.ix.2003 (*T. Kondo*) (BME, 1 ad ♀=CMU035).

**Taxonomic notes.** Refer to the *C. rosae* group for discussion of similar species.

### ***Crypticerya rileyi* (Cockerell)**

*Icerya rileyi* Cockerell, 1895: 15.

*Icerya (Proticerya) rileyi*; Cockerell (1896b: 202) [not Cockerell (1899b: 4), as in Ben-Dov (2005: 218)].

*Icerya rileyi larreae* Cockerell, 1902b: 82.

*Icerya rileyi* Cockerell; Morrison (1928: 208).

*Crypticerya rileyi*; Unruh & Gullan (2008: 28).

**Unmounted material.** Adult female dull red, covered with white and yellowish mealy powder, with lateral waxy tufts that easily break off. Ovisac white with slight yellowish tinge, smooth, not fluted, 10 mm long, 5 mm wide (adapted from Cockerell, 1895).

**Slide-mounted material.** Adult female elliptical, widest across abdomen, 5.3–7.0 mm long, 3.8–6.0 mm wide (lectotype of *I. rileyi* 5.1 mm long, 3.8 mm wide; lectotype of *I. rileyi larreae* 6.6 mm long, 6.0 mm wide). Antennae 9 or 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with cluster of 3–7 simple multilocular pores, each 11–12 µm in diameter, with bilocular centre and 9–12 outer loculi. Robust hair-like setae and short hair-like setae distributed as for genus; longest setae forming marginal clusters, between antennae and forming sparse dorsal submedial longitudinal rows. Flagellate setae distributed as for genus. Multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, forming medial to submedial longitudinal rows on dorsal head and thorax; also forming marginal clusters and scattered across marginal to submarginal venter. Smaller simple multilocular pores, each 9–10 µm in diameter, with bilocular centre and 6–8 outer loculi, scattered across rest of dorsum. Ovisac band present, formed by flagellate setae, each 53–60 µm long, with rounded bases, and by multilocular pores of two types: (i) larger pores, each 10–12 µm in diameter, with trilocular centre (sometimes bilocular, rarely quadrilocular) and 9–12 outer loculi, and (ii) smaller pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–12 outer loculi, appearing slightly bluish when stained. Simple multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre and 4 or 5 outer loculi, scattered on ventromedial to submedial head and thorax; similar pores, each 11–12 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered across ventromedial to submedial abdomen. Vulvar opening surrounded by typical multilocular pores, each 13–14 µm in diameter, with bilocular centre and 8–12 outer loculi, and by hair-like setae, each 70–100 µm long. Cicatrices elongate, numbering 3, central cicatrix largest. Abdominal spiracles as for genus; multilocular pores clustered on derm around atrial opening, each 10–12 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi. Anal ring as for genus; anal opening as for genus, surrounded by hair-like setae and typical multilocular pores.

First-instar nymph as for genus, except each dorsal abdominal segment with one submarginal pore, one submedial pore and one medial pore, and relatively short hair-like setae at abdominal apex in two pairs.

**Type data.** *Icerya rileyi*: USA: New Mexico, Las Cruces, ex Mesquite [= *Prosopis* sp.] 26.iv.1892 (Townsend); ex Creosote bush [= *Larrea tridentate*] (20.xi.1894) (Cockerell); Tularosa, ex Mesquite [= *Prosopis* sp.], 30.ix.1892 (Townsend). *Icerya rileyi larreae*: MEXICO: Chihuahua, plain at base of Cerro Chilicote, ex *Larrea*, 29.iv.1902 (T. and B. Cy).

**Type material.** **Lectotype** of *I. rileyi* here designated: ad ♀, “*Icerya/rileyi* Ckll./Type/On *Larrea*/New Mexico/Nov. 20, 1894/Ckll. Coll.” (USNM). **Paralectotypes**: ad ♀, “*Icerya/rileyi* Ckll./On *Mesquite*/Las Cruces, N. Mex./Townsend, Coll./April 26, 1892” (USNM); 2 ad ♀♀ (one slide), 5 1<sup>st</sup>-instar nymphs (one slide), “*Icerya/rileyi* Ckll./On *Mesquite*/Tularosa, N. Mexico/Townsend, Coll./Sept. 30, 1892” (USNM); dry material (USNM).

**Lectotype** of *I. rileyi larreae* here designated: ad ♀, “*Icerya/rileyi* v. *larreae*/Ckll./On *Larrea* (Wild)/Cerro

Chilicote plains/Chihuahua, Mexico./T. + B. Cy #31/Rec'd, July, 1903" (USNM). **Paralectotypes:** 1 1<sup>st</sup>-instar nymph, 1 embryo (one slide), "*Icerya/rileyi* v. *larreae*/Ckll./On *Larrea* (Wild)/Cerro Chilicote plains,/Chihuahua, Mexico/T. + B. Cy. #31/Rec'd., July, 1903" (USNM); dozens of body parts of 1<sup>st</sup>-instar nymphs (one slide), "I. *rileyi* v. *larreae*/Ckll./on *Larrea* TYPE/Plains base/Cerro Chilicote./Chi. Mex/(Townns.)" (USNM); 3 ad ♀♀ (BMNH); dry material (USNM).

**Taxonomic notes.** Refer to the taxonomic notes for *C. littoralis* and the *C. rileyi* group for a discussion of similar species. The lectotype slide of *I. rileyi* is labelled 'Type'.

Cockerell (1895: 15) described the subgenus *Proticerya* and *I. rileyi* in the same paper. He designated *I. rileyi* as the type species of the subgenus, but he named the species *Icerya rileyi* in the description and not *Icerya (Proticerya) rileyi*. The specific epithet is listed under the subgenus *Proticerya* in Cockerell's checklist of the Coccidae (1896a), but he did not refer in print to the species as *Icerya (Proticerya) rileyi* until later that year (Cockerell, 1896b: 202).

Townsend first collected material of *Icerya rileyi* in 1891 and 1892, but did not describe it because he seemed to believe that C.V. Riley was planning to do it (Townsend, 1892: 15). Unfortunately, before he was able to describe it, Riley was killed in a bicycle accident in September of 1895 (Mallis, 1971). Cockerell described *I. rileyi* three months later and stated that it "was to have been described by Dr. Riley had he lived" (1895: 15).

Cockerell and Parrott (1899: 283) discussed the possibility of splitting this species into two species based on the host (mesquite or larrea), but found no differences in the shape of the legs and antennae of the adult females. Later, however, Cockerell created a subspecies, *I. rileyi larreae* (Cockerell, 1902b: 82).

### ***Crypticerya rosae* (Riley & Howard)**

*Icerya rosae* Riley & Howard, 1890a: 333.

*Icerya (Crypticerya) rosae* Riley & Howard; Cockerell (1895: 15).

*Crypticerya rosae* (Riley & Howard); Cockerell (1899b: 4).

*Palaeococcus rosae* (Riley & Howard); Cockerell (1902a: 233).

*Crypticerya rosae* (Riley & Howard); Vayssière (1926: 313).

**Unmounted material.** Adult female broadly oval and densely covered with a short secretion which forms a series of close plaits around the margin. The waxy secretion often has a yellowish tinge. Beneath the wax, the head and thorax are black with red around the margins and the abdominal dorsal and ventral surfaces are bright red. Antennae, legs and eyes black. Lacking an ovisac. Segments clearly marked, abdomen with a broad rounded subdorsal ridge. Females become more rounded with age (adapted from Riley & Howard, 1890b).

**Slide-mounted material.** Adult female elliptical, 3.6–4.0 mm long, 3.0–3.4 mm wide (lectotype 4.0 mm long, 3.0 mm wide). Antennae 11 segmented, setae on apical segment up to 200 µm long. Eyes, mouthparts, legs and thoracic spiracles as for genus. Short hair-like setae evenly scattered on dorsal surface, longest setae around ventral margins. Flagellate setae distributed as for genus. Simple multilocular pores, each 8–9 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi, scattered across all body segments on dorsal surface; pores with trilocular centre found mostly on dorsal head. Simple multilocular pores, each 6–8 µm in diameter, with bilocular to trilocular centre and 6–9 outer loculi, on ventral margins of head and thorax. Simple multilocular pores, similar to vulvar pores, each 10–11 µm in diameter, with bilocular centre and 5–8 outer loculi on ventromedial head and thorax. Simple multilocular pores, similar to vulvar pores, each 10–11 µm in diameter, with trilocular centre (appearing elongate) and 6–10 outer loculi, scattered across ventromedial to submedial abdomen. Ovisac band absent. Marsupium absent. Vulvar opening as for genus, surrounded by typical multilocular pores, each 12–13 µm in diameter, with bilocular centre and 12–20 outer loculi. Cicatrices

hourglass-shaped to reniform, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal ring as for genus; anal opening as for genus, surrounded by typical multilocular pores each 8–10 µm in diameter with round centre and 8–10 outer loculi. Tubercles absent.

First-instar nymph as for genus, except three pairs of long, hair-like setae at abdominal apex and anal tube with 8 multilocular pores at opening.

**Type data.** USA: Florida, Key West, ex rose, 16.iv.1890 and 28.iii.1890 (*H. A. Smith*).

**Type material listed in Unruh & Gullan, 2008: 30.** Lectotype designated by Unruh & Gullan (2008: 30): ad ♀ (USNM). **Paralectotypes:** 6 ad ♀♀, 9 3<sup>rd</sup>-instar nymphs, 7 2<sup>nd</sup>-instar nymphs, 32 1<sup>st</sup>-instar nymphs, 6 eggs (12 slides including lectotype) (USNM); 3 boxes, several medium to large, destroyed specimens in a vial (USNM).

**Additional paralectotypes.** 2 ad ♀♀ (one slide), 4 first-instar nymphs (one slide), “On Rose/Key West, Fla./Apr. 16, 1890/#4650” (USNM); 1 ad ♀, 7 third-instar nymphs, 5 second-instar nymphs (all specimens on one slide), “*I. rosae*/March 28, 1890”//“4650”//“36/3” (USNM); 9 first-instar nymphs (one slide), “*Icerya rosae*./Rec. Mch 29, 1890”//“36/2”//“4650” (USNM); head and leg of ad ♀, “*I. rosae*./Rose./Key West, Fla./Apr. 16. ‘90/(Smith)”// “4650”// “36/8” (USNM); 8 first-instar nymphs, 6 eggs (nymphs and eggs on one slide), same data as previous slide, except “36/8” (USNM); 3 boxes, one containing a vial with several medium to large destroyed specimens (same data as lectotype, except 28.iii.1890) (USNM).

**Taxonomic notes.** Refer to the *C. rosae* group for discussion of similar species.

More type slides were discovered on a trip to USNM after Unruh & Gullan (2008) designated the lectotype and identified several paralectotypes. Those type slides are here recognized as paralectotypes and complete slide label data are provided above.

### *Crypticerya similis* (Morrison)

*Icerya similis* Morrison, 1927: 108.

*Crypticerya similis* (Morrison); Unruh & Gullan (2008: 28).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female oval (lectotype 5.4 mm long, 4.0 mm wide). Antennae 11 segmented. Eyes, mouthparts, legs and thoracic spiracles as for genus. Hair-like setae scattered across all segments, longest marginally, between antennae and at abdominal apex. Flagellate setae distributed as for genus. Simple multilocular pores, each 10–12 µm in diameter, with trilocular (rarely quadrilocular) centre and 6–8 outer loculi, covering dorsal surface, densest around submargin and forming a medial longitudinal row on head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi, present in segmental clusters of 6–14 on submedial dorsal head and thorax and submarginal ventral head and thorax. Simple multilocular pores, each 8–9 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 3–5 outer loculi, scattered on ventromedial head and thorax. Ovisac band made of two types of simple multilocular pores present on ventral surface: (i) slightly larger pores forming inner band 6–8 pores wide, each 10–12 µm in diameter, with trilocular or quadrilocular centre and 6–8 outer loculi, and (ii) smaller pores (appearing bluish when stained) forming outer band 3 or 4 pores wide, each pore 9–10 µm in diameter, with triangular, cruciform or star-shaped centre and 10–12 outer loculi. Simple multilocular pores, each 8–9 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered in transverse rows on ventromedial abdomen. Vulvar opening as for genus. Cicatrices circular to oval, numbering 7. Abdominal spiracles as for genus. Anal ring and anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** PANAMA: Coco Plum, near Bocas del Toro, ex *Cocos nucifera* (Palmae), received ii.1922 (J.R. Johnston); TRINIDAD AND TOBAGO: Tobago, Scarborough, ex unknown fruit tree, 7.xi.1918 (H. Morrison); Trinidad, Port-of-Spain, ex *Cassia fistula*, 4.xi.1918 & 23.xi.1918 (H. Morrison); Trinidad, Port-of-Spain, ex *Clusia alba*, date and collector unknown.

**Type material. Holotype:** ad ♀, "*Icerya zeteki* Ckll/~~*montserratensis*~~ R.+H./similis/on Coconut leaves./Cocoplum, near Bocas/del Toro, Panama./John R. Johnston, Coll./Rec'd Feb. 9, 1922." (USNM). **Paratypes:** ad ♀, "*Icerya similis* (?)/Morr./~~*montserratensis*~~ R.+H./*zeteki*/Ckll/On *Clusia alba*/Port of Spain, Trinidad." (USNM); ad ♀, "*Icerya zeteki*/~~*montserratensis*~~/R.+H./on unknown/fruit tree./similis/Scarborough./Tobago./H. Morrison./Nov. 7, 1918./A-922" (USNM); ad ♀, 4 1<sup>st</sup>-instar nymphs, 1 embryo (nymphs and embryo on one slide), "*Icerya similis* Morr/~~*montserratensis*~~/R.+H./On *Clusia alba*/Port of Spain, Trinidad./#4708" (USNM); 6 1<sup>st</sup>-instar nymphs (one slide), "*Icerya zeteki* (?)/Ckll/~~*montserratensis*~~ R.+H./larvae/*similis*/Morr./On *Clusia alba*/Port of Spain, Trinidad" (USNM); 2 ad ♀♀ (one slide), 14 1<sup>st</sup>-instar nymphs (one slide), "*Icerya zeteki*/Ckll./similis/on *Cassia fistula*./St. Clair, Port-/of-Spain, Trin./H. Morrison./Nov. 4, 1918./A-881." (USNM); ad ♀, "*Icerya zeteki*/On *Cassia fistula*/St. Clair Port-of-/Spain Trinidad./H. Morrison coll./Nov. 23, 1918./A-1044" (USNM); dry material (USNM).

**Taxonomic notes.** Refer to the *C. montserratensis* group for a discussion of similar species.

The type material was collected from different locations and different hosts. The World Catalogue (Ben-Dov, 2005: 224) only listed the type data of the holotype but did not list type data for the paratypes.

### ***Crypticerya subandina* (Leonardi)**

*Icerya subandina* Leonardi, 1911: 238.

*Crypticerya subandina* (Leonardi); Unruh & Gullan (2008: 28).

**Unmounted material.** Body of adult female red; antennae, legs and setae brown to black. Ovisac about 7 mm long, snow-white, very convex and constituted of many waxen strips; shape of ovisac resembles that of *I. purchasi*. Stripped of ovisac, body of adult female oval, widest across abdomen. Derm covered with setae of varying lengths; thick clusters of setae found around margin. (adapted from Leonardi, 1911).

**Slide-mounted material.** Adult female oval to round, 3.9–4.7 mm long, 3.8–4.0 mm wide, widest across abdomen. Antennae 9 to 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 4–7 pores, each with bilocular or trilocular centre and 6–8 outer loculi. Short, robust hair-like setae very sparsely scattered across all surfaces. Flagellate setae distributed as for genus. Simple multilocular pores, each 10–12 µm in diameter, with trilocular (sometimes quadrilocular) centre and 6–8 outer loculi, covering dorsal surface, densest around submargin and forming a medial longitudinal row on head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi, present in segmental clusters of 6–14 on submarginal ventral head and thorax. Ovisac band made of simple multilocular pores of two types: (i) pores forming inner band 5–7 pores wide, each pore 11–12 µm in diameter, with trilocular centre and 6–8 outer loculi, and (ii) pores forming outer band, 1 or 2 pores wide, each pore 10–11 µm in diameter, with trilocular, quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 4–8 outer loculi and appearing slightly bluish when stained. Simple multilocular pores, similar to vulvar pores and appearing slightly bluish when stained, each 10–11 µm in diameter, with bilocular, trilocular or quadrilocular (appearing cruciform) centre and 4–8 outer loculi, scattered on ventromedial to submedial head and thorax; similar pores with bilocular or trilocular centre and 4–8 outer loculi, scattered across ventromedial to submedial abdomen. Vulvar opening as for genus; surrounded by typical multilocular pores with bilocular centre and 8–12 outer loculi. Cicatrices elongate to reniform, numbering 3, subequal in size.

Abdominal spiracles as for genus. Anal tube and anal opening as for genus.

First-instar nymph as for genus except with three pairs of long, hair-like setae at abdominal apex.

**Type data.** ARGENTINA: Cachueta, ex *Bulnesia retama*.

**Type material. Syntypes:** ad ♀♀, 1<sup>st</sup>-instar nymphs (IFSP).

**Material examined.** ad ♀, 6 1<sup>st</sup>-instar nymphs, “*Icerya/subandina* Leon./On *Bulnesia retama*/Mendoza,/ Argentina/Jorgensen Coll./#8a” (USNM); 3 ad ♀♀ (one slide), 2 ad ♀♀ (one slide), “*Icerya/purehasi* Mask./on *subandina* Leon./on/*Bulnesia retama*/Chile/Mendoza, Argentine [sic]/Dr. Carlos S. Reed, coll./May/July 21 – 09/J.G. Sanders./J.F. Zimmer” (3 ad ♀♀ at USNM, 2 ad ♀♀ at BME).

**Taxonomic notes.** Refer to the *C. montserratensis* group for a discussion of similar species. The type location of this species is Cachueta, Argentina, which is located in the province of Mendoza. The slides we examined from the USNM and BME list Mendoza, Argentina, as the collection locality and were collected two years before Leonardi described *C. subandina*. However, these slides may not be syntypes and therefore we refrain from designating a lectotype from this series.

### *Crypticerya tabernicola* (Ferris)

*Steatococcus tabernicolus* Ferris, 1921: 70.

*Crypticerya tabernicola* (Ferris); Unruh & Gullan (2008: 28).

**Unmounted material.** Mature adult female globose, round and most distended across abdomen; body dark purple; legs, antennae and eyes black; with age, covered in mealy secretion forming conspicuous transverse rows across dorsum; waxy tendrils forming around margin and dorsal head and thorax.

**Slide-mounted material.** Adult female elliptical, 4.4–5.2 mm long, 3.2–4.5 mm wide (lectotype 5.2 mm long, 4.5 mm wide). Antenna 10 or 11 segmented (segments V and VI fused if 10 segmented). Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 5–10 simple multilocular pores, each with bilocular centre and 8–10 outer loculi. Short hair-like setae sparsely scattered across all surfaces; longest setae forming marginal clusters and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 10–12 µm in diameter, with bilocular centre and 6–12 outer loculi, forming medial to submedial longitudinal row on dorsal head and thorax, densest in marginal clusters on dorsal abdomen and on medial to submedial dorsal abdomen anterior to anal opening and medial to marginal dorsal abdomen posterior to anal opening; similar pores, each 12–13 µm in diameter, with bilocular (sometimes trilocular) centre and 8–12 outer loculi, forming marginal clusters and scattered on marginal to submarginal ventral head and thorax and across ventral abdomen. Marsupium present, shaped as for genus, except anterior edge formed by sparse row of multilocular pores; marsupial band formed by sparse short hair-like setae and simple multilocular pores of two types: (i) larger pores forming inner band 5–7 pores wide, each 12–13 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, and (ii) smaller pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi and appearing slightly bluish when stained, scattered around inner band. Simple multilocular pores, each 10–12 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial to submedial head and thorax; similar pores, with bilocular centre and 4 or 5 outer loculi, scattered in marsupium. Vulvar opening as for genus, surrounded by typical multilocular pores, each 13–15 µm in diameter, with elongate centre and 8–12 outer loculi. Cicatrices numbering 3, central cicatrix largest, hourglass-shaped, lateral cicatrices reniform. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical multilocular pores, each 12–14 µm in diameter. Slightly wrinkled patches of derm on submarginal and submedial thorax and in transverse rows on abdomen.

First-instar nymph as for genus, except each dorsal abdominal segment with one submarginal pore, one

submedial pore and one medial pore and relatively short hair-like setae at abdominal apex in 2 pairs.

**Type data.** MEXICO: Baja California, near La Rivera, ex *Prosopis* sp.

**Type material. Lectotype** here designated: ad ♀, “*Palaeococcus Type/tabernicolus*/n.sp./On *Prosopis* sp./Near La Rivera Dist./Sur Baja Calif./July 1919/G.F. Ferris/Entomological Laboratory/Stanford University” (BME). **Paralectotype**: 2<sup>nd</sup>-instar nymph, “*Palaeococcus Paratype/tabernicolus*/n.sp./On *Prosopis* sp./Near La Rivera Dist./Sur, /Baja Calif./July 1919/G.F. Ferris/Entomological Laboratory/Stanford University” (BME).

**Other material examined.** MEXICO: 1<sup>st</sup>-instar nymph, “*Palaeococcus tabernicolus* n.sp./On *Prosopis* sp./Near La Rivera Dist./Sur, Baja Calif./July, 1919/G.F. Ferris/Entomological Laboratory/Stanford University” (BME).

**Taxonomic notes.** Refer to the *C. rileyi* group for discussion of similar species.

Ferris stated that only two specimens were available for study and that immature stages were not seen (1921: 70). The slide with the second-instar nymph is labelled “Paratype” and therefore we consider this the second specimen to which Ferris referred. CMU discovered a 1<sup>st</sup>-instar nymph in the BME slide collection with Ferris’s slide label and identical collection information written in the same handwriting as the type material. As Ferris explicitly stated that he did not see the any other material, we consider this first-instar nymph not to be as part of the type series.

### *Crypticerya townsendi* (Cockerell)

*Icerya* (*Crypticerya*) *townsendi* Cockerell, 1896b: 201.

*Icerya* (*Crypticerya*) *townsendi plucheae* Cockerell, 1896b: 202. Synonymy by Unruh & Gullan (2008: 32).

*Crypticerya townsendi* (Cockerell); Cockerell (1899a: 390).

*Crypticerya townsendi plucheae* (Cockerell); Cockerell (1899a: 390).

*Palaeococcus plucheae* (Cockerell); Cockerell (1902a: 233).

*Palaeococcus townsendi* (Cockerell); Cockerell (1902a: 233).

*Steatococcus plucheae* (Cockerell); Ferris (1921: 69).

*Steatococcus townsendi* (Cockerell); Ferris (1921: 69).

*Crypticerya townsendi* (Cockerell); Unruh & Gullan (2008: 28).

**Unmounted material.** Adult female subglobose, denuded of wax, body appears dark pink to dark purple; legs, eyes and antennae black; dorsal surface thinly covered with white mealy secretion; tufts of wax forming middorsal and marginal longitudinal rows; ventral surface covered with thin white waxy secretion, especially around marsupial opening (adapted from Cockerell, 1896b).

**Slide-mounted material.** Adult female elliptical, 4.2–5.7 mm long, 3.5–4.4 mm wide (lectotype of *I. (Crypticerya) townsendi* 5.7 mm long, 4.4 mm wide; lectotype of *I. (Crypticerya) townsendi plucheae* 5.5 mm long, 4.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with cluster of 6–8 simple multilocular pores, each with bilocular centre and 6–10 outer loculi. Hair-like setae distributed as for genus; longest setae forming marginal clusters and between antennae. Flagellate setae distributed as for genus. Multilocular pores, each 12–13 µm in diameter, with bilocular (sometimes trilocular) centre (ventral marginal clusters with bilocular pores only) and 6–12 outer loculi, forming dorsal medial, submedial, submarginal longitudinal rows and marginal clusters and scattered across marginal to submarginal venter; similar smaller pores, each 9–11 µm in diameter, with bilocular (sometimes trilocular) centre and 6–9 outer loculi scattered over rest of derm. Marsupium present, marsupial band shaped as for genus, formed by sparse hair-like setae and simple multilocular pores, each 12–13 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi, forming band about 4–6 pores wide. Simple multilocular pores, 8–9 µm in diameter, with bilocular centre and 6–10 outer loculi and appearing slightly bluish when stained, scattered on ventromedial to submedial head and thorax; similar pores, 12–13 µm in diameter, with bilocular centre and 4–8 outer loculi, also similar to vulvar pores, scattered within marsupium. Vulvar opening

surrounded by hair-like setae and typical multilocular pores, each 13–15 µm in diameter, with elongate centre and 8–12 (mostly 10) outer loculi. Cicatrices round to hourglass shaped, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal ring as for genus; anal opening surrounded by typical multilocular pores and robust hair-like setae.

First-instar nymph as for genus, except each dorsal abdominal segment with no submarginal pore, one submedial pore and one medial pore, and relatively short hair-like setae at abdominal apex in two pairs.

**Type data.** *Icerya (Crypticerya) townsendi*: USA: New Mexico, Mescalero Reservation, a short distance below the Agency, at base of stems of *Gutierrezia sarothrae*, 2.x (Cockerell). *Icerya (Crypticerya) townsendi pluchae*: USA: New Mexico, Mesilla Park, ex *Pluchea borealis*, 1896 (Townsend).

**Type material.** **Lectotype** of *Icerya (Crypticerya) townsendi* here designated: ad ♀, “Steatococcus townsendi/(Ckll.)/Co-type/On Gutierrezia/sarothrae/Mescalero Apache Agency/Oct. 2, 1896 N. Mex” (USNM). **Paralectotypes**: ad ♀, 3 1<sup>st</sup>-instar nymphs (nymphs on one slide), 4 1<sup>st</sup>-instar nymphs (one slide), 3 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype) (USNM); ad ♀, “Steatococcus/Palaeococcus/townsendi (Ckll.)/on Gutierrezia/sarothrae/New Mexico/Oct. 2 – 1896. **Co-Type**” (USNM); 8 1<sup>st</sup>-instar nymphs (one slide), “Steatococcus/Palaeococcus/townsendi (Ckll.)/Co-type/on Gutierrezia/sarothrae/New Mexico./Oct. 2, 1896” (USNM); ca. 50 1<sup>st</sup>-instar nymphs (one slide), “Steatococcus/I. townsendi/Prob. From Co-type/mat.??/N.M./Oct. ‘96/(Townsend)”/“72 3”/“147/8” (USNM); 12 1<sup>st</sup>-instar nymphs (one slide), “Steatococcus/I. townsendi/Gutierrezia./Mescalero, N.M./Oct. 2. ‘96/(Townsend)”/“7-78”/“150/10” (USNM); ad ♀, “I. townsendi/N.M./Oct. ‘96/(Townsend)”/“7274”/“147/7” (USNM); ad ♀, 11 1<sup>st</sup>-instar nymphs (nymphs on one slide), “Steatococcus/townsendi (Ckll.)/Mescalero Reservat/New Mexico/Type Material/Stanford University/Natural History Museum” (BME); dry material (USNM).

**Lectotype** of *Icerya (Crypticerya) townsendi pluchae* here designated: ad ♀, “Steatococcus pluchae/townsendi (Ckll.)/On Pluchea sp./Mesilla Pk., N. Mexico/Oct. 8, 1896” (USNM). **Paralectotypes**: ad ♀ (same data as lectotype) (USNM); ad ♀, “Steatococcus/pluchea [sic] (Ckll.)/On Pluchea sp./Mesilla Park, N.M./Oct. 8, 1896/#7279” (USNM).

**Other material examined.** USA: 11 1<sup>st</sup>-instar nymphs (one slide), 9 1<sup>st</sup>-instar nymphs (one slide), “Palaeococcus/pluchae (Ckll.)/Type/On Pluchea borealis/Misella [sic], New Mexico./C.H.T. Townsend, Coll./Ckll. Coll.” (USNM).

**Taxonomic notes.** Refer to the *C. rileyi* group for discussion of similar species.

Refer to Unruh & Gullan (2008: 34) for a discussion of taxonomy of this species. The other material examined has identical collection data to the lectotype and paralectotypes of *I. (Crypticerya) townsendi pluchae*, but are not included as type material because Cockerell (1896b: 202) stated that he did not have any immature specimens when he described the species.

### ***Crypticerya tuberculata* (Morrison)**

*Steatococcus tuberculatus* Morrison, 1941: 140.

*Crypticerya tuberculata* (Morrison); Unruh & Gullan (2008: 28).

**Unmounted material.** Adult female strongly ovoid, broadest and high convex across abdomen, narrowest at anterior end. Body of adult female blue purple in colour, dusted with wax, with whitish or yellowish tufts of wax forming four tufts on dorsum and eight tufts around margin on each side of body. Short tubercles forming four rows on dorsal surface, each tubercle with several stout setae; three or four tubercles forming inner sub-medial rows on head and thorax; six tubercles forming outer, submarginal rows; two conspicuous marginal tubercles on each side, apparently associated with thoracic spiracular region of the body margin; smaller, inconspicuous tubercles on each body segment around margin; these tubercles less conspicuous in old, fully

distended and sclerotized adults (adapted from Morrison, 1941).

**Slide-mounted material.** Adult female elliptical, 6.0–7.0 mm long, 4.2–5.6 mm wide (holotype 6.0 mm long, 5.6 mm wide). Antenna 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 5–10 simple multilocular pores, each with bilocular centre and 8–10 outer loculi. Robust hair-like setae and finer hair-like setae scattered across all segments; longest setae forming marginal clusters and between antennae. Flagellate setae distributed as for genus. Simple multilocular pores, each 12–14 µm in diameter, with bilocular (rarely trilocular) centre and 8–12 outer loculi, scattered across all body segments, densest on head and thorax; similar, smaller pores, each 10–12 µm in diameter, forming marginal clusters and scattered across ventral marginal to submarginal head and thorax and across abdomen. Marsupium present, shaped as for genus; marsupial band formed by short hair-like setae, each 38–50 µm long, and simple multilocular pores two types: (i) larger pores forming inner band 5–7 pores wide, each pore 12–13 µm in diameter, with bilocular or trilocular centre and 6–9 outer loculi, and (ii) smaller pores scattered outside of inner band, each pore 11–12 µm in diameter, with bilocular or trilocular centre and 6–12 outer loculi. Simple multilocular pores, each 9–10 µm in diameter, with bilocular or trilocular centre and 4–8 outer loculi appearing and slightly bluish when stained, scattered on ventromedial to submedial head and thorax; similar pores, each 9–10 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered within marsupium. Vulvar opening as for genus, surrounded by typical multilocular pores, each 13–15 µm in diameter, with elongate to bilocular centre and 10–12 outer loculi. Cicatrices oval to reniform, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal ring as for genus; anal opening surrounded by robust hair-like setae and typical multilocular pores, each 10–13 µm in diameter. Tubercles present on dorsal head and thorax in 1 medial pair, 2 submedial pairs and 2 submarginal pairs; present on abdomen in 4 longitudinal rows: 2 medial, 2 submarginal; each tubercle with several robust hair-like setae on tips, each 100–200 µm long; tubercles present on venter in marginal longitudinal band, with several robust hair-like setae on tips, each 100–350 µm long.

First-instar nymph as for genus, except each dorsal abdominal segment with one submarginal pore, one submedial pore and one medial pore, and long hair-like setae at abdominal apex in two pairs.

**Type data.** MEXICO: Oaxaca, Oaxaca, ex *Acacia pennatula*, 20-30.xi.1930 (*S. Hughes-Schrader*); San Geronimo, ex *Caesalpinia coriaria*, 20-30.xi.1930 (*S. Hughes-Schrader*).

**Type material. Holotype:** ad ♀, “*Steatococcus tuberculatus*/n.sp./On *Acacia pennatula*/Oaxaca, Oax., Mexico/Nov.20-30, 1933/By S. Hughes-Schrader/No. 41-1” (USNM). **Paratypes:** 4 1<sup>st</sup>-instar nymphs (one slide, same data as holotype) (USNM); 2 ad ♀, 7 1<sup>st</sup>-instar nymphs (nymphs on one slide), “*Steatococcus tuberculatus*/n.sp./On *Caesalpinia coriaria*/Sa Geronimo, Oax.,/Mexico/By S. Hughes-Schrader” (USNM).

**Taxonomic notes.** This species is distinct from all other *Crypticerya* species by the presence of elongate tubercles on the dorsal surface and margin. Refer to the *C. mexicana* group for further discussion of similar species.

Hughes-Schrader collected *C. tuberculata* in Oaxaca, Mexico, and it was described by Morrison (1941). Hughes-Schrader established greenhouse populations of this species at Columbia University and later at Duke University from a stock of females she collected in Tehuantepec, Oaxaca, Mexico, which, according to Moses and Wilson (1970, p. 375), “were imported by permission of the Bureau of Entomology and Plant Quarantine of the U.S. Department of Agriculture”. The insects were maintained on *Acacia arnesiana* and *A. pennatula* in a small, non-fumigated greenhouse. This captive population provided fresh material for Hughes-Schrader, her colleagues and students to study the cytology of this species extensively for decades (Franks, 1965; Hughes-Schrader, 1946; Hughes-Schrader & Ris, 1941; Moses, 1966a, 1966b; Moses & Wilson, 1970; O'Brien, 1956).

### ***Crypticerya zeteki* (Cockerell)**

*Icerya zeteki* Cockerell, 1914b: 148. Incorrectly synonymized with *I. brasiliensis* by Ben-Dov (2005: 193). *Crypticerya zeteki* (Cockerell); Unruh & Gullan (2008: 28).

**Unmounted material.** Adult female densely covered with white-yellow cottony tufts; large tufts present on middorsum with lateral depression; tufts also forming submarginal and marginal longitudinal rows; horn-like, truncate waxy projection present at anterior and posterior end, longer at posterior end and projecting over ovisac. Ovisac 3.0–3.5 mm long, striated and suffused with pink (adapted from Cockerell, 1914b).

**Slide-mounted material.** Adult female oval (lectotype 5.4 mm long, 4.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered across all segments, longest marginally, between antennae and at abdominal apex. Flagellate setae distributed as for genus. Simple multilocular pores, each 10–12 µm in diameter, with trilocular (rarely quadrilocular) centre and 6–8 outer loculi, covering dorsal surface, densest around submargin and forming a medial longitudinal row on head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 10–12 outer loculi, present in segmental clusters of 6–14 on submedial dorsal head and thorax and submarginal ventral head and thorax. Simple multilocular pores, each 8–9 µm in diameter, with trilocular (appearing triangular), quadrilocular (appearing cruciform) or quinquelocular (appearing star-shaped) centre and 3–5 outer loculi, scattered on ventromedial head and thorax. Ovisac band made of two types of simple multilocular pores: (i) slightly larger pores forming inner band 6–8 pores wide, each pore 10–12 µm in diameter, with trilocular to quadrilocular centre and 6–8 outer loculi, and (ii) smaller pores (appearing bluish when stained) forming outer band 3 or 4 pores wide, each pore 9–10 µm in diameter, with triangular, cruciform or star-shaped centre and 10–12 outer loculi. Simple multilocular pores, each 8–9 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered in transverse rows on ventromedial abdomen. Vulvar opening as for genus. Cicatrices circular to oval, numbering 5. Abdominal spiracles as for genus. Anal ring and anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** PANAMA: Panama Canal Zone, ex stems of an undetermined plant, having dark red colour externally and much white pith within (*J. Zetek*).

**Type material.** Lectotype here designated: ad ♀, "*Icerya* Type material/*zeteki* Ckll./From undetermined/host/Panama Canal Zone/*J. Zetek*, coll./From Ckll. 1918/Entomological Laboratory/Stanford University/G.F.F." (BME). **Paralectotypes:** ad ♀, 2 ad ♀♀ (latter ♀♀ on one slide), 3 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype) (BME); 2 ad ♀♀, "*Icerya zeteki* Ckll./On undetermined plant./Panama Canal Zone./*J. Zetek*, col./Part of type material, received/from Ckll. 1919" barcode 74 24 107432 (dry material) (BME); dry material (USNM); body parts of 3 ♀♀ and 3 embryos (all on one slide) (UCEC); dry material [many on paper strip], "Panama Canal Zone/9866/*Icerya zeteki* Ckll." (NYSM).

**Other material examined.** PANAMA: ad ♀, "*Icerya/zeteki* Ckll./Possibly Type; acc. to Ckll/On a fine foliage plant/Ancon, Canal Zone/Zetek + Bethel, Coll./March 7, 1913/Rec'd thru Cockerell" (USNM).

**Taxonomic notes.** Refer to the *C. montserratensis* group for a discussion of similar species. 'The Scale' published in March, 2001 lists material at NYSM. A slide at USNM labelled "Possibly Type" is not type material because the collectors listed on the slide are incorrect.

The on-line list of type material housed at UCEC has misspelled *Icerya zeteki* as *Icerya zetski* (UCEC, 2003).

## ***Echinicerya* Morrison**

*Echinicerya* Morrison, 1930: 17. Type species: *Echinicerya anomala* Morrison.

The monotypic genus *Echinicerya* was excluded from the recent phylogenetic study of the tribe due to unavailability of fresh material (Unruh & Gullan, 2008). However, its status as a distinct genus was not questioned due to its unique morphological features. The Guatemalan species *E. anomala* is the only iceryine with

30–40 cicatrices forming up to two semi-circles on the ventral abdomen. The spiniform setae covering the dorsal surface resemble the robust setae of *C. mexicana*, but the setae are longer and the setal bases are more visible in *C. mexicana*. As this is a monotypic genus, we do not provide separate generic and species diagnoses. Refer to Unruh & Gullan (2008) for detailed descriptions of the species and genus.

### ***Echinicerya anomala* Morrison**

*Echinicerya anomala* Morrison, 1930: 18.

**Unmounted material.** Adult female living exposed on host during growing period. Female covered with white secretion and with one median incomplete row of conspicuous, elongate, truncate-conical tufts dorsally; one complete marginal row of short truncate-conical tufts, and an almost complete intermediate row of similar tufts on each side; colour of denuded body in life coral-red, but varying in shade. Largest dimensions when covered with white secretion 9 mm long, 5 mm wide and 5 mm high. Eggs deposited beneath body of female that becomes concave as oviposition progresses (adapted from Morrison, 1930).

**Slide-mounted material.** Adult female elliptical, 5.5–8.4 mm long, 4.3–6.4 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for tribe, derm at atrial opening with cluster of 20–25 multilocular pores, each with bilocular to trilocular centre and 4–8 outer loculi. Spiniform setae covering dorsal surface, forming marginal clusters and medial longitudinal row on abdomen; absent from medial clusters of pores on head and thorax; scattered over entire surface of ventral head, thorax and margins of abdomen. Hair-like setae scattered amongst spiniform setae on dorsal surface and ventral surface, longest around margins and scant in transverse rows on ventromedial to submedial abdomen. Flagellate setae distributed as for tribe. Simple multilocular pores, each 10–14 µm in diameter, with bilocular, trilocular or quadrilocular centre and 6–10 outer loculi, forming medial clusters on dorsal head and thorax, submedial clusters on each side of head and also present surrounding small, sclerotized patches of derm arranged in transverse rows on abdomen and scattered amongst setae on marginal to submarginal ventral head, meso- and metathorax, and in marginal clusters on all body segments. Simple multilocular pores, each 10–12 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered on ventromedial head and prothorax. Simple multilocular pores, similar to vulvar pores, each 13–15 µm in diameter, with bilocular centre and 5–10 outer loculi, forming transverse rows on ventromedial to submedial abdomen. Ovisac band absent. Marsupium absent. Vulvar opening surrounded by short spiniform setae and typical multilocular pores each 14–16 µm in diameter with bilocular to trilocular centre and 8–12 outer loculi. Cicatrices each circular to slightly elliptical, 20–40 arranged in 2 lateral longitudinal rows on each side of abdomen, smaller cicatrices make up inner longitudinal row. Abdominal spiracles in 3 pairs on abdominal segments VI–VIII; multilocular pores absent from derm at each spiracular opening. Anal opening and anal ring as for tribe, except derm surrounding anal opening sclerotized; anal opening surrounded by spiniform setae and typical multilocular pores, each 13–14 µm in diameter, with bilocular to trilocular centre and 10–12 outer loculi.

First-instar nymph as for tribe except in the following features: abdominal spiracles in 3 pairs, anal tube with ring of 9 pores, each side of dorsal metathorax and each dorsal abdominal segment with a submedial row of 3–5 multilocular pores, and 5 pairs of long hair-like setae at abdominal apex.

**Type data.** GUATEMALA: Quirigua, ex *Acacia*, 16.iii.1928 (*F. Schrader*); ex *Acacia* sp., Spring 1929 (*S. Hughes-Schrader*).

**Type material.** **Lectotype** designated by Unruh & Gullan (2008: 36): ad ♀ (USNM). **Paralectotypes:** 1 2<sup>nd</sup>-instar nymph, 1 1<sup>st</sup>-instar nymph (one slide) (USNM); ad ♀, 1 2<sup>nd</sup>-instar nymph and 1 1<sup>st</sup>-instar nymph (one slide) (USNM); adult ♂ (USNM).

**Taxonomic notes.** Refer to Unruh & Gullan (2008) for detailed information about type material.

## ***Gigantococcus* Pesson & Bielenin**

*Gigantococcus* Pesson & Bielenin, 1966: 219. Type species: *Icerya maxima* Newstead.

The third largest genus in the Iceryini, *Gigantococcus*, now contains 19 species restricted to the Afrotropical region. The adult females of all species have compound multilocular pores on the derm. Despite the implication of the generic name, the adult females of some species are not very large and can be as small as 4.0 mm long. Adult females of *Gigantococcus* either form an ovisac that extends posteriorly from the body or have a simple waxy flap covering the ventral abdomen, or marsupium that appears as a semi-circle or winged V-shape.

### Generic description of adult female and first-instar nymph of *Gigantococcus*

Slide-mounted adult female elongate to elliptical, 4.8–13.8 mm long, 3.0–10.7 mm wide. Eyes and mouthparts as for tribe. Antennae as for tribe, 9 to 11 segmented. Legs as for tribe. Mesothoracic spiracles typically much smaller than metathoracic spiracles, pores absent or present on derm at opening of atrium. Hair-like setae distributed as for tribe; setae often dense on ventral head and thorax. Simple multilocular pores of various types present across all body segments. Compound pores of various types scattered across all body segments. Ovisac band absent or present. Marsupium absent or, if present, marsupial band forming V-shape or incomplete circle of setae and simple multilocular pores with bilocular to trilocular centre, derm becoming sclerotized at maturity. Cicatrices numbering 1 or 3. Abdominal spiracles in 3 pairs on abdominal segments VI–VIII. Anal ring simple, anal opening as for tribe.

Slide-mounted first-instar nymph as for tribe except for the following features: abdominal spiracles in 3 pairs; anal tube with ring of 6 multilocular pores; each side of dorsal metathorax and each abdominal segment with submedial row of 1–3 pores; long hair-like setae at abdominal apex in 2 or 3 pairs.

### ***Gigantococcus* species groups**

#### ***Gigantococcus alboluteus* group**

Three species, *Gi. alboluteus*, *Gi. pattersoni* and *Gi. schoutedeni*, closely resemble one another. The ventral surface of the adult females of all three species has compound multilocular pores with an 8 to 12 lobed centre and 6–8 elongate reniform outer loculi. *Gigantococcus schoutedeni* can be separated from the other two by the absence of large compound pores, each with a bilocular to trilocular centre and 8–12 reniform outer loculi. *Gigantococcus alboluteus* and *Gi. pattersoni* differ by the density of these compound pores: *Gi. alboluteus* has 3–6 of these pores in marginal clusters on the head and thorax but *Gi. pattersoni* has only one or two. Also, pore density in the ovisac band of *Gi. alboluteus* is less than that of *Gi. pattersoni*.

#### ***Gigantococcus ewarti* group**

Four species, *Gi. euphorbiae*, *Gi. ewarti*, *Gi. gowdeyi*, and *Gi. madagascariensis*, were described as forming a marsupium at maturity. A fifth species, *Gi. longisetosus*, forms a marsupium, but Newstead (1911) did not describe this structure in his original description. These species have identical pores, but are widely distributed across the Afrotropical region (South Africa, Nigeria, Uganda, Madagascar and Tanzania, respectively) and we cannot confidently synonymize all of them without further study. Three other species, *Gi. bicolor*, *Gi. cajani* and *Gi. caudatus* (first collected in Ghana, Nigeria and Uganda, respectively) also closely resemble one

another and were described originally as lacking an ovisac or marsupium (Newstead), but examination of the type material of *Gi. bicolor* and *Gi. caudatus* reveals that they are teneral adult females that had not yet fully formed the marsupium. *Gi. cajani* was described as an adult female from immature specimens and is possibly a synonym of a member of this group. We compared the third-instar nymph of *Gi. cajani* and *Gi. gowdeyi* and found them to be identical, but refrain from synonymizing them without further information. In the key to species, we separate the former five species from the latter three species by the length and density of hair-like setae around the margin of the body. In life, *Gi. euphorbiae* and *Gi. gowdeyi* are described as covered in a thick waxy secretion, and *Gi. madagascariensis*, *Gi. bicolor*, *Gi. caudatus*, and *Gi. ewarti* are described as having waxy tufts forming longitudinal rows. Newstead commented that the specimens of *Gi. longisetosus* were too badly damaged for him to give an adequate description of the waxy secretion.

### Other *Gigantococcus* species

The remaining *Gigantococcus* species (*Gi. bimaculatus*, *Gi. brachystegiae*, *Gi. maximus*, *Gi. nigroareolatus* and *Gi. theobromae*) do not resemble one another nor do they resemble any other *Gigantococcus* or iceryine species. Each species has unique compound multilocular pores not seen in any other species, except for *Gi. brachystegiae* and *Gi. theobromae*, which have unique simple multilocular pores in addition to common compound pores. Refer to the comparison section for each of these species for a discussion of unique features. We were unable to examine material of *Gi. rodriguessi*, *Gi. splendidus* and *Gi. sulfureus*. The original descriptions are not sufficient enough for us to place any of these species into groups.

### Key to *Gigantococcus* species based on the adult females (not including *Gi. cajani*, *Gi. ewarti*, *Gi. rodriguessi*, *Gi. splendidus* or *Gi. sulfureus*)

- 1 Ovisac band present. Marsupium absent ..... 2
- Ovisac band absent. Marsupium present or absent..... 8
- 2 Adult female very large (>8 mm long, >5 mm wide). All simple multilocular pores in ovisac band, each with a quadrilocular or quinquelocular centre ..... *Gi. maximus*
- Adult female not especially large (4–6 mm long, 3–5 mm wide). All simple multilocular pores in ovisac band, each with a bilocular or trilocular centre ..... 3
- 3 Inner ovisac band composed of simple multilocular pores, each with a bilocular centre only. Compound multilocular pores, each with a quadrilocular or quinquelocular centre and 8–12 rectangular outer loculi, present on ventral derm ..... *Gi. bimaculatus*
- Inner ovisac band composed of simple multilocular pores, each with a trilocular centre. Compound multilocular pores, each with a quadrilocular or quinquelocular centre and 8–12 rectangular outer loculi, absent throughout ..... 4
- 4 Compound pores, each with an 8 to 12-lobed centre and 6–8 elongate reniform outer loculi, present on ventral surface ..... 5
- Compound pores of this structure absent throughout ..... 7
- 5 Compound pores, each with a large trilocular centre and 6–8 reniform outer loculi, present in marginal clusters on head and thorax..... 6
- Compound pores of this structure absent throughout ..... *Gi. schoutedeni*
- 6 Compound pores, each with a large trilocular centre and 6–8 reniform outer loculi, present in marginal clusters of 3 or 4 on head and thorax..... *Gi. alboluteus*
- Compound pores, each with a large trilocular centre and 6–8 reniform outer loculi, present in marginal

- clusters of 1 or 2 on head and thorax ..... *Gi. pattersoni*
- 7 Dorsal surface covered with pores of two types: simple multilocular pores, each with a trilocular centre and 6–9 outer loculi, and compound multilocular pores, each with a 6-lobed centre and 6–8 elongate, slightly reniform, outer loculi ..... *Gi. nigroareolatus*
- Dorsal surface covered with pores of one type only: multilocular pores, each with a trilocular centre and distinctive elongate profile. Compound multilocular pores, each with a 6-lobed centre and elongate, slightly reniform, outer loculi absent ..... *Gi. brachystegiae*
- 8 Marsupial band forming a sclerotized V-shape with lateral wings. Compound multilocular pores covering dorsal surface, each 17–20 µm in diameter, with a trilocular (sometimes bilocular) centre and 4–6 outer loculi (loculi arranged in pairs)..... *Gi. theobromae*
- Marsupial band forming sclerotized semi-circle. Simple multilocular pores covering dorsal surface smaller, each 10–12 µm in diameter, with a trilocular centre and 6–9 outer loculi ..... 9
- 9 Setae on most antennal segments and around margin very long, each up to 1500 µm long .....  
..... *Gi. gowdeyi*, *Gi. madagascariensis*, *Gi. bicolor*
- Setae on antennae and around margin not especially long, only 900–1000 µm .....  
..... *Gi. caudatus*, *Gi. euphorbiae*, *Gi. longisetosus*

### ***Gigantococcus alboluteus* (Cockerell)**

*Icerya seychellarum albolutea* Cockerell, 1898b: 259.

*Icerya albolutea* (Cockerell); Cockerell (1902a: 257).

*Gigantococcus alboluteus* (Cockerell); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female dark red, "resting" on a cushion of yellow and white cotton. Dorsum entirely covered with bright yellow cotton and thick tufts of around margin; this wax white ventrally and yellow dorsally; ovisac not well-formed, represented by a loose, cottony secretion (adapted from Cockerell, 1898b).

**Slide-mounted material.** Adult female oval, 4.6–5.5 mm long, 3.0–3.5 mm wide (lectotype about 4.6 mm long, 3.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; posterior spiracles much larger than anterior spiracles. Hair-like setae distributed as for genus, longest in marginal clusters. Flagellate setae dense on ventral head and thorax, forming sparse transverse rows on ventromedial abdomen. Simple multilocular pores, each 10–12 µm in diameter, with trilocular or quadrilocular centre and 6–8 outer loculi, scattered across dorsal surface and ventral margins, forming mid-dorsal clusters on head and thorax. Simple multilocular pores, each 9–10 µm in diameter with trilocular, quadrilocular, quinquelocular or hexalocular centre and 4–8 widely spaced outer loculi, scattered on ventromedial head and thorax. Compound multilocular pores, each 15–20 µm in diameter, with bilocular or trilocular centre (appearing bilobed or trilobed) and 8–9 reniform outer loculi, in marginal cluster of 3–6 on each segment of head and thorax. Ovisac band made of simple multilocular pores of two types: (i) larger pores forming inner ovisac band 3–5 pores wide, each pore 10–12 µm in diameter, with trilocular to quadrilocular (rarely quinquelocular) centre with 6–8 outer loculi, and (ii) smaller pores forming outer ovisac band 1 or 2 pores wide, each pore 9–10 µm in diameter, with square or star-shaped centre and 6–8 outer loculi. Compound multilocular pores, each 13–16 µm in diameter, with 8 to 12-lobed centre and 6–10 reniform outer loculi, arranged around perimeter of ovisac band, except anteromedially, densest around margin. Simple multilocular pores, similar to vulvar pores, each 13–14 µm in diameter, with trilocular centre (appearing oval) and 6–8 outer loculi, forming transverse rows on ventromedial to submedial abdomen. Vulvar opening as for genus. Cicatrices round, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal tube as for genus; anal opening surrounded by robust hair-like setae and typical multilocular pores, each with bilocular

centre and 16–18 elongate outer loculi.

**Type data.** NIGERIA: Lagos, ex *Annona squamosa* (H. Strachan).

**Type material.** Lectotype here designated: ad ♀, “9802./*Icerya/albolutea*./Ckll. TYPE./on *Anona/squamosa*/Lagos./(Dr. Strachan.)/con. T.D.A. Cockerell/Posted May 26, 1903.” (USNM). **Paralectotypes:** dry material (USNM).

**Other material examined.** REPUBLIC OF LIBERIA: ad ♀, “*Icerya/albolutea* Ckll./on rose leaf/Cape Mount, Liberia/C.C. Blickenstaff/and Mac. Coll./2–17–53–16/–53–1240” [slide also has an ad ♀ of *Gi. nigroareolatus* on left side] (USNM).

**Taxonomic notes.** Refer to the *Gi. alboluteus* group for discussion of similar species.

The lectotype is partially destroyed, but mouthparts, three legs and the anterior edge of the ovisac band are in good condition. The description of the slide-mounted adult female is based on a single female, collected in Liberia (collection details above in "Other material examined"), that has an ovisac band and pores matching that of the lectotype.

### ***Gigantococcus bicolor* (Newstead)**

*Palaeococcus bicolor* Newstead, 1917: 5.

*Crypticerya bicolor* (Newstead); Vayssière (1926: 313).

*Gigantococcus bicolor* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered with tufts of white or yellow wax, arranged in seven longitudinal rows, a short median row plus three others on each side, lateral rows continuous and intervening spaces with granular wax. Hair-like setae longest around margins. Ventral abdomen with a thin layer of white wax, not forming an ovisac or marsupium (adapted from Newstead, 1917).

**Slide-mounted material.** Adult female oval (lectotype 5.4 mm long, 4.8 mm wide). Antennae at least 10 segmented (antennae of lectotype broken). Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening with 6–15 simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi. Hair-like setae scattered on derm, longest setae forming dense marginal clusters and with one very long setae on each segment of dorsum in submedial longitudinal rows; long, fine hair-like setae covering ventral surface. Flagellate setae as for genus, densest on ventral head and thorax. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, covering dorsal surface and ventral margin. Marsupium present, shaped as for genus, marsupial band made of simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with trilocular centre and 7–10 outer loculi, surrounding outer edge of marsupial band. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre at 4–8 outer loculi and appearing slightly bluish when stained, scattered on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular or hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8-lobed centre and 6–8 slightly reniform outer loculi, scattered around ventral submargin to margin. Vulvar opening as for genus. Cicatrices hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

First-instar nymph as for genus, except with three pairs of long hair-like setae at abdominal apex, median pair half as long as lateral pairs.

**Type data.** GHANA [=GOLD COAST]: Aburi, ex *Thespesia* sp., 1913 (W.H. Patterson).

**Type material.** Lectotype here designated: ad ♀, “W.H. Patterson Aburi./On Thespesia./No. 736/Newsteads No. 4/88.”/“Brit. Mus./Reg. No. 1916.136”/“Palaeococcus/bicolor, nsp./Newst./Cotype ♀ adult./RN./Co-type [round sticker]” (BMNH). **Paralectotypes:** pupal ♂, 2<sup>nd</sup>-instar nymph, 3<sup>rd</sup>-instar nymph (one slide), “W.H. Patterson Aburi./On Thespesia./No. 736./Newsteads No. 4/88/B.M.N.H. Reg. N.1916.136”/“Palaeococcus/bicolor, nsp./Newst./Cotype ♀ Juv./B.M.N.H. 1916.136” (BMNH); 2 2<sup>nd</sup>-instar nymphs (one slide), “W.H. Patterson Aburi./On Thespesia./No. 736./Newsteads No. 4/88./B.M. 1945, 121”/“Palaeococcus/bicolor, nsp./Newst./Co-type/larvae/co-type ♀ Juv./R.N.” (BMNH); ad ♀, 3 3<sup>rd</sup>-instar nymphs, ca. 5 2<sup>nd</sup>-instar nymphs (dry material), “Palaeococcus bicolor, Newst (Cotypes)/Aburi/Gold Coast. On Thespesia sp. !1913./W.H. Patterson (yellow forms)” (BMNH).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

Newstead (1917: 6) stated that in life this species resembles young adult females of *I. seychellarum*. He stated also that the wax of the females occurs in one of two colours, yellow and white, and that a single specimen either is entirely white or entirely yellow, with no intermingling of colours. The adult female from the dry material appears to have yellow wax on the dorsal surface and white wax on the ventral surface. Although Newstead believed this species formed neither an ovisac nor marsupium, a careful examination of the lectotype female reveals that it is most likely in a teneral state and had just started to form a marsupial band. The vulva and cicatrices are found towards the middle of the ventral abdomen and in other non-ovisac/marsupium species, those features are found near the posterior end. Also on the ventral abdomen is a transverse row of simple multilocular pores with trilocular centre and 6–8 outer loculi. Posterior to this row are compound pores with an 8–12 lobed centre and 8–10 reniform outer loculi. Anterior to the row of the simple multilocular pores are vulvar pores. Often, species that form neither an ovisac nor a marsupium have a single pore type on the ventromedial abdomen, in addition to the typical vulvar pores.

### ***Gigantococcus bimaculatus* (De Lotto)**

*ICERYA BIMACULATA* De Lotto, 1959: 385.

*Gigantococcus bimaculatus* (De Lotto); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered by white cottony wax with two red-orange spots on dorsal surface of thorax, represented by two small areas devoid of any wax covering. Tufts of cottony wax found around margin, tufts shorter and stouter on head and thorax, becoming longer and slender towards posterior end. Ovisac large, rounded, strongly convex, extending beyond posterior wax tassels, which may become broken with age. Total length 10–12 mm (adapted from De Lotto, 1959).

**Slide-mounted material.** Adult female elongate, 5.9–7.4 mm long, 3.1–4.2 mm wide (paratype 6.8 mm long, 3.9 mm wide) widest across abdomen with a slight constriction just above first abdominal segment. Antennae 11 segmented. Eyes and mouthparts as for tribe. Legs slender, as for tribe. Thoracic spiracles as for genus, derm at atrial opening with 3–5 simple multilocular pores, each with trilocular centre and 6 outer loculi. Hair-like setae as for genus, longest around margins. Flagellate setae as for genus, densest on ventral head and thorax. Compound pores, each 10–15 µm in diameter with trilocular, quadrilocular or quinquelocular centre and 10–14 rectangular outer loculi and appearing slightly bluish when stained, forming dense clusters on ventromedial thorax. Compound multilocular pores, each 18–20 µm in diameter, with quadrilocular, quinquelocular or hexalocular centre and 6–8 semicircular outer loculi, forming segmental clusters on submarginal to marginal venter. Simple multilocular pores, similar to vulvar pores, each pore 10–12 µm in diameter, with trilocular centre and 5–12 outer loculi, scattered on ventromedial head. Compound multilocular pores, each 10–11 µm in diameter, with trilocular centre and 3 elongate rectangular outer loculi, scattered on dorsal medial to submedial head and thorax. Simple multilocular pores, each 9–10 µm in diameter, with trilocular

centre and 3–6 outer loculi, scattered across dorsal surface and margin. Ovisac band made of two types of simple multilocular pores: (i) pores forming inner band 3–5 pores wide, each pore 8–10 µm in diameter, with bilocular (rarely trilocular) centre and 10–16 outer loculi, and (ii) pores forming outer band, 1 or 2 pores wide, each pore 8–12 µm in diameter, with trilocular or quadrilocular centre and reniform outer loculi. Simple multilocular pores, similar to vulvar pores, each 10–15 µm in diameter, with bilocular or trilocular centre and 8–12 elongate outer loculi, scattered on ventromedial abdomen. Vulvar opening as for genus. Cicatrices elongate to reniform, numbering 3. Abdominal spiracles as for genus. Anal tube and anal opening as for genus.

**Type data.** KENYA: Nairobi, ex underside of leaves of *Chaetachmae aristata*, 20.viii.1958 and 13.i.1951 (*G. De Lotto*), Collection Nos. 373 and 2393.

**Type material.** **Holotype:** ad ♀ (BMNH) (not examined). **Paratypes:** ad ♀, “3 *Icerya* 373/*bimaculata* DeLotto/ex *Chaetacme* [sic] *aristata*/Nairobi: 13.i.1951/PARATYPE” (USNM); 4 ad ♀♀ (Kenya Department of Agriculture).

**Other material examined.** KENYA: 3 ad ♀♀, 1 3<sup>rd</sup>-instar nymph, Nairobi, ex *Schinus* sp., 27.ii.1993 (*D. Smith*) (QDPI).

**Taxonomic notes.** *Gigantococcus bimaculatus* looks unlike any other species of iceryine. Several compound multilocular pore types on the derm of this species are not found on any other species.

De Lotto (1959: 385) stated in his description that the holotype was deposited at BMNH, a paratype was deposited at USNM and remaining material was deposited in the collection of the Department of Agriculture, Nairobi, Kenya. His description was based on 6 slide-mounted adult females. We were unable to confirm the presence of slides in the Kenyan depository, but presumably, four of the six females were placed there. DeLotto provided a thorough description and illustration of this species. Based on the structure of the ventral pores, DeLotto believed that it approached *Gi. schoutedeni* and differed by the number of pores in the ovisac band. *Gigantococcus bimaculatus* looks unlike any other iceryine species, however, and the pores differ greatly from those of *Gi. schoutedeni*.

### ***Gigantococcus brachystegiae* (Hall)**

*Icerya brachystegiae* Hall, 1940: 488.

*Gigantococcus brachystegiae* (Hall); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered with thick waxy secretion arranged in rounded tufts; one large oval tuft found middorsally, this tuft surrounded by two or three tufts; tufts arranged submarginally at posterior end and with very large, elongate marginal tufts present at posterior end; waxy ovisac slightly fluted with faint transverse striations, equal in length to body of adult female and tapering gently (adapted from Hall, 1940).

**Slide-mounted material.** Adult female oval (lectotype 7.0 mm long, 7.3 mm wide). Antennae 10 or 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles with very large atria; posterior spiracles much larger than anterior spiracles; derm outside atrium with simple multilocular pores, each with trilocular centre and 3–6 outer loculi. Hair-like setae covering derm, longest around margins and between antennae. Flagellate setae scattered over derm, densest on ventral head and thorax. Simple multilocular pores, each 11–12 µm in diameter, with trilocular centre (rarely quadrilocular) and 6 outer loculi and distinct profile with elongate edges, covering dorsal surface and ventral margin. Ovisac band made of simple multilocular pores of two types: (i) larger pores forming inner band 6–9 pores wide, each pore 11–12 µm in diameter, with trilocular or quadrilocular centre and 8 or 9 outer loculi, and (ii) smaller pores forming outer band 2–4 pores wide, each pore 6–8 µm in diameter, with trilocular or quadrilocular centre and 3–5 reniform outer loculi. Compound multilocular pores, each 10–12 µm in diameter, with quinquelocular or hexalocular centre and 5–7 elongate reniform outer loculi covering submarginal head, thorax and abdomen and ventromedial to submedial met-

athorax. Simple multilocular pores, each 10–12 µm in diameter, with quinquelocular or hexalocular centre and 4–6 outer loculi, scattered on ventromedial head, prothorax, mesothorax and abdomen. Vulvar opening as for tribe. Cicatrices elongate, numbering 3, subequal in size. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** ZIMBABWE [=RHODESIA]: Mazoe, ex *Brachystegia* sp., 9.x.1927.

**Type material. Lectotype** here designated: ad ♀, [etched in glass] “*Icerya/brachystegiae/Hall/Brachystegiae/sp/Mazoe/[unintelligible writing] 9/10/27*”/[label] “PARATYPE/W.J. Hall/1 1.1.39/BM–1958–579” (BMNH). **Paralectotypes:** ad ♀, [etched in glass] “*Icerya/brachystegiae/Hall/Rhodesia/other/particulars/mislaid*”/[label] “TYPE/W.J. Hall/i.i.39” (BMNH); 5 1<sup>st</sup>-instar nymphs (one slide), [etched in glass] “*Icerya/brachystegiae/Hall/Brachystegiae/sp/Mazoe/WH [?] 9/10/27/larvae/77*” (BMNH); 7 1<sup>st</sup>-instar nymphs (one slide), [etched in glass] “*Icerya/brachystegiae/Hall/Rhodesia/Other particulars/mislaid/larvae/ex type specimen/same as 77*”/[label]Brit.Mus./1958–229” (BMNH).

**Taxonomic notes.** The dorsal surface is covered with simple multilocular pores, each with a trilocular centre and 6 outer loculi and with a distinctive profile. The profile is elongate with pointed tips. This species also has compound multilocular pores that resemble the pores of *Gi. maximus*.

Hall did not designate a holotype or paratypes in his original description. The slide we are designating as lectotype has “PARATYPE” written on it. We chose this slide rather than the slide with “TYPE” written on it because the latter slide has incorrect collection data. Both the lectotype and paralectotype have broken antennae, so we cannot be sure if the antennae are 10 or 11 segmented.

### *Gigantococcus cajani* (Newstead)

*Palaeococcus cajani* Newstead, 1917: 7.

*Crypticerya cajani* (Newstead); Vayssière (1926: 315).

*Gigantococcus cajani* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Third-instar female covered in pure white wax arranged in distinct tufts as follows: margin with 13–14 short and rounded tufts packed closely together, followed by submarginal constriction and another row of waxy tufts; anterior portion with cluster of tufts. Flocculent secretion present beneath body (adapted from Newstead, 1917).

**Slide-mounted material.** Third-instar female oval (lectotype 3.8 mm long, 3.0 mm wide). Antennae 8 or 9 segmented. Eyes and mouthparts as for tribe. Legs subequal, robust. Thoracic spiracles as for genus; derm outside atrial opening with 1–4 simple multilocular pores, each 9–11 µm in diameter, with trilocular centre and 6–8 outer loculi. Hair-like setae as for genus, longest sparsely scattered around margin, densest at posterior. Flagellate setae as for genus. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi, covering dorsal surface and ventral margin. Simple multilocular pores, each 9–10 µm in diameter, with bilocular (appearing reniform) or trilocular centre and 4–6 outer loculi scattered on ventromedial derm. Simple multilocular pores, each 10–11 µm in diameter, with quinquelocular or hexalocular centre and 6–8 outer loculi, scattered around ventral submargin. Cicatrices oval, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube not visible on specimen; anal opening surrounded by typical multilocular pores, each 10–11 µm in diameter with bilocular or trilocular centre and 8–10 elongate outer loculi.

**Type data.** [S.] NIGERIA: Agege, ex pigeon pea [= *Cajanus cajan*], 1914 (*Dr. W.A. Lamborn*).

**Type material. Lectotype** here designated: 3<sup>rd</sup>-instar nymph, “I.B.E./S. Nigeria: Agege/On Pigeon pea: 1914/Dr. W.A. Lamborn/223. 32/B.M. 1916–190. 205”//“*Palaeococcus/cajani*, Newst/Type ♀/Type H.T. [round sticker]/R.N. B.M.N.H. 1916–190.” (BMNH).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

Newstead (1917) believed that he was describing an adult female but he described and illustrated 9-segmented antennae. Presumably, he placed this species in *Palaeococcus* originally because of the lack of an ovisac. *Gigantococcus cajani* is placed in the *Gi. ewarti* group based on the shape of the pores that resemble the multilocular pores present in other third-instar females in the group. This species is a possible synonym of another species in the group.

### ***Gigantococcus caudatus* (Newstead)**

*Palaeococcus caudatus* Newstead, 1917: 6.

*Steatococcus caudatus* (Newstead); Vayssière (1926: 307).

*Crypticerya caudatus* (Newstead); Morrison (1928: 203).

*Gigantococcus caudatus* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered with short white waxy tufts arranged in seven rows; median row broadest and lateral rows smaller, appearing continuous around margin; marginal row apparently hidden by submarginal row. Long, hair-like setae project beyond waxy covering, especially at anterior margin. Posterior end narrow with long white waxy tassel, appearing tail-like. Ovisac absent (adapted from Newstead, 1917).

**Slide-mounted material.** Adult female oval (lectotype 4.2 mm long, 2.5 mm wide). Antennae 11 segmented, segments IV and V appear fused. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm outside atrium with 10–20 pores, each pore 10–11 µm in diameter with bilocular or trilocular centre and 4–6 outer loculi. Hair-like setae covering derm, longest around margins, especially at posterior abdomen. Flagellate setae scattered on derm, densest on ventral head and thorax. Simple multilocular pores, each 10–11 µm in diameter, with bilocular (appearing reniform) or trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, covering dorsal surface and ventral margin. Marsupium present, shaped as for genus, marsupial band made of simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores on outer edge of marsupial band, each 10–11 µm in diameter with trilocular centre and 7–10 reniform outer loculi. Simple multilocular pores, each with bilocular or trilocular centre and 4–8 outer loculi, on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular, hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8–12 lobed centre and 6–8 slightly reniform outer loculi, scattered on ventral submargin to margin. Vulvar opening as for genus. Cicatrices hour-glass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** UGANDA: Entebbe, ex croton, 13.viii.1912 (C.C. Gowdey).

**Type material.** **Lectotype** here designated: ad ♀, “Col. Off./Ent. Res. Com. T.A./4359./On Crotons./Entebbe. Uganda./13.viii.12. C.C. Gowdey./Newsteads No. 18/8./BM 1945, 121”//“*Icerya/caudata*/Newst./Adult (Cotype)/♀ + ♀ Juv.” (BMNH). **Paralectotypes:** exuviae of 3<sup>rd</sup>-instar nymph (same slide as lectotype); ad ♀, 2<sup>nd</sup>-instar nymph (1 slide), “Col. Off./Ent. Res. Com. T.A./4359./On Crotons./Entebbe Uganda./13.viii.12. C.C. Gowdey./Newstead No. 18/8./BM 1945, 121”//“*Icerya/caudata*/Newst/Co-type ♀/+ young ♀/Keep” (BMNH); 2 ad ♀♀ (one slide), “On CROTONS./Entebbe, Uganda./13.viii.1915./C.C. Gowdey./1913.362”//“*Icerya/caudatum*/Newst./Mounted from/material named by/Prof. Newstead./7.x.1915.” (BMNH).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

One of the paralectotype slides of *P. caudatus* is labelled 13.viii.1915 instead of 13.viii.1912. The material was mounted on 7.x.1915 and presumably, the incorrect date is a transcriptional error on the part of the label-maker. We examined the type material of this species and believe that the adult female forms a marsupium.

The lectotype is a teneral adult female.

### ***Gigantococcus euphorbiae* (Brain)**

*Icerya euphorbiae* Brain, 1915: 167.

*Steatococcus euphorbiae* (Brain); Morrison (1928: 208).

*Gigantococcus euphorbiae* (Brain); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female an orange-red colour, covered in thick waxy secretion not divided into distinct masses; as adult female matures, wax towards margin and posterior end breaks away from body, which causes the appearance of waxy groups (adapted from Brain, 1915).

**Slide-mounted material.** Adult female oval, 5.9–8.0 mm long, 4.4–5.0 mm wide (lectotype 5.9 mm long, 4.4 mm wide). Eyes, mouthparts and legs as for tribe. Antennae 10 segmented. Thoracic spiracles as for genus; derm outside atrium with 6–20 pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Hair-like setae covering derm, longest around margins, especially at posterior abdomen. Flagellate setae scattered on derm, densest on ventral head and thorax. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, covering dorsal surface and ventral margin. Marsupium present, shaped as for genus, marsupial band made of simple multilocular pores, each 8–10 µm in diameter with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with trilocular centre and 7–10 outer loculi, scattered around outer edge of marsupial band. Simple multilocular pores, each with bilocular or trilocular centre at 4–8 outer loculi, scattered on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular, hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8–12 lobed centre and 6–8 slightly reniform outer loculi, scattered around ventral submargin to margin. Vulvar opening as for genus. Cicatrices hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** SOUTH AFRICA: Cape Province, East London, ex *Euphorbia* tree, 1898 (*C.P. Lounsbury*) and same data, except i.1915 (*J. L. King*).

**Type material.** **Lectotype** here designated: ad ♀, "*Icerya euphorbiae* Brain./on Tree *Euphorbia*./E. London. C.P./Jan. 1915./- ♀ Type -"/"7./C.K.B." (USNM). **Paralectotypes:** ad ♀, "*Icerya euphorbiae* Brain/on Tree *Euphorbia*./E. London C.P./Jan. 1915/-Paratype-"/"7./C.K.B." (USNM); 6 first-instar nymphs (one slide), same data as lectotype, except, "Larvae -Type -" instead of "- ♀ Type -" (USNM); additional material (SANC).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

The lectotype slide has a piece of paper included in the slide envelope which reads, "Type Slide of: ♂ + ♀./49. *Icerya euphorbiae* Brain/Cocc. S.A.I. p. 167, 168 Coll. No: 7." The slide, however, does not have a slide-mounted male. The slide with 6 first-instar nymph paralectotypes has a piece of paper included in the slide enveloped and reads, "Type Slide of Larvae of/49 *Icerya euphorbiae* Brain/Cocc. S.A.I. 167.168 Coll: No: 7". Brain's description of the adult male is based on specimens mounted by Claude Fuller in 1898 and his description of the male puparium is taken directly from Fuller's notes (Brain, 1915: 103). This species is described from two different collections spaced 17 years apart. The material at USNM is from the 1915 collection only and presumably, the material at SANC is from the 1898 collection and includes the adult male.

### ***Gigantococcus ewarti* (Newstead)**

*Icerya ewarti* Newstead, 1896: 132.

*Crypticerya ewarti* (Newstead); Cockerell (1899a: 390).

*Palaeococcus ewarti* (Newstead); Cockerell (1902a: 233).

*Crypticerya ewarti* (Newstead); Vayssière (1926: 313) [not Morrison (1928: 203) as in Ben-Dov (2005: 156)].

*Gigantococcus ewarti* (Newstead); Unruh & Gullan (2008: 37).

**Diagnosis (adapted from Newstead, 1896).** Adult female with double row of waxy extensions around margin, dorsal surface covered with wax. Derm on ventral surface becoming shrivelled, forming a cavity into which eggs are laid. Body widely oval, nearly circular, convex behind. Antennae 10 segmented, with short hair-like setae on each segment. Legs short, as for genus. Ovisac absent. Marsupium absent. Dorsal surface with scattered setae and pores with quadrilocular centre. Ventral surface with longer, denser setae than on dorsal surface and pores of the same structure, but smaller than pores on dorsum.

First-instar nymph with two pairs of very long setae at abdominal apex.

**Type data.** NIGERIA: Lagos, Lekie, ex "Pephet", 24.vii.1895 (*J.W. Ewart*).

**Type material. Syntypes:** ad ♀, ad ♂ (partial), 2<sup>nd</sup>-instar nymph, 1<sup>st</sup>-instar nymph (BMNH?).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

We were unable to examine the type material of this species because it is not present in the collection at BMNH (J.H. Martin, BMNH, pers. comm.). Despite the inability to examine specimens, this species was transferred to *Gigantococcus* by Unruh & Gullan (2008) based on the shape of the pores illustrated by Newstead (1896: 132).

### ***Gigantococcus gowdeyi* (Newstead)**

*Aspidoproctus gowdeyi* Newstead, 1920: 177.

*Steatococcus gowdeyi* (Newstead); Vayssière (1926: 307).

*Gigantococcus gowdeyi* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered with dense, felted layer of dusky white and pale wax more or less divided into segments corresponding to segmentation of the body; ventral surface castaneous, slightly mealy and covered with woolly filaments. Marsupium well developed, with waxy operculum absent, apparently broken away (adapted from Newstead, 1920).

**Slide-mounted material (based on non-type material).** Adult female oval (lectotype third-instar female 2.2 mm long, 2.0 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm outside atrium with 6–20 pores, each pore 10–11 µm in diameter, with bilocular centre and 4–6 outer loculi. Hair-like setae covering derm, forming marginal clusters of very long, robust hair-like setae, longest and densest at posterior abdomen. Flagellate setae scattered on derm, densest on ventral head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, covering dorsal surface and ventral margin and forming medial clusters. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi on ventromedial head and thorax. Marsupium present, marsupial band made of simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with trilocular centre and 7–10 outer loculi, scattered around outer edge of marsupial band. Simple multilocular pores each with bilocular or trilocular centre and 4–8 outer loculi scattered on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular, hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8–12-

lobed centre and 6–8 slightly reniform outer loculi, scattered on ventral submargin to margin. Vulvar opening as for genus. Cicatrices hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** UGANDA: Kampala, ex plumbago and rose, 15.x.1918 (*C.C. Gowdey*).

**Type material.** **Lectotype** here designated: 3<sup>rd</sup>-instar nymph, “211 (I.B.E.)/Uganda:/Kampala on/Plumbago and/roses. 15.x.18./C.C. Gowdey”/“?Aspidoproctus/gowdeyi,/Newst./Parasitized/From flocculent sac/R.N. BM 1945, 121” (BMNH). **Paralectotypes:** 3 2<sup>nd</sup>-instar nymphs (one slide), “I.B.E. 211/Uganda: Kampala/‘on Plumbago and/roses’ 15.x.18./C.C. Gowdey”/“?Aspidoproctus/gowdeyi,/Newst./BM/R.N. 1945, 121” (BMNH); 3 2<sup>nd</sup>-instar nymphs (one slide), “I.B.E. 211|1919.86./Uganda: Kampala,/‘on Plumbago and/roses.’ 15.x.18./C.C. Gowdey”/“?Aspidoproctus/gowdeyi,/Newst./R.N. B.M. 1919.86” (BMNH); 2 2<sup>nd</sup>-instar nymphs (one slide), “I.B.E. 211|1919/86./Uganda, Kamp–/–ala, on Plumbago/and roses,/15.x.18./C.C. Gowdey”/“?Aspidoproctus/gowdeyi/Newst/from flocculent sacs/1 ♀ [unintelligible writing]/R.N. B.M. 1919.86.” (BMNH); 1 3<sup>rd</sup>-instar nymph, 1 2<sup>nd</sup>-instar nymph (one slide), “Aspidoproctus/gowdeyi Newst/Kampala, Uganda/13 x 1918/Stanford University/C.C. Gowdey/Natural History Museum” (BME); dry material, “On His Majesty’s Service./Aspidoproctus gowdeyi Newst./Kampala, Uganda, 15.x.1918/C.C. Gowdeyi./Uganda Protectorate.” (BME bar code 17 24 107640).

**Other material examined.** GHANA: ad ♀, Volta Region, Kyabobo National Park, ex *Cassia* sp., 15.vi.2005 (*T. Kondo*) (BME, CMU133); ad ♀, Volta Region, Nkwanta, ex *Tectona grandis*, 15.vi.2005 (*T. Kondo*) (BME, CMU135); ad ♀, Volta Region, 8 km from Nkwanta, ex leaves of weed, 17.vi.2005 (*T. Kondo*) (BME, CMU134).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

The lectotype third-instar nymph and paralectotype second-instar nymph are parasitized by a larval *Cryp-tochaetum* sp. and this could cause abnormalities in the cuticular features of the specimen. The description is based on the adult females listed under “Other material examined”. Newstead’s original description of the adult female of this species is very brief, but he described a well-developed marsupium. The type material we examined from the BMNH collection included non-adult female specimens only.

### ***Gigantococcus longisetosus* (Newstead)**

*Icerya longisetosa* Newstead, 1911: 15.

*Gigantococcus longisetosus* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female oval, covered in white wax, margin of body with fringe of very long setae, longest setae at anterior and posterior margins where twice length of antennae and two-thirds width of body (adapted from Newstead, 1911).

**Slide-mounted material.** Adult female oval, lectotype 6.0 mm long, 4.0 mm wide. Antennae 11 segmented. Eyes and legs as for tribe. Mouthparts missing from lectotype. Thoracic spiracles as for genus; derm outside atrium with 0–12 pores, each pore 10–11 µm in diameter, with bilocular centre and 4–6 outer loculi. Hair-like setae covering derm, forming marginal clusters of long, hair-like setae, longest at anterior head. Flagellate setae scattered on derm, densest on ventral head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre and 6–9 outer loculi, covering dorsal surface and ventral margin. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Marsupium present, marsupial band made of simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with trilocular centre and 7–10 outer loculi, scattered around outer edge of marsupial band. Simple multilocular pores, each with bilocular or triloc-

ular centre at 4–8 outer loculi, scattered on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular, hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8–12-lobed centre and 6–8 slightly reniform outer loculi, scattered on ventral submargin to margin. Vulvar opening as for genus. Cicatrices hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

**Type data.** TANZANIA [=GERMAN EAST AFRICA ]: Amani, ex *Acacia* sp. (*S.G. Vosseler*).

**Type material. Lectotype** here designated: ad ♀, “Cocciden von Acacia/mit Larven./18.xi.03.”/“Zoolog. Museum Berlin./Fundort: D. O. Afrika/Amani/Sammler. Prof. Vosseler S. G./fe.am XI.03/Jr. Nu 938/06” (ZMB).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for a discussion of similar species.

The World Catalogue listed BMNH (type no. 938/06) as the type depository of this species, but the material is located at ZMB (J.H. Martin at BMNH and J. Deckert at ZMB, pers. comm.).

Newstead originally described an adult female and first-instar nymph and his only illustrations are of the first-instar nymph and enlargements of two pore types. He described 9 antennal segments in the adult female, but we counted 11 segments. He did not describe a marsupial opening on the venter, a feature which is often quite obvious even without the aid of a microscope.

The lectotype of this species was slide-mounted by P.J. Gullan from type material housed at ZMB. Although Newstead described a first-instar nymph (and presumably a third-instar nymph), only a single damaged adult female remains.

An undescribed species of *Gigantococcus* has been misidentified as *I. longisetosa* ever since Newstead (1913) incorrectly identified BMNH specimens collected in Sierra Leone by J.J. Simpson in 1912 as *I. longisetosa*. Newstead’s (1911, 1913) descriptions of *I. longisetosa* emphasise the long marginal setae of the female but this feature is common in several *Gigantococcus* species. The adult female of true *Gi. longisetosus* forms a marsupium and has small compound pores on the ventral surface. The adult female of the undescribed species that has been identified as *I. longisetosa* for the past century forms an ovisac and has unusual compound pores not seen in any other iceryine species.

### ***Gigantococcus madagascariensis* (Mamet)**

*Steatococcus madagascariensis* Mamet, 1951: 233.

*Gigantococcus madagascariensis* (Mamet); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female reddish-brown, covered with thick white waxy secretion arranged in rounded tufts each conspicuously separated from one another; tufts small and short around margin; longer in longitudinal row on middorsum and submedial rows shorter; forming submarginal longitudinal rows; long white pencil of waxy projecting from anal region. Venter covered with mealy secretion, marsupial opening clearly indicated (adapted from Mamet, 1951).

**Slide-mounted material.** Adult female oval, syntypes 4.0–5.6 mm long, 2.7–3.8 mm wide. Antennae 9 to 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm outside atrium with 6–20 pores, each 10–11 µm in diameter with bilocular centre and 4–6 outer loculi. Hair-like setae covering derm, longest in marginal clusters of very long, slightly wavy, robust hair-like setae. Flagellate setae scattered on derm, densest on ventral head and thorax. Simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Simple multilocular pores, each 12–14 µm in diameter, with trilocular (sometimes bilocular or quadrilocular) centre

and 6–9 outer loculi covering dorsal surface and ventral margin. Marsupium present, shaped as for genus, marsupial band made of simple multilocular pores, each 8–10 µm in diameter, with bilocular or trilocular centre and 4–6 outer loculi. Simple multilocular pores, each 10–11 µm in diameter, with trilocular centre and 7–10 outer loculi, scattered around outer edge of marsupial band. Simple multilocular pores, each with bilocular or trilocular centre and 4–8 outer loculi, scattered on ventromedial abdomen (within marsupial cavity). Multilocular pores, each 8–10 µm in diameter, with quinquelocular or hexalocular centre and 5–8 outer loculi, sparsely scattered across ventral abdomen and around ventral submargin to margin. Compound multilocular pores, each 10–11 µm in diameter, with 8–12 lobed centre and 6–8 slightly reniform outer loculi, scattered on ventral submargin to margin. Vulvar opening as for genus. Cicatrices hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae.

Slide-mounted first-instar nymph oval. Antennae with very long hair-like setae at apical segment. Long hair-like setae at abdominal apex in 3 pairs, central pair shorter than lateral pair.

**Type data.** MADAGASCAR: 75 km west of Miandrivazo, on undetermined host, vi.1949 (*R. Paulian*); Tsaratanana Mt. (1500 m), ex *Psiadia tsaratananae*, x.1949; Tsaratanana Mt. (1000 m), ex *Philippia* sp., x.1949 (*R. Paulian*).

**Type material. Syntypes:** ad ♀, “*Steatococcus/madagascariensis* Mamet sp.n./on *Philippia* sp./MADAGASCAR (Tsaratanana Mt./1000 m./x.1949 - Coll. R Paulian”//[label]“HOLOTYPE”//[etched in glass]“MNHM - PARIS/No. 8696/1/[ink]xii” (MNHM); 2 ad ♀♀ (one slide), “MADAGASCAR/Mt. Tsaratanana (1500 m)/On *Psiadia/tsaratananensis*/Coll. R. Paulian/x.1949 No. 75/BM 1964/4/I.I.E. 1934/1131”//“*Steatococcus/madagascariensis*/Mamet/W.J. Hall, det.” (BMNH); additional material (MNHN).

**Taxonomic notes.** Refer to the *Gi. ewarti* group for discussion of similar species.

A syntype slide located at the MNHN is incorrectly labelled holotype as Mamet did not designate a holotype in his original description.

### ***Gigantococcus maximus* (Newstead)**

*Icerya maxima* Newstead, 1914: 301.

*Icerya corticalis* Vayssière, 1926: 321. Synonymy by Pesson & Bielenin (1966: 248).

*Gigantococcus maximus* (Newstead); Pesson & Bielenin (1966: 219).

**Unmounted material.** Adult female very large, dorsal surface covered with white wax arranged as striated lamellae; those in front small and irregularly shaped; median row of short tufts; submedian row broad and curved outwards; marginal series of very long, ribbon-like tassels, becoming curled. Venter with ovisac formed by thin layer of closely-felted secretion attached to sides of body; eggs deposited in space between wax layer and abdomen (adapted from Newstead, 1914).

**Slide-mounted material.** Adult female elongate to elliptical, 8.7–13.8 mm long, 5.2–10.7 mm wide. Antennae 10 or 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, metathoracic spiracles much larger than mesothoracic spiracles, derm at atrial opening with 20–30 simple multilocular pores, each 10–13 µm in diameter, with quadrilocular to quinquelocular centre and 6–8 outer loculi. Patches on dorsum of derm lacking setae and pores, forming medial to submedial transverse bands on all body segments and submarginal patches on metathorax and all abdominal segments. Hair-like setae on dorsal surface associated with compound multilocular pores only; hair-like setae on ventral surface longest between antennae, covering medial to submarginal head and thorax. Flagellate setae distributed as for genus. Multilocular pores of two types present on dorsal surface: (i) compound multilocular pores, each 15–18 µm in diameter, with square or star-shaped centre and 6–10 reniform outer loculi, forming transverse rows on each segment, a longitudinal submarginal row and an incomplete submedial longitudinal row; and (ii) simple mul-

tilocular pores, each 11–13 µm in diameter, with quadrilocular or quinquelocular centre, surrounding compound multilocular pores and bare patches. Compound multilocular pores, similar to compound pores on dorsal surface, scattered on marginal to submarginal ventral head and thorax. Ovisac band made of pores of two types: (i) simple multilocular pores forming inner ovisac band 10–12 pores wide, each pore 11–13 µm in diameter, with quadrilocular or quinquelocular (rarely trilocular) centre and 4–6 outer loculi, and (ii) compound multilocular pores forming outer band, same as on compound pores on dorsal surface. Vulvar opening as for genus, surrounded by simple multilocular pores, each 14–16 µm in diameter, with quadrilocular centre and 10–16 outer loculi. Abdominal segments II–VI with medial to submedial alternating transverse rows of bare derm and compound multilocular pores, each 11–13 µm in diameter, with 8-lobed centre and 9–12 semi-circular outer loculi. Multilocular pores, each 10–11 µm in diameter, with 5 or 6-lobed centre and 6–8 outer loculi, scattered on ventromedial head and clustered on ventromedial thorax. Cicatrices hourglass-shaped, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal ring as for genus; anal opening surrounded by sparse hair-like setae and simple multilocular pores, similar to vulvar pores, with bilocular centre and 10–14 outer loculi.

**Type data.** *Icerya maxima*: GHANA [=GOLD COAST]: Winneba district, Kwanyako, ex *Ficus* sp., 16.xi.1913 (W.H. Patterson). *Icerya corticalis*: DEMOCRATIC REPUBLIC OF THE CONGO [=CONGO BELGE]: Makaïantête, ex bark of undetermined forest tree, xi.1915 (R. Mayné).

**Type material. Syntypes** of *I. maxima*: ad ♀♀, 1<sup>st</sup>-instar nymphs (missing from BMNH). **Syntypes** of *I. corticalis*: ad ♂, additional material? (MNHN).

**Taxonomic notes.** *Gigantococcus maximus* is the largest described iceryine species. It differs from all other species by the presence of large compound multilocular pores with a square or star-shaped centre and reniform outer loculi. Also, the pore type present on the ventromedial abdomen (within the ovisac band) is found in no other species and the pores around the vulvar region have a quadrilocular centre.

The diagnosis is based on material listed in Unruh & Gullan (2008: 38). The syntypes of *I. maxima* are missing from the collection at BMNH and their whereabouts are unknown. Refer for Unruh & Gullan (2008) for detailed information about this species.

### ***Gigantococcus nigroareolatus* (Newstead)**

*Icerya nigroareolata* Newstead, 1917: 8.

*Icerya maynei* Vayssière, 1926: 326. Synonymy by Unruh & Gullan (2008: 38).

*Gigantococcus nigroareolatus* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female elongate (lectotype 5.5 mm long, 3.4 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for genus. Thoracic spiracles as for genus; derm at opening of atrium with flagellate setae and 3–5 simple multilocular pores, each with quadrilocular, quinquelocular to hexalocular centre (appearing cruciform or star-shaped) and 5–7 widely spaced reniform outer loculi. These pores also scattered around mouthparts and medial to submedial head, prothorax and metathorax. Hair-like setae longest around margins and between antennae, scattered on dorsum on all body segments. Flagellate setae as for genus, densest on ventral head and thorax. Ovisac band made of simple multilocular pores, each with trilocular centre and 6–10 outer loculi. Compound multilocular pores, each 15–17 µm in diameter, with hexalocular centre (appearing hexagonal) and 5–7 elongate reniform outer loculi, lining anterior edge of ovisac band and scattered on margin of head and thorax. Pores of two types forming alternating transverse rows on dorsum and marginal abdomen: (i) compound multilocular pores, each with quinquelocular or hexalocular centre and 5–7 elongate reniform outer loculi, and (ii) simple multilocular pores, each with trilocular centre and 8–12 outer loculi. Ventromedial abdomen with alternating transverse rows of (i) simple multilocular pores, each with

bilocular centre and 4 or 5 outer loculi, interspersed with flagellate and hair-like setae and (ii) simple multilocular pores, similar to vulvar and anal pores, with bilocular to trilocular centre and 10–12 outer loculi. Vulvar opening as for genus. Cicatrices large, hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles as for genus. Anal tube and anal opening as for genus.

**Type data.** *Icerya nigroareolata*: UGANDA: Kampala, ex coffee, 4.xi.1913 (C.C. Gowdey); Jinja, ex Croton, 1914 (Dr. R. Van Someren). *Icerya maynei*: DEMOCRATIC REPUBLIC OF THE CONGO [=CONGO BELGE]: Makaïantête, ex *Acalypha*, 20.vii.1917 (R. Mayné).

**Type material. Lectotype** of *I. nigroareolata* here designated: ad ♀, “*Icerya nigroareolata*/Newst/=to Cotype Material/On Coffee/Kampala Uganda/C.C. Gowdy [sic] Colr./Feb 4, 1913/Cooley Coll. 645” (USNM). **Paralectotypes**: 2 ad ♀♀ (same slide as lectotype), 1 2<sup>nd</sup>-instar nymph, (same data as lectotype) (USNM); additional material? (BMNH).

**Syntypes** of *I. maynei*: 2 ad ♀♀, “BELGIAN CONGO/Makaïantête/On *Acalypha*/ Coll. R. Mayné/20/vii/1917/C.I.E. 3777/14501”//“*Icerya maynei*/Vayss. Cotype/Ex Coll. Mus. Nat. Hist Paris/D.J. Williams, det./B17–1958–578” (BMNH); 1 ad ♀, “CONGO (ex Belge)/Makaïentete/20.vii.1917/rep. larve bois/recolore en 1978/6580/2/MNHM – Paris”//“TYPE [label]/*Icerya maynei* Vayss/♀ adulte/probabl. syn. de/nigroareolata/s/*Acalypha*” (MNHM).

**Taxonomic notes.** *Gigantococcus nigroareolatus* has unique compound multilocular pores with a hexagonal centre and elongate reniform outer loculi. These pores form alternating transverse rows on the dorsal surface and clusters around the ventral margin.

The lectotype of *I. nigroareolata* is the female furthest from the original data label. The original description lists two type localities for *I. nigroareolata*, but the only material present in the USNM collection is from coffee in Kampala, Uganda, collected by C.C. Gowdey. The slide with the lectotype ♀ is accompanied by a piece of paper labelled, “not *Pseudococcus* but *Icerya nigroareolata* Newst/=to cotype material”.

### ***Gigantococcus pattersoni* (Newstead)**

*Icerya sulfurea pattersoni* Newstead, 1917: 9.

*Icerya pattersoni* (Newstead); Aisagbonhi, Nwana & Agwu (1985: 24).

*Gigantococcus pattersoni* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female covered with bright yellow waxy secretion; arranged on dorsum in thick tufts, tufts forming long rows around margin. Ovisac well defined, made of white to yellowish wax (adapted from Newstead, 1917).

**Slide-mounted material.** Adult female oval (lectotype 4.9 mm long, 3.2 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for genus. Thoracic spiracles as for genus, posterior spiracles larger than anterior spiracles. Hair-like setae scattered on all body segments, longest in clusters around margin. Flagellate setae dense on ventral head and thorax, forming sparse transverse rows on ventromedial abdomen. Simple multilocular pores, each with trilocular to quadrilocular centre and 6–8 outer loculi, scattered across dorsal surface and ventral margins. Simple multilocular pores, each with trilocular, quadrilocular, quinquelocular or hexalocular centre and 4–8 outer loculi, scattered on ventromedial head and thorax. Compound multilocular pores, each 15–20 µm in diameter, with trilocular (rarely bilocular) centre and 8–9 reniform outer loculi, with only 1 or 2 pores marginal on each segment of head and thorax. Ovisac band made of simple multilocular pores of two types: (i) larger pores forming inner band 3–5 pores wide, each pore with trilocular to quadrilocular (rarely quinquelocular) centre with 6–8 outer loculi, and (ii) smaller pores forming outer band 1 or 2 pores wide, each pore with square or star-shaped centre and 6–8 outer loculi. Compound multilocular pores, each 13–16 µm in diameter, with 6–12-lobed centre and 6–10 reniform outer loculi, scattered around perimeter of ovisac band, except anteromedially, and densest around margin. Simple multilocular pores, similar to

vulvar pores, each with trilocular centre (appearing oval) and 6–8 outer loculi, forming transverse rows on ventromedial to submedial abdomen. Vulvar opening as for genus. Cicatrices round, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal tube as for genus; anal opening surrounded by robust hair-like setae and simple multilocular pores with round centre and 16–18 elongate outer loculi.

**Type data.** GHANA [=GOLD COAST]: Aburi, ex *Tectona* sp. (W.H. Patterson).

**Type material.** **Lectotype** here designated: ad ♀, “W.H. Patterson .Aburi./No.735./Tectona./Newsteads No. 5/88./B.M.N.H. 1916. 136.”/“*Icerya/pattersoni./Newst./Co-type ♀./R.N. B.M.N.H. 1916. 136*” (BMNH).

**Paralectotypes:** ad ♀, 3<sup>rd</sup>-instar nymph (one slide), “W.H. Patterson Aburi./No. 735/Tectona./Newstead’s No. 5/88./BM 1945, 121”/“*Icerya V/pattersoni./Newst./Cotype ♀ and/♀ Juv./R.N.*” (BMNH); ad ♀ (dry material), “*Icerya pattersoni, Newst. Cotype ♀/Aburi. Gold Coast; on Tectona sp. 1913/W.H. Patterson. 1913.*” (BMNH).

**Taxonomic notes.** Refer to the *Gi. alboluteus* group for discussion of similar species.

Newstead (1917) did not explain why he recognised this species as a variety of *Icerya sulfurea* or how he separated it from that species (now *Gigantococcus sulfureus*, see below). He compared the form and arrangement of the waxy tufts with those of *Icerya aegyptiaca* (Douglas).

### ***Gigantococcus rodriguesi* (Castel-Branco)**

*Crypticerya rodriguesi* Castel-Branco, 1952: 23.

*Gigantococcus rodriguesi* (Castel-Branco); Unruh & Gullan (2008: 37).

**Diagnosis (adapted from Castel-Branco, 1952).**—Adult female oval, widest across abdomen with slight constriction between thorax and abdomen. Head and thorax completely coated in granular wax, with visible long, coarse black setae. Abdomen with clear segmentation irregularly coated with granular white wax and with robust black setae in the posterior region forming 4 tufts with 2–6 setae. Not forming an ovisac. Slide-mounted adult female oval. Antennae 10 segmented; each antennal segment with setae. Eyes, mouthparts, thoracic spiracles and legs as for tribe. Long, thick hair-like setae present around margin, densest around head and thorax and longest at posterior abdomen. Setae and multilocular pores covering derm, pores less dense in the middorsal and ventral regions. Internal round sac full of numerous larvae present in abdominal region. Ventral cicatrices numbering 3. Abdominal spiracles as for genus.

First-instar nymph as for genus, except two pairs of long hair-like setae at abdominal apex. More robust setae present on dorsal surface.

**Type data.** MOZAMBIQUE: Nampula, C.I.C.A. experiment station, ex “algodoeiros” [=cotton plants], 16.ix.1948.

**Type material.** **Syntypes:** ad ♀ ♀, 1<sup>st</sup>-instar nymphs (CZLP).

**Taxonomic notes.** We were unable to examine material of this species. Castel-Branco (1952: 26) placed this species in *Crypticerya sensu* Cockerell because he believed it resembled *C. rosae* but with a waxy covering and very long setae. Furthermore, he described an internal ovisac full of “larvae” in the abdominal region, which fits the description of a marsupium. He believed that it could be confused with *Auloicerya*, but placed it in *Crypticerya* because it is covered with pores of shapes and sizes that differ from those of *Auloicerya* (1952: 23). We transferred this species to *Gigantococcus* based on the description of the adult female in life.

### ***Gigantococcus schoutedeni* (Vayssière)**

*Icerya schoutedeni* Vayssière, 1926: 337.

*Icerya tremae* (Vayssière, 1926: 344). Synonymy by Unruh & Gullan (2008: 39).

*Gigantococcus schoutedeni* (Vayssière); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female red-brick in colour, covered with white or yellow wax; wax on dorsum granular; long tufts found around margin, longest at posterior; on venter, ovisac formed by waxy flap of secretion attached to all sides of abdomen (adapted from Vayssière, 1926).

**Slide-mounted material.** Adult female oval, 3.8–5.0 mm long, 3.1–3.6 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, posterior spiracles larger than anterior spiracles. Hair-like setae scattered on all body segments, longest in clusters around margin. Flagellate setae dense on ventral head and thorax, forming sparse transverse rows on ventromedial abdomen. Simple multilocular pores, each with trilocular or quadrilocular centre and 6–8 outer loculi, scattered across dorsal surface and ventral margins, forming middorsal clusters on head and thorax. Simple multilocular pores, each with trilocular, quadrilocular, quinquelocular or hexalocular centre and 4–8 outer loculi, scattered on ventromedial head and thorax. Ovisac band made of simple multilocular pores of two types: (i) larger pores forming inner band 3–5 pores wide, each pore with trilocular to quadrilocular (rarely quinquelocular) centre with 6–8 outer loculi, and (ii) smaller pores forming outer band, 1 or 2 pores wide, each pore with square or star-shaped centre and 6–8 outer loculi. Compound multilocular pores, each 13–16 µm in diameter with 6–12-lobed centre and 6–10 reniform outer loculi, arranged around perimeter of ovisac band, except anteromedially, and densest around margin. Simple multilocular pores, similar to vulvar pores, each pore with trilocular centre (appearing oval) and 6–8 outer loculi, forming transverse rows on ventromedial to submedial abdomen. Vulvar opening as for genus. Cicatrices round, numbering 3, central cicatrix largest. Abdominal spiracles as for genus. Anal tube as for genus; anal opening surrounded by robust hair-like setae and simple multilocular pores, each pore with round centre and 16–18 elongate outer loculi.

**Type data.** *Icerya schoutedeni*: DEMOCRATIC REPUBLIC OF THE CONGO [=CONGO BELGE]: Eala, ex *Acalypha wilkesiana*, vii.1915 (R. Mayné). *Icerya tremae*: DEMOCRATIC REPUBLIC OF THE CONGO [=CONGO BELGE]: Eala, ex coffee (R. Mayné); Kisangani [=Stanleyville], ex *Trema guineensis*, mango, guava, citrus and *Ura* [=Hura] *crepitans*, 1912 (J. Ghesquiere).

**Type material. Syntypes** of *Icerya schoutedeni*: ad ♀, “CONGO (Belge):/Eala VII. 1915/R. Mayné re’c./6581/7/MNHN - Paris/-prepare en 1979/[unintelligible writing]”/“*Icerya schoutedeni* Vays/LECTOTYPE [label]/des. Par Foldi/Fevrier 2001 [label]/♀/s/*Acalypha/wilkesiana*” (MNHN); 2 ad ♀♀ (one slide), “ex. Coll/Museum National/d’Histoire Naturelle/PARIS”/“Co-Type”/“*Icerya* 2404/*schoutedeni* Vayss./ex *Acalypha wilkesiana*/Eala (Belgian Congo): July/coll. R. Mayné 1915/PARATYPE” (BMNH); ad ♀, “VQ/=34/V.Q. Beg. Congo/Eala, on *Acalypha/wilkesiana* Jul 1915/R. Mayné/Stain Acid Fuchsin/win 3/o Pieric”/“*Icerya* nsp./congoensis/Newst/schoutedeni/Vayss./RT.” (BMNH); 2 ad ♀♀, 1 3<sup>rd</sup>-instar nymph (one slide), “V.Q =34/Belgian Congo./Eala, on/*Acalypha wilkes-/iana*, July 1915/R. Mayné”/“*schoutedeni* Vayss./*Icerya* nsp./congoensis./Newst/cotype ♀♀/BM/RV. 1945, 121” (BMNH).

**Syntypes** of *Icerya tremae*: ad ♀, “Stanleyville/J.Ghesquiere/1926/Co-Type/ex. Coll. Museum/National d’Histoire/Naturelle - PARIS”/“*Icerya tremae* s/*Tremae guineensis*/Station Entomologique de Paris/ PARATYPE 2405” (BMNH); 2 ad ♀♀, [written on wood] “*Icerya tremae*/2001/LECTOTYPE/des par Foldi 2001/Eala (Congo B.)/R. Mayné 3 -ix -1912/ex coll. Tervuren/6579/7” (MNHN).

**Other material examined.** REPUBLIC OF SENEGAL: ad ♀, “F.W.AFRICA/Senegal/Eucalyptus/13.5.1966”/“*Icerya/schoutedeni*/Vayss./SN7/C.I.E. 9300.1291/B.M. 1969.27” (BMNH).

**Taxonomic notes.** Refer to the *Gi. alboluteus* group for discussion of similar species.

Refer to Unruh & Gullan (2008) for discussion of this species. A manuscript name of “*Icerya congoensis*” is written on “co-type” slides of *I. schoutedeni* at the BMNH and the name is attributed to Newstead.

### ***Gigantococcus splendidus* (Lindinger)**

*Icerya splendida* Lindinger, 1913: 84.

*Gigantococcus splendidus* (Lindinger); Unruh & Gullan (2008: 37).

**Diagnosis (adapted from Lindinger, 1913).** Adult female oval, broadest across posterior, 5–6 mm long, 4–6 mm wide. Dorsal surface covered with white wax, arranged in tufts; largest tufts around margin, becoming long at posterior. Antennae 11 segmented. Legs as for genus. Ovisac fluted, up to 10 mm long, with waxy tassels projecting from it.

**Type data.** TANZANIA [=GERMAN EAST AFRICA ]: Langenburg, 31.x.1898 (*Dr. Fulleborn*).

**Type material. Syntypes:** ad ♀♀ and 1<sup>st</sup>-instar nymphs. Type material lost (ZMB).

**Taxonomic notes.** We were unable to examine material of this species.

### ***Gigantococcus sulfureus* (Lindinger)**

*Icerya sulfurea* Lindinger, 1913: 85.

*Gigantococcus sulfureus* (Lindinger); Unruh & Gullan (2008: 37).

**Diagnosis (adapted from Lindinger, 1913).** Adult female covered with sulphur-yellow waxy secretion arranged in tufts on dorsal surface; tufts of wax arranged in double row along midline; wax tufts along margins elongate, becoming curled. Antennae 11 segmented. Setae present all over body.

First-instar nymph oval, 1.33–1.50 mm long. Long hair-like setae at posterior abdomen in 2 pairs.

**Type data.** TANZANIA [=GERMAN EAST AFRICA]: Amani, ex *Ficus elastica*, iii.1907 (*Zimmermann*).

**Type material. Syntypes:** ad ♀♀ and 1<sup>st</sup>-instar nymphs. Type material lost (ZMB).

**Taxonomic notes.** We were unable to examine material of this species. The World Catalogue listed Vayssière (1926) incorrectly as providing a description, illustration and distribution for this species (Ben-Dov, 2005: 225). In fact, Vayssière provided a description, illustration and distribution of *I. sulfurea* var. *pattersoni* Newstead, which was elevated later to species rank. Consequently, the World Catalogue cited Vayssière as providing only taxonomy for *I. pattersoni* (Ben-Dov, 2005: 204).

### ***Gigantococcus theobromae* (Newstead)**

*Palaeococcus theobromae* Newstead, 1908b: 154.

*Steatococcus theobromae* (Newstead); Vayssière (1926: 307).

*Gigantococcus theobromae* (Newstead); Unruh & Gullan (2008: 37).

**Unmounted material.** Adult female almost flat, covered in densely felted, bright yellow secretion. Dorsal surface with medial, submarginal and submedial bare patches of derm, medial patches forming longitudinal row, submarginal and submedial patches following outline of body, appearing as dark secretions. Derm surrounding anal opening sclerotized (Newstead, 1908b).

**Slide-mounted material.** Adult female oval (lectotype 4.5 mm long, 3.2 mm wide, widest across abdomen). Antennae 9 to 10 segmented; each segment with short hair-like setae. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, derm at opening with 4–6 simple multilocular pores with bilocular or trilocular centre and 4–8 outer loculi. Hair-like setae as for genus, scattered on derm, longest around margin. Flagellate setae as for genus. Compound multilocular pores, each 17–20 µm in diameter, with trilocular

(rarely bilocular) centre and 6 outer loculi clustered in pairs (4 outer loculi with bilocular centre), covering dorsum and margins of ventral head and thorax and submarginal to marginal ventral abdomen. Simple multilocular pores, each with trilocular centre and 4–6 outer loculi, scattered on ventromedial head and thorax. Marsupium present, marsupial band forming distinctive V-shape with lateral flanges at anterior; band formed by multilocular pores, each 10–12 µm in diameter with bilocular or trilocular centre and 4–6 outer loculi clustered in pairs. Simple multilocular pores, each with trilocular, quadrilocular, quinquelocular or hexalocular centre and 4–10 outer loculi, scattered on ventromedial abdomen (within marsupium) and on derm around marsupial opening on medial to submedial abdomen. Vulva as for genus. Cicatrices not visible on specimens examined. Abdominal spiracles as for genus. Anal tube as for genus; derm around anal opening sclerotized, surrounded by long hair-like setae.

**Type data.** NIGERIA: Calabar, ex leaves of cultivated cocoa [= *Theobroma* sp.], i.1907 (*Slater Jackson*).

**Type material. Lectotype** here designated: ad ♀, “*Palaeococcus/theobromae*, n.sp./(*Newstead*) Types./on Cacao, Calabar/W. Africa. i.07/Sl. Jackson/B.M. 1945, 121” (BMNH). **Paralectotypes:** ad ♀ (torn in half), ad ♀ (bottom half only), 2 2<sup>nd</sup>-instar nymphs (all specimens on same slide as lectotype); ad ♀, “*Palaeococcus/theobromae*, n.sp./*Newstead*./on Caco, Calabar/W. Africa/S. Jackson/i.07/B.M. 1945, 121” (BMNH); 2<sup>nd</sup>-instar nymph, “*Palaeococcus/theobromae*, n sp./*Newstead* Type lot -/On Cacao. Calabar/W. Africa/Sl. Jackson. 1.07/B.M. 1945, 121” (BMNH); ad ♀, ca. 15 embryos (within marsupium of ad ♀), 2<sup>nd</sup>-instar nymph, 1<sup>st</sup>-instar nymph, “~~*Steatococcus/Palaeococcus/theobromae*~~/*Newst.*/on ?/Calabar, W. Coast/Africa/Dr. S. Jackson, Coll/Jan, 1907./Co-Type” (USNM); dry material (USNM).

**Taxonomic notes.** This species forms a V-shaped marsupial band and the dorsal surface is densely covered with large pores with a trilocular centre and 6 outer loculi clustered in pairs. The marsupial band shape is unique as other *Gigantococcus* species form a semicircular marsupial band. The lectotype is the only intact adult female on the slide.

### ***Gueriniella* Fernald**

*Guerinia* Targioni Tozzetti, 1868: 724. Type species: *Guerinia tinctoria* Targioni Tozzetti (= *Coccus serratulae* Fabricius 1775)

*Gueriniella* Fernald, 1903: 331. Replacement name for *Guerinia*.

The concept of the genus *Gueriniella* did not change as a result of our phylogenetic study (Unruh & Gullan, 2008). The two species in the genus are morphologically identical, but we did not synonymize them because *Gueriniella* is distributed over a wide geographic range, we have examined only a small number of specimens, and we only included material of one species in the molecular analysis.

### ***Gueriniella decorata* Borchsenius**

*Gueriniella decorata* Borchsenius, 1949: 338.

**Diagnosis.** Refer to the diagnosis of *Gu. serratulae*. Lectotype of *Gu. decorata* 4.4 mm long, 2.7 mm wide.

**Type data.** ARMENIA: Megri, ex *Verbascum*, 25.v.1947 (*N. Borchsenius*).

**Type material. Syntypes:** ad ♀, “*Gueriniella/decorata/Borchs.*”//“*Verbascum/ARMENIA/Megri/24.v.47./N. Borchsenius/10/74*” (BMNH); 2 ad ♀♀ (same data, except ‘1974’ instead of ‘74’) (BMNH); additional material (ZMAS).

**Taxonomic notes.** Refer to the discussion of the genus *Gueriniella* for a discussion of similar species.

The World Catalogue listed only ZMAS as the type depository for this species, but we examined type

material present in the BMNH collection. We did not designate a lectotype from this material because Recommendation 74D of the ICZN (1999: 84) states that, “a lectotype should be chosen from syntypes in the collection of a public institution, preferably of the institution containing the largest number of syntypes of the nominal species-group taxon, or containing the collection upon which the author of the nominal species-group taxon worked, or containing the majority of that author’s species.” The majority of Borchsenius’ material is present in ZMAS. We were unable to examine material from that collection, so we refrain from designating a lectotype from material present in the BMNH.

### *Gueriniella serratulae* (Fabricius)

*Coccus serratulae* Fabricius, 1775: 744.

*Monophlebus serratulae* (Fabricius); Cockerell (1902a: 232).

*Gueriniella serratulae* (Fabricius); Fernald (1903: 331).

*Coccus picridis* Boyer de Fonscolombe, 1834: 201. Synonymy by Signoret (1876: 356).

*Coccus fabae* Guérin-Ménéville, 1852: 334. Synonymy by Signoret (1876: 356); unjustifiably replaced with *Guerinia tinctoria* by Targioni Tozzetti (1868: 724).

**Unmounted material.** In life, living on stems of host, protected by wax coating; producing a conspicuous mass of white cottony secretion at time of oviposition, this surrounding adult female and eggs (adapted from Morrison, 1928).

**Slide-mounted material.** Adult female elongate, 4.3–5.7 mm long, 2.2–3.5 mm wide. Antenna 11 segmented. Eyes, mouthparts, legs and thoracic spiracles as for tribe. Hair-like and flagellate setae distributed as for tribe, longest in marginal clusters and between antennae, clustered ventromedially on thoracic segments, forming medial to submedial transverse rows on abdomen. Simple multilocular pores, each with bilocular or trilocular centre and 6–10 outer loculi, forming dorsal transverse rows and marginal and medial clusters on each segment. Simple multilocular pores on ventral surface of two types: (i) pores with bilocular centre and 4–8 outer loculi, scattered on medial head and thorax and forming transverse rows on medial to submedial abdomen, and (ii) pores, same structure as on dorsum, scattered amongst setae on head, thorax and marginally on all segments. Ovisac band absent. Marsupium and marsupial band absent. Vulvar opening as for tribe, surrounded by pores, each 9–10 µm in diameter, with bilocular centre and 10–12 outer loculi, and hair-like setae. Cicatrices round to oval, numbering 3–5, central cicatrix largest. Abdominal spiracles in 4 pairs on abdominal segments V–VIII. Anal tube with inner sclerotized ring of pores with 1 or 2 round central loculi and 6 or 7 round outer loculi and external opening with 2 or 3 rings of multilocular pores with trilocular centre and 5–8 outer loculi; anal opening as for tribe, except lacking specialized pores.

First-instar nymph as for tribe except for the following features: abdominal spiracles in 4 pairs, anal tube with 6 multilocular pores at external opening, each side of dorsal metathorax and each abdominal segment with 1 submarginal hair-like seta and 1 submedial multilocular pore, simple multilocular pores with trilocular (rarely bilocular) centre and 5 or 6 outer loculi, setae with slightly spatulate apices, abdominal apex with 2 pairs of hair-like setae, and each side of ventral metathorax and abdominal segment with submedial short hair-like setae and lacking marginal pore.

**Type data.** *Coccus serratulae*: ENGLAND: ex *Serratula arvensis*. *Coccus picridis*: FRANCE: Aix, ex *Picris hieracioides* and *Serratula arvensis*. *Coccus fabae*: FRANCE: midi de la France, ex *Phaseolus fabae*.

**Type material. Syntypes** of *Coccus serratulae*: ♀♀, type material lost (Zimsen, 1964: 341). **Syntypes** of *Coccus picridis*: ♀♀, type material lost (Ben-Dov, 2005: 182). **Syntypes** of *Coccus fabae*: ♀♀ (MNHN).

**Taxonomic notes.** Refer to the discussion of the genus *Gueriniella* for comparison with similar species. Refer to Unruh & Gullan (2008) for detailed information about this species.

## ***Icerya* Signoret**

*Icerya* Signoret, 1876: 351. Type species: *Icerya sacchari* Guérin-Méneville (= *Dorthisia seychellarum* Westwood).  
*Crossotosoma* Douglas, 1890: 79. Type species: *Crossotosoma aegyptiacum* Douglas. Synonymy by Morrison (1928: 219)  
*Newsteadiella* MacGillivray, 1921: 75. Type species: *Icerya formicarum* Newstead. Synonymy by Rao (1951a: 40).  
*Auloicerya* Morrison, in: Morrison & Morrison, 1923: 22. Type species: *Icerya rosae australis* Maskell. Synonymy by Unruh & Gullan (2008: 41).  
*Pericerya* Silvestri, 1939: 648. Type species: *Icerya purchasi* Maskell. Synonymy by Morrison & Morrison (1966: 152).

*Icerya* has always been and remains the largest genus in the tribe, but the number of described *Icerya* species has been reduced to 30. *Icerya* is defined by the absence of compound multilocular pores in all species, presence of open-centre pores in some species as well as occurrence of pore types seen in no other genus. All species are found in the Australasian or Indomalayan biogeographic regions, except *I. schrottkyi*, which was collected in Brazil and *I. natalensis*, which was collected in South Africa. These species are included in *Icerya* because of the shape of the pores of the adult female. We believe they were most likely introduced to the regions where they were collected originally.

### Generic description of adult female and first-instar nymph of *Icerya*

Slide-mounted adult female elongate, elliptical or round, 2.7–10.4 mm long, 2.0–6.2 mm wide. Antennae 9 to 11 segmented. Labium 3 segmented. Hair-like setae scattered over entire surface, longest medially and marginally, sometimes in marginal clusters. Flagellate setae scant, scattered. Simple multilocular pores of varying types generally found over entire surface, sometimes in marginal and/or dorsal medial clusters. Open-centre pores absent or, if present, in marginal clusters on all body segments and sometimes on dorsum in medial clusters or transverse rows on head and thorax. Ovisac band absent or present. Marsupium absent or, if present, marsupial band forming a complete circle of setae and multilocular pores with bilocular centre; posterior portion of band becoming sclerotized at maturity. Cicatrices circular to elliptical, numbering 1 or 3. Abdominal spiracles in 2 or 3 pairs on abdominal segments VII–VIII or VI–VIII; simple multilocular pores sometimes clustered on derm at thoracic and/or abdominal spiracular opening. Anal opening and anal ring as for tribe. Dorsal derm may become very sclerotized and form distinct sclerotized patches in some species.

Slide-mounted first-instar nymph as for tribe except for following features: abdominal spiracles in 2 or 3 pairs; anal tube with ring of 6 pores at opening; dorsum with abdominal submedial row of 1–3 multilocular pores on each side of metathorax and each abdominal segment, long hair-like setae at abdominal apex in 2 or 3 pairs. Hair-like setae of one species (*I. australis*) with trifold apices.

## ***Icerya* species groups**

### ***Icerya aegyptiaca* group**

Two species belong to this group: *I. aegyptiaca* and *I. schrottkyi*. The pores of these two species are quite different, but both have pores on the derm that resemble the vulvar pores. They are separated easily by the number of cicatrices (*I. aegyptiaca* has one, *I. schrottkyi* has three) and are separated further by the shape of pores on the derm. *Icerya schrottkyi* has unique hexalocular pores on the ventral surface that are absent from all other iceryine species.

### ***Icerya jacobsoni* group**

We include five species in this group: *I. assamensis*, *I. jacobsoni*, *I. jaihind*, *I. mangiferae* and *I. zimmermanni*. Although the species vary in their egg-tending behaviour (*I. assamensis* forms an internal marsupium, *I. zimmermanni* has an ovisac band and a simple waxy pad of secretion covering the ventral surface and *I. jacobsoni*, *I. jaihind* and *I. mangiferae* form neither an ovisac nor a marsupium), simple multilocular pores with characteristic stalked profiles are found on the dorsal surface of all species. *Icerya jacobsoni* and *I. jaihind* differ from one another by the number of ventral cicatrices (*I. jacobsoni* has three and *I. jaihind* has a single cicatrix). We were unable to examine material of *I. mangiferae*, but we include it in this group based on the original description and because we believe it a likely synonym of *I. jacobsoni*. Refer to the taxonomic notes on *I. mangiferae* for further discussion.

### ***Icerya natalensis* group**

Three species make up this group: *I. clauseni*, *I. natalensis* and *I. travancorensis*. The former two species are the only *Icerya* species that do not form an ovisac band and have open-centre pores. The open-centre pores of each species resemble each other except that the open-centre pores of *I. clauseni* have a small cleft, which is lacking from the open-centre pores of *I. natalensis*. The third species, *I. travancorensis* lacks open-centre pores and forms an ovisac band. All species have only simple multilocular pores with bilocular centres on the dorsal surface, but *I. natalensis* differs by the shape of the pores on the ventromedial abdomen [*I. natalensis* has larger pores that appear bluish when stained] with a trilocular centre and 8–12 elongate outer loculi, while *I. clauseni* and *I. travancorensis* have smaller pores with a bilocular or trilocular centre and 4–6 outer loculi]. *Icerya natalensis* is very rare and was collected originally in Natal, South Africa, over 100 years ago. We placed it in *Icerya* rather than *Gigantococcus*, because of the presence of open-centre pores and absence of compound multilocular pores.

### ***Icerya nudata* group**

We include two marsupium-forming species in this group: *I. nudata* and *I. samaraia*. These are the only two marsupium-forming species that have open-centre pores present on the derm. They can be separated by the shape and size of the open-centre pores: *I. samaraia* has large pores with tightly-spaced outer loculi while the open-centre pores of *I. nudata* are smaller, have fewer widely-spaced outer loculi and have a small cleft.

### ***Icerya pilosa* group**

We place two species in this group: *Icerya pilosa* and *I. kumari*. We were unable to examine material of *I. kumari*. Based on Rao's description, illustration and photographs, we believe it is probably closely related to *Icerya pilosa* and that it might even be a third-instar nymph of that species (refer to the taxonomic notes on *I. kumari* for further discussion). On both species, the derm around the open-centre pores becomes very sclerotized and the loculi present in the outer rim look similar. *Icerya pilosa* forms an ovisac band but Rao believed *I. kumari* formed neither an ovisac band nor a marsupium.

### ***Icerya pulchra* group**

This group includes three species: *I. pulchra*, *I. morrisoni* and *I. minor*. All have the same pore types distributed in the same way on the derm. *Icerya morrisoni* has a single cicatrix whereas *I. minor* and *I. pulchra* have three cicatrices. The latter two species differ by the density of simple multilocular pores with a quinquelocular or hexalocular centre and 4–8 outer loculi.

Morrison believed *I. minor* and *I. pulchra* to be synonyms because the only difference he found between the two species was the number of multilocular pores on the dorsum. Green also believed these two species to be synonyms and suggested that *I. minor* represented a smaller form of *I. pulchra*. Rao separated the two species based on the length of the antennal and apical setae of the first-instar nymph (long in *I. minor*, short in *I. pulchra*). He found that the dorsal pores of *I. minor* tend to have bilocular centres while the dorsal pores of *I. pulchra* tend to have trilocular centres.

### ***Icerya seychellarum* group**

Five species belong to this group: *I. crocea*, *I. formicarum*, *I. hanoiensis*, *I. menoni* and *I. seychellarum*. Until recently, *I. crocea* was considered a synonym of *I. seychellarum*, but the two were separated based on the shape and distribution of the open-centre pores and genetic differences (Unruh & Gullan, 2008). These five species all have open-centre pores present in marginal clusters and transverse rows on the dorsal surface. This distribution of open-centre pores differs from other species in which the distribution is restricted to the margins and across the head only. The five species of this group can be separated based on the shape and density of their open-centre pores. The open-centre pores of *I. crocea* have 17–20 outer loculi and may or may not have a small cleft present. These pores are densely clustered on the middorsal head and thorax. *Icerya seychellarum* has similar-looking pores that always have a triangular cleft and are scattered only across the dorsal head and thorax. Both species have three cicatrices, which differs from *I. formicarum* and *I. menoni*, which each have a single cicatrix. The latter two species can be separated by the number of loculi in the open-centre pores and the shape of the ovisac in life [we were unable to examine material of *I. menoni* and base these claims on Rao's (1951a) description and illustrations]. In life, the external appearance of the two species differs as the ovisac of *I. menoni* consists of a fluffy white secretion on the ventral abdomen compared to the elongate, fluted ovisac of *I. formicarum*. *Icerya menoni* also has two pencils of wax projecting from the posterior end of the body [projections visible in photograph accompanying original description (Rao, 1951a: 61)] and *I. formicarum* has two tufts of wax surrounding the anal opening (1951a: 54). Rao reported that the open-centre pores of *I. menoni* are larger than those of *I. formicarum* and have a proportionately larger number of outer loculi and larger diameter.

Refer to the taxonomic notes on *I. hanoiensis* for a discussion of possible synonymy with *I. seychellarum*.

### **“Pericerya” group**

Species in this group form a clade in our molecular phylogenetic analysis (Unruh & Gullan, 2008). “Pericerya” is the generic name created by Silvestri (1939) to describe all iceryine species with two pairs of abdominal spiracles. Four species, *I. purchasi*, *I. callitri*, *I. koebelei* and *I. sumatrana*, as well as several undescribed species from New Caledonia and Australia, belong to the “Pericerya” group. All species have only two pairs of abdominal spiracles and have open-centre pores present in marginal clusters. *Icerya callitri* looks the most dissimilar to the other species with simple multilocular pores, similar to vulvar pores, present on the dorsal surface and ventral margin to submargin. *Icerya purchasi* and *I. koebelei* can be separated easily in life

because *I. koebelei* forms a “pencil” of wax that projects upward from the middorsum. Under the microscope they can be distinguished from one another by the number of antennal segments (*I. purchasi* has 11 segments, *I. koebelei* typically has 9 or 10) and by the density of dark hair-like setae on the dorsal surface. Also *I. koebelei* has a dense middorsal cluster of 30–50 simple multilocular pores from which the wax pencil emanates.

*Icerya sumatrana* resembles *I. purchasi* in life, but can be separated by the shape of the multilocular pores, the absence of marginal clusters of setae and the absence of bilocular centre pores on the dorsum.

### Unplaced *Icerya* species

Four *Icerya* species that we examined cannot be placed in any other group. These species are *I. australis*, *I. acaciae*, *I. imperatae* and *I. nuda*. We did not place *I. nuda* in any group because the material is in very poor shape. Several undescribed species of *Icerya* that look similar to *I. imperatae* have been collected in Australia. Although *I. acaciae* and *I. australis* look similar and previously belonged to the genus *Auloicerya*, they were not closely related in our phylogenetic reconstruction.

### Key to the species of *Icerya* based on adult females (not including *I. hanoiensis*, *I. mangiferae* or *I. nuda*)

- 1 Abdominal spiracles in two pairs. Open-centre pores present on derm ..... 2
- Abdominal spiracles in three pairs. Open-centre pores present or absent on derm..... 5
- 2 Derm not densely covered in hair-like setae. Ventral submargin with a band of simple multilocular pores, appearing slightly bluish when stained, each with a bilocular or trilocular centre and 4–8 outer loculi .....  
..... *I. sumatrana*
- Derm densely covered in hair-like setae. Ventral submarginal band of simple multilocular pores, which appear slightly bluish when stained, absent..... 3
- 3 Simple multilocular pores on dorsal surface of two types: (i) each pore with bilocular centre and 6–12 outer loculi; and (ii) pores similar to vulvar/anal pores (slightly bluish), each with bilocular, trilocular or quadrilocular centre and 10–12 outer loculi ..... *I. callitri*
- Simple multilocular pores on dorsal surface of one type only, each pore with bilocular center and 6–8 outer loculi ..... 4
- 4 Antennae 9 or 10 segmented. In life, adult female with a distinct “pencil” of wax on dorsal surface, corresponding to a dense patch of pores on middorsum..... *I. koebelei*
- Antennae 11-segmented. In life, adult female without a distinct “pencil” of wax on dorsal surface, and without a dense cluster of pores on middorsum ..... *I. purchasi*
- 5 Open-centre pores present ..... 6
- Open-centre pores absent ..... 15
- 6 Open-centre pores forming dense transverse rows on dorsal surface as well as around body margins ..... 7
- Open-centre pores generally restricted to margins, not forming transverse rows on dorsal surface ..... 10
- 7 With 1 cicatrix present ..... 8
- With 3 cicatrices present ..... 9
- 8 Open-centre pores, each with 14–16 outer loculi, present. In life, ovisac fluted ..... *I. formicarum*
- Open-centre pores, each with 18–24 outer loculi, present. In life, ovisac not fluted ..... *I. menoni*
- 9 Open-centre pores sparsely scattered on middorsum, each with a triangular cleft ..... *I. seychellarum*
- Open-centre pores densely clustered on middorsum, each lacking triangular cleft ..... *I. crocea*
- 10 Marsupial band present. Ovisac band absent ..... 11

- Marsupial band absent. Ovisac band present or absent .....	12
11 Open-centre pores, each with a faint triangular cleft and 5–7 outer loculi .....	<i>I. nudata</i>
- Open-centre pores, each without a triangular cleft and with 14–16 outer loculi .....	<i>I. samaraia</i>
12 Open-centre pores with a sclerotized rim (see <i>Icerya pilosa</i> group in Table 2) .....	13
- Open-centre pores lacking a sclerotized rim (see <i>Icerya pilosa</i> group in Table 2) .....	14
13 Ovisac band present .....	<i>I. pilosa</i>
- Ovisac band absent .....	<i>I. kumari</i>
14 Open-centre pores each with a small cleft .....	<i>I. clauseni</i>
- Open-centre pores each without a small cleft .....	<i>I. natalensis</i>
15 Simple multilocular pores each with bilocular and/or elongate centre only; none with trilocular centres. Ovisac band present .....	16
- Simple multilocular pore each with a trilocular, bilocular and/or elongate centre present. Ovisac band absent or present .....	17
16 Ovisac band complete anteriorly, becoming incomplete towards posterior abdomen. With 1 cicatrix present .....	<i>I. imperatae</i>
- Ovisac band forming a complete band around abdomen. With 3 cicatrices present .....	<i>I. travancorensis</i>
17 Anal/genital pores not restricted to around anal opening and vulva but also found elsewhere such as around ovisac band on ventral abdomen .....	18
- Anal/genital pores restricted to around anal opening and vulva .....	20
18 Pores that appear bilobed present on ventral submargin .....	<i>I. zimmermanni</i>
- Pores that appear bilobed absent .....	19
19 With 1 cicatrix present .....	<i>I. aegyptiaca</i>
- With 3 cicatrices present .....	<i>I. schrottkyi</i>
20 Pores, each with a stalked profile, present on dorsal surface and ventral submargin of head and thorax	21
- Pores, each with a stalked profile, absent .....	23
21 Marsupial band present .....	<i>I. assamensis</i>
- Marsupial band absent .....	22
22 With 1 cicatrix present .....	<i>I. jaihind</i>
- With 3 cicatrices present .....	<i>I. jacobsoni</i>
23 Ovisac absent .....	24
- Ovisac present .....	25
24 Multilocular pores, each with a bilocular centre (rarely trilocular), present on dorsum .....	<i>I. australis</i>
- Multilocular pores, each with a bilocular or trilocular centre, equally frequent on dorsum .....	<i>I. acaciae</i>
25 With 1 cicatrix present .....	<i>I. morrisoni</i>
- With 3 cicatrices present .....	26
26 Dorsal surface with many simple multilocular pores with a quinquelocular or hexalocular centre and 4–6 outer loculi .....	<i>I. minor</i>
- Dorsal surface with very few simple multilocular pores with a quinquelocular or hexalocular centre and 4–6 outer loculi .....	<i>I. pulchra</i>

### ***Icerya acaciae* (Morrison & Morrison)**

*Auloicerya acaciae* Morrison & Morrison, 1923: 26.

*Icerya acaciae* (Morrison & Morrison); Unruh & Gullan (2008: 41).

**Unmounted material.** Body of mature adult female bare of visible wax, dorsum orange and purple with lon-

gitudinal rows of black spots; young adult female covered in powdery white wax with four dorsal longitudinal rows of exposed orange-reddish spots on derm; legs, antennae and eyes brownish-black; adult female convex dorsally becoming very rounded with age, with distinct segmentation visible on dorsal surface; adult female deposits eggs beneath concave body.

**Slide-mounted material.** Adult female elongate to oval, 5.8–9.4 mm long, 3.4–6.0 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm outside atrial opening with cluster of 15–20 simple multilocular pores, each with bilocular centre and 6–8 outer loculi. Robust hair-like setae scattered on derm, dense on ventral surface, longest setae in medial clusters on dorsal surface and clustered around ventral margin and between antennae. Flagellate setae as for genus. Open-centre pores absent. Simple multilocular pores, each 12–13 µm in diameter, with thickened outer rim and bilocular or trilocular centre and 6–8 slightly reniform outer loculi, covering dorsal surface and forming marginal band around ventral surface. Ovisac absent. Marsupium absent. Simple multilocular pores, each 12–13 µm in diameter, with thickened outer rim, bilocular centre and 4 slightly reniform outer loculi, covering ventromedial to submarginal derm, densest around mouthparts and around thoracic spiracles. Vulva as for genus, surrounded by hair-like setae and typical simple multilocular pores, each 12–13 µm in diameter, with thickened outer rim, bilocular or trilocular centre and 6–10 elongate outer loculi. Cicatrices large, hourglass-shaped, numbering 3, subequal in size. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by short hair-like setae and typical simple multilocular pores with thickened outer rim, bilocular or trilocular centre and 8–10 elongate outer loculi. Dorsal surface becoming sclerotized with age; sclerotized patches present in transverse intersegmental rows across dorsal surface of each segment and on ventral surface of abdomen, largest patches on dorsal submedial head and thorax.

**Type data.** AUSTRALIA: Western Australia, Swan River, ex *Acacia huegii* (George Compere).

**Type material. Holotype:** ad ♀, “near/*Icerya*./On *Acacia huegii*/Swan River, West/Australia./Coll. Geo. Compere/#950” (USNM). **Paratype:** 1<sup>st</sup>-instar nymph, “*Auloicerya/acaciae*/On *Acacia huegii*/Swan River, West/Australia./Coll. Geo. Compere/#950” (USNM).

**Taxonomic notes.** This species resembles *I. australis*, but can be separated by the shape of the pores on the derm and by the presence of dense robust setae on the ventral margin and clustered on the middorsal surface.

The slide envelopes of both the holotype and paratype have written on them “*Auloicerya* new genus”// “*acaciae* new species”//“H.M. I-20-22”. The slides do not have an original holotype or paratype label, but Morrison & Morrison (1923) designated the adult female as the holotype and first-instar nymph as the paratype.

### ***Icerya aegyptiaca* (Douglas)**

*Crossotosoma aegyptiacum* Douglas, 1890: 79.

*Icerya aegyptiacum* (Douglas); Riley & Howard (1890b: 97) [not Riley and Howard (1890a: 256), as in Ben-Dov (2005: 188)].

*Icerya aegyptiaca* (Douglas); Maskell (1893: 247).

*Icerya tangalla* Green, 1896: 7. Synonymy by Rao (1951a: 54).

**Unmounted material.** Dorsum of adult female covered in wax, margin with long waxy extensions, longer at anterior end; posterior tassels covering ovisac, giving it a fluted appearance (adapted from Rao, 1951a).

**Slide-mounted material.** Adult female oval, 4.3–5.3 mm long, 3.1–3.8 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm near atrial opening with simple multilocular pores (appearing bluish when stained), each with bilocular centre and 6–8 outer loculi. Hair-like and flagellate setae distributed as for genus. Open-centre pores absent. Simple multilocular pores,

similar to vulvar pores, each 13–14 µm in diameter, with bilocular or trilocular centre and 6–12 slightly reniform outer loculi and appearing bluish when stained, forming medial, submedial and submarginal bands from dorsal head to anal opening (absent or reduced to 1 or 2 pores only on dorsal surface of some specimens); scattered across ventromedial head, prothorax and mesothorax, forming a band across metathorax and forming submarginal band around venter; dorsal submarginal band and ventral submarginal band connected to one another via transverse rows of pores across margin. Simple multilocular pores, similar to pores in ovisac band, each with bilocular or trilocular centre and 6–8 outer loculi, forming marginal clusters and covering derm on dorsal surface around other dorsal pores. Ovisac band made of simple multilocular pores, forming band 3 or 4 pores wide, each pore 8–10 µm in diameter, with bilocular to trilocular (sometimes quadrilocular) centre and 6–8 outer loculi. Simple multilocular pores, similar to vulvar pores, each 10–11 µm in diameter, with trilocular centre (appearing elongate) and 5 or 6 outer loculi, scattered on ventromedial abdomen; similar pores, but each pore with bilocular or trilocular centre and 8–12 outer loculi, scattered on ventromedial head and thorax. Vulvar opening as for genus, surrounded by multilocular pores with 16–24 outer loculi; pores forming medial to submedial band across 2 abdominal segments anterior to vulvar opening. Cicatrix round. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by long, hair-like setae and typical pores with bilocular centre and 8–12 outer loculi.

**Type data.** *Crossotosoma aegyptiaca*: EGYPT: Intercepted at England. *Icerya tangalla*: SRI LANKA: Tangalla, ex leaves of unidentified plant.

**Type material. Lectotype** of *Crossotosoma aegyptiacum* here designated: ad ♀, “No. 40/BM 1945, 121/R. Newstead.”/“*Icerya*(=*Crossotosoma*)/*Aegyptiaca* Doug/♀s (Egypt)./Alexandra [sic]/1890.” (BMNH). **Paralectotype**: half an antenna and a single leg (same slide as lectotype).

**Lectotype** of *I. tangalla* designated by Williams & Watson (1990: 221): ad ♀ (BMNH).

**Other material examined.** HONG KONG: ad ♀, HK, Wanchai Gap Road, ex *Alchornea trewioides*, 8.xii.2003 (*J. H. Martin*) (BME, CMU043); ad ♀, NT, Lion’s Education Centre, Sai Kung, ex *Alchornea trewioides*, 5.xii.2003 (*C.S.K. Lau & J.H. Martin*) (BME, CMU040). INDIA: 4 ad ♀♀ (2 slides), Calcutta, ex inflorescence of Sago Palm [= *Cycas revolute*] (BMNH, ex collection of Indian Museum); 4 ad ♀♀, 1 3<sup>rd</sup>-instar nymph (one slide), Calcutta, ex Croton [= *Codiaeum variegatum*] (BMNH, ex collection of Indian Museum); ad ♀, 3<sup>rd</sup>-instar nymph (one slide), Tinnevely, ex *Asystasia chelonoides* (*Ramakrishna*) (BMNH). AUSTRALIA: 3 ad ♀♀ (3 slides), Northern Territory, Howards Springs, 12°27’S, 131°02’E, 12.v.1992 (*P.J. Gullan*) (ANIC).

**Taxonomic notes.** Refer to the *I. aegyptiaca* group for discussion of similar species.

Although Williams & Watson (1990) stated that the type material of *Crossotosoma aegyptiacum* probably was lost, we believe the slide we are designating as lectotype is part of the type series. Douglas (1890) described the species from material sent to him in England from Alexandria, Egypt. In Newstead’s (1894: 28) review of the pest, he stated that he “had specimens of the females from Egypt...”. We believe that the specimens Newstead had were from Douglas’s original collection.

Green never synonymized *I. tangalla* with *I. aegyptiaca* officially, although he referred to it as *I. aegyptiaca* in papers he published subsequent to his description of *I. tangalla*. However, he reinstated *I. tangalla* as a species after re-examining the pores of several non-type specimens (Green, 1932: 32). (The India specimens listed under “Other material examined” may or may not be the specimens he examined for that paper.) In this paper, he provided a more thorough description and illustration of the pore types and their distribution and explained that the distinctive anal/vulvar-like pores present on the derm of *I. aegyptiaca* were absent from the derm of *I. tangalla* (except for derm surrounding the genital and anal regions). Rao (1951a: 54) synonymized the two species.

We have examined material of both true *I. aegyptiaca* and the “tangalla” form and concur with Rao and Williams & Watson that *I. tangalla* is a synonym of *I. aegyptiaca*. Although the lectotype of *I. aegyptiaca* possesses those distinctive pores on the dorsal surface, which are absent from the dorsal surface of the lecto-

type of *I. tangalla*, we have examined different specimens of *I. aegyptiaca* from the same collection with and without the distinctive pores on the dorsal surface; some specimens possess only 1 or 2 of these pores. The difference in pore types does not seem to be correlated with host plant, locality or season as individuals of both pore types frequently occur together on the same host plant.

### ***Icerya assamensis* (Rao)**

*Steatococcus assamensis* Rao, 1951b: 154.

*Icerya assamensis* (Rao); Unruh & Gullan (2008: 41).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female oval to round, 4.5–6.8 mm long, 3.6–5.6 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered over derm, longest in marginal clusters and at posterior end. Flagellate setae distributed as for genus. Open-centre pores absent. Simple multilocular pores, each 8–10 µm in diameter, with trilocular centre and 6–9 outer loculi and appearing stalked with a faint tongue visible in profile, covering dorsal surface. Simple multilocular pores, each 11–12 µm in diameter, with bilocular or trilocular centre and 6–10 outer loculi, scattered on ventral surface, densest around mouthparts and around margin. Marsupial band round at posterior, forming an incomplete circle made of simple multilocular pores, each 11–12 µm in diameter, with trilocular centre, 6 outer loculi and distinctive profile; ventromedial transverse row on abdominal segment I of simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi. Simple multilocular pores, each 8–9 µm in diameter, with bilocular centre and 4–8 outer loculi, scattered within marsupial cavity. Vulvar and anal opening surrounded by typical vulvar pores with 12–18 outer loculi. Cicatrices oval to round, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube as for genus.

**Type data.** INDIA: Assam, Dawki, ex citrus (*V.P. Rao*).

**Type material. Holotype:** ad ♀ (INPC).

**Material examined.** 5 ad ♀♀ (one slide), HONG KONG: HK Island west, Hill above Belchers, 200–250 m, ex *Litsea glutinosa*, 12.xi.1996 (*J.H. Martin*) (BMNH); ad ♀, THAILAND: Phang Nga, Sring Phang Nga National Park, ex *Homonium riparia*, 13.vi.2004 (*P.S. Cranston*) (BME, CMU079).

**Taxonomic notes.** —Only three described *Icerya* species form a marsupium: *I. assamensis*, *I. nudata* and *I. samaraia*. This species differs from the latter two by the absence of open-centre pores in the adult female. Also, the pores that make up the marsupial band are not seen in the marsupial or ovisac band of any other iceryine species. Refer to the *I. jacobsoni* group for further discussion of similar species.

The original description was based on a single specimen collected by Rao in India, which we were unable to borrow and examine. Rao's (1951b) description agrees perfectly with the specimens from Hong Kong and Thailand.

### ***Icerya australis* Maskell**

*Icerya rosae australis* Maskell, 1894: 101.

*Icerya* (*Crypticerya*) *australis* Maskell; Cockerell (1896a: 323).

*Palaeococcus australis* (Maskell); Cockerell (1902a: 233).

*Auloicerya australis* (Maskell); Morrison & Morrison (1923: 22) [not Vayssière (1926: 307) as in Ben-Dov (2005: 151)].

*Icerya australis* Maskell; Unruh & Gullan (2008: 41).

**Unmounted material.** Adult female with convex dorsum and flat venter; deep brown, almost black, with rows of yellow spots on margin and in two submarginal rows; white flocculent wax scattered on dorsal surface

and forming a thin cushion on ventral surface (adapted from Maskell, 1894).

**Slide-mounted material.** Adult female oval. Antennae 10 or 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae almost entirely absent from dorsal surface; sparsely scattered on ventral surface, longest between antennae. Flagellate setae absent from dorsal surface, sparsely scattered on ventral surface. Open-centre pores absent. Simple multilocular pores, each 12–14 µm in diameter, with thickened outer rim, bilocular centre and 6–8 outer loculi, scattered on dorsal surface, forming marginal band on venter. Ovisac band absent. Marsupium absent. Simple multilocular pores, each 10–11 µm in diameter, with bilocular centre (appearing reniform) and 4 outer loculi, scattered on ventromedial derm. Vulva as for genus, surrounded by typical pores, each with bilocular centre and 10–12 elongate outer loculi. Cicatrices numbering 3. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening not surrounded by typical pores, instead surrounded by simple multilocular pores, each with bilocular centre and 10–12 outer loculi, and short hair-like setae. Dorsal surface and ventral margin of adult female becoming very sclerotized with age; small intersegmental sclerotized patches present, forming 2 submedial and 2 submarginal longitudinal rows on dorsal abdomen.

**Type data.** AUSTRALIA: New South Wales, Sydney, ex *Hakea gibbosa* (Froggatt).

**Type material.** Lectotype here designated: antennae and mouthparts of an ad ♀, “*Icerya rosae*/var. *australis*/antennae of female/1893 W.M.M./Entomology Div., DSIR, NZ” (ANIC). **Paralectotypes:** 3<sup>rd</sup>-instar nymph, “*Icerya rosae*/var. *australis*/adult female/1894 W.M.M.” (NZAC); 1<sup>st</sup>-instar nymph, “*Icerya rosae*/var. *australis*/larva/1894 W.M.M.” (NZAC); 2 ♀♀, 19 1<sup>st</sup>-instar nymphs (nymphs on two slides), ad ♀ and first-instar nymphs (unmounted), ex pillbox of Maskell labelled, “*Icerya rosae*/Var. *australis*” (NZAC, slide-mounted by PJG in 1993); ad ♀, “*Icerya rosae* var/*australis* Mask./adult ♀/Mask Coll. #389/Cotype Cat. No 25271/U.S.N.M” (USNM); 1 2<sup>nd</sup>-instar nymph, “*Icerya rosae*/var *australis*/Mask/Mask. Coll. #389/Cotype Cat. No 25271/U.S.N.M.” (USNM); 6 1<sup>st</sup>-instar nymphs (2 slides), “*Icerya rosae* var./*australis* Mask./larva[e]/Mask. Coll. #389/Cotype No. 25271/U.S.N.M.” (USNM); 5 1<sup>st</sup>-instar nymphs (one slide), “*Icerya rosae*/var. *australis*/Riley./Mask/Mask. Coll. #389/Cotype Cat #25271/U.S.N.M.”/[pencil X through label]“*Icerya natalensis* Dougl./So. Africa/Mask. Coll. #114” (USNM).

**Other material examined.** AUSTRALIA: 2 ad ♀♀, “Family Margarodidae/*Auloicerya australis*/(Maskell), ad ♀ removed/from card with 3 labels –/♀/*Icerya* / *roseae* /Heathcote’, ‘200’, and/“*Palaeococcus* / *australis* /Type specimens.”/BCRI specimen ex/W.W. Froggatt collection.”/“Dry ♀ removed from glue/on card by soaking in Decon/90 and water. Acid/fuchsin stain. Mounted in/canada balsam in xylene./Slide prepared by P.J. Gullan,/1984./BCRI” (ASCU); 8 1<sup>st</sup>-instar nymphs (one slide), 10 1<sup>st</sup>-instar nymphs (one slide), 13 1<sup>st</sup>-instar nymphs (one slide), “Family Margarodidae/*Auloicerya australis*/(Maskell), 1st instar nymphs/ from below dry ♀ on card/with 3 labels –/ “♀/*Icerya/roseae*/Heathcote”, “200”, and/“*Palaeococcus/australis*/Type specimens”./BCRI specimens ex/W.W. Froggatt collection.”/“Dry 1st instar soaked in/Decon 90 and water./Acid fuchsin stain./Mounted in canada balsam/in xylene. Slide prepared/by P.J. Gullan, 1984./BCRI” (ASCU).

**Taxonomic notes.** *Icerya acaciae* and *I. australis* resemble one another but can be separated by the shape of the simple multilocular pores on the dorsum. Also, the hair-like setae present on first-instar nymphs of *I. australis* have trifid apices, whereas the setae of *I. acaciae* do not.

Although Maskell (1894) lists the type locality only as ‘near Sydney’, Froggatt (1906, 1921), who collected the type specimens, stated that they came from National Park, near Sydney. Also Froggatt (1906) stated that he had collected this species on *Hakea acicularis* (now *H. sericea*) and *Grevillea buxifolia* (both Proteaceae), which are different to the host plant specified in Maskell's description. Froggatt (1906: 773) also stated that he collected this species in 1893 at Cook's River, near Sydney and then shortly afterwards found that it “extended well over National Park”. The ASCU specimens listed above are from the W. W. Froggatt collection and were collected at Heathcote, which is a suburb at the southern edge of greater Sydney sur-

rounded by Royal National Park. Thus these specimens were possibly part of the original collection retained by Froggatt when he sent material to New Zealand for W. M. Maskell to identify.

### ***Icerya callitri* (Froggatt)**

*Llaveia callitri* Froggatt, 1923: 162.

*Icerya callitri* (Froggatt); Morrison (1928: 189).

**Unmounted material.** Adult female enveloped in mass of loose cotton woolly secretion, only tarsi are visible. Body of adult female, denuded of wax, bright orange-yellow; legs, eyes and antennae black (adapted from Froggatt, 1923). In life, young adult female from near Binya in New South Wales (see 'Other material examined') covered in loose white wax dorsally and laterally, with one dense wax tuft arising from area of each thoracic spiracle, a skirt of white wax ventromarginally covering ovisac band and area within ovisac band completely devoid of wax.

**Slide-mounted material.** Adult female elongate to oval, 4.5 mm long, 4.0 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae dense on ventral head, thorax and marginal abdomen, forming dense clusters on dorsal head and thorax, scattered across abdomen. Flagellate setae as for genus. Open-centre pores, each 14–16 µm in diameter, 13–14 µm long, with 6–10 outer loculi, forming marginal clusters and sparse clusters on dorsal submedial head and thorax. Dorsal surface and ventral head and thorax covered with simple multilocular pores of two types: (i) pores, each 9–10 µm in diameter, with bilocular centre and 6–12 outer loculi, forming submedial and submarginal clusters on dorsal head and thorax; dorsal submedial, submarginal and marginal clusters on abdomen; ventral clusters on head and thorax; and (ii) pores, similar to vulvar pores and appearing bluish when stained, each 11–13 µm in diameter, with bilocular, trilocular or quadrilocular centre and 10–12 outer loculi, covering derm on dorsum surrounding previously described pores, covering ventral head and thorax and in marginal clusters around ovisac band on ventral abdomen. Ovisac band, 6–8 pores wide, made of simple multilocular pores, each 9–10 µm in diameter, with bilocular centre and 10–12 outer loculi. Simple multilocular pores, each 8–9 µm in diameter, with bilocular (appearing reniform) centre and 4 outer loculi, scattered across ventromedial abdomen. Vulva as for genus, surrounded by typical pores, each with bilocular or trilocular centre and 10–14 elongate outer loculi. Cicatrices large, hourglass shaped, numbering 3, subequal in size or central cicatrix largest. Abdominal spiracles in 2 pairs. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical multilocular pores.

**Type data.** AUSTRALIA: New South Wales, near Corinbil homestead, near Carrathool, ex branchlets of Cypress pine, *Callitris glauca*.

**Type material. Syntypes:** ad ♀, 1<sup>st</sup>-instar nymphs (missing).

**Other material examined.** AUSTRALIA: ad ♀, New South Wales, 19 km E of Ardlethan, roadside, 147°05'E, 34°21'S, ex *Callitris glaucophylla*, 31.xi.1993 (*P.J. Gullan*) (ANIC); ad ♀, New South Wales, 2 km E of Binya, roadside, 146°22'E, 34°14'S, ex *Callitris glaucophylla*, 30.x.1993 (*P.J. Gullan*) (ANIC); ad ♀, New South Wales, 6 km WNW of Kamarah, 34°18'34"S, 146°43'52"E, ex *Callitris preissii* subsp. *verrucosa*, 6.xii.1997 (*P.J. Gullan*) (ANIC); ad ♀, New South Wales, Ardlethan, ex *Callitris* sp., 27.ix.1997 (*P.J. Gullan*) (BME, CMU100).

**Taxonomic notes.** Refer to the "Pericerya" group for discussion of similar species.

We looked for the type specimens of *L. callitri* at ANIC and ASCU and did not find material with correct collection data. This species has only ever been collected on *Callitris* spp.

## *Icerya clauseni* (Rao)

*Crypticerya clauseni* Rao, 1951b: 144.

*Icerya clauseni* (Rao); Unruh & Gullan (2008: 41).

**Unmounted material.** Appearance of adult female unknown.

**Slide-mounted material.** Adult female oval, 3.9–4.9 mm long, 3.3–4.2 mm wide (holotype 4.1 mm long, 3.2 mm wide). Antenna 10 to 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae distributed as for genus, longest around margin and at posterior. Flagellate setae as for genus. Open-centre pores, each 14–15 µm in diameter, with 8–10 outer loculi and small cleft, in clusters of 8–10 with robust hair-like setae around margin. Ovisac band absent. Marsupium absent. Simple multilocular pores, each with bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial to submedial head and thorax and abdomen. Simple multilocular pores, each 9–11 µm in diameter, with bilocular centre and 10–14 outer loculi and blunt projection, scattered on dorsal surface and around ventral submarginal abdomen; similar pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 6–8 slightly reniform outer loculi and appearing slightly bluish when stained, clustered with open-centre pores around margin. Vulvar opening as for tribe. Cicatrices small, round or oval, numbering 3–5, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by several robust hair-like setae.

**Type data.** MALAYASIA: Kuala Selangor, ex *Citrus*, iv.1930 (*C.P. Clausen*).

**Type material. Holotype:** ad ♀, “*Crypticerya/clauseni* Rao/on citrus/Kuala Selangor, F.MS./C.P. Clausen, Coll./April, 1930./No. 90” (USNM). **Paratypes:** 2 ad ♀♀ (same slide as holotype).

**Taxonomic notes.** Refer to the *I. natalensis* group for discussion of similar species.

The holotype is the adult female on the right side of the slide. The specimen is encircled with a line and the word “holotype” written to the side of it. Rao reported abdominal spiracles in 2 pairs, but we examined the holotype and paratypes and counted 3 pairs.

## *Icerya crocea* Green

*Icerya crocea* Green, 1896: 7. Incorrectly synonymized with *Icerya seychellarum* by Green (1922: 440); status revalidated by Unruh & Gullan (2008: 41).

**Unmounted material.** Body of adult female reddish-orange; dorsum covered with bright yellow mealy wax, with double marginal series of yellow waxy tufts and numerous delicate silky filaments (adapted from Green, 1896).

**Slide-mounted material.** Adult female oval to elliptical (lectotype 5.1 mm long, 3.7 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Open-centre pores, each 25–28 µm in diameter, 15 µm long, with 18–20 outer loculi, cleft absent or very rare, present in marginal clusters and dorsal transverse rows; smaller open-centre pores, 15–20 µm in diameter, with 12–16 outer loculi may be present on head margin. Simple multilocular pores, each with large bilocular centre and 6–10 outer loculi, covering dorsal surface. Ovisac band made of simple multilocular pores of two types: (i) larger pores forming inner ovisac band 3–5 pores wide, each pore 10–12 µm in diameter, with bilocular centre and 6–10 outer loculi, and (ii) slightly smaller pores forming outer ovisac band 2–4 pores wide, each pore 9–10 µm in diameter, with bilocular to trilocular centre and 6–8 outer loculi. Simple multilocular pores, each 7–8 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered on ventromedial head, thorax and abdomen. Vulvar opening as for genus. Cicatrices, oval to reniform, numbering 3, central cicatrix slightly larger than lateral cicatrices. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus.

**Type data.** SRI LANKA: Pundaloya, ex leaves of *Citrus*, *Croton* and *Cocculus*.

**Type material. Lectotype** here designated: ad ♀, “CEYLON/Kandy/On Croton/see Williams & Watson/p.27/C.I.E. type matl./B.M 19”/“*Icerya crocea*/Green/Type material/C.I.E./B.M 19” (BMNH).

**Other material examined.** HONG KONG: ad ♀, NT, Fung Yuen Village, ex *Rubus reflexus*, 4.xii.2003 (*J.H. Martin*) (BME, CMU041); INDIA: ad ♀, Assam, Guwahati, ex unidentified plant, 26.x.2004 (*N.B. Hardy*) (BME, CMU112).

**Taxonomic notes.** Refer to the *I. seychellarum* group for discussion of similar species. Refer to Unruh & Gullan (2008) for discussion of this species.

### *Icerya formicarum* Newstead

*Icerya formicarum* Newstead, 1897: 169.

*Newsteadiella formicarum* (Newstead); MacGillivray (1921: 75).

*Icerya formicarum* Newstead; Morrison (1928: 208).

**Unmounted material.** Adult female pink to brown in colour, covered with white or pale yellow waxy secretion, not forming longitudinal series of wax tufts on dorsum; waxy tassels present around margins, shorter and widely spaced at anterior end, longer and more tightly packed at posterior end; tassels at posterior end projecting above ovisac; two hemispherical tufts of wax present in anal region, one at each side of anal opening; ovisac fluted and curved upward; glassy filaments projecting from margin (adapted from Rao, 1951a).

**Slide-mounted material.** Adult female oval (second-instar nymph lectotype 2.1 mm long, 1.5 mm wide). Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered on derm; long, robust hair-like setae associated with open-centre pores and longest around anal opening. Flagellate setae as for genus. Open-centre pores, each 19–20 µm in diameter, 13–14 µm long, with 16–20 outer loculi and without a cleft, present in marginal clusters and transverse rows on dorsal head and thorax. Simple multilocular pores of two types found on dorsal surface: (i) pores, each 12–13 µm in diameter, with bilocular centre and 10–12 outer loculi, covering all body segments, and (ii) pores, each 10–11 µm in diameter, with trilocular or bilocular centre and 6–8 outer loculi, clustered with open-centre pores. Ovisac band made of two types of simple multilocular pores: (i) pores, similar to dorsal pores, forming inner ovisac band 5–7 pores wide, each pore 10–12 µm in diameter, with 10–12 outer loculi, and (ii) pores, similar to marginal pores, forming outer ovisac band 4–6 pores wide, each pore 8–9 µm in diameter, with trilocular (appearing triangular) or quadrilocular (appearing cruciform) centre and 6–8 outer loculi. Simple multilocular pores, each 8–10 µm in diameter, with bilocular centre and 3–5 outer loculi, scattered on ventromedial head, thorax and abdomen. Vulva as for genus. Cicatrix round to elliptical. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus.

First-instar nymph with hair-like setae at abdominal apex in three pairs.

**Type data.** INDIA: Bombay District, in nests of *Crematogaster subnuda* (*R.C. Wroughton*).

**Type material. Lectotype** here designated: 2<sup>nd</sup>-instar nymph, “289 (Type). *Icerya/formicarum*, n.sp./with *Crematogaster/subnuda*, M. Bombay/district. Wroughton/Colln. Ex coll./Wasmann N. [unintelligible writing]” (BMNH). **Paralectotypes:** 1<sup>st</sup>-instar nymph, “No 289 “A”/Ripersia/formicola, Mask/with *Crematogaster/subnuda*, Bombay/district. Wroughton/coll. Ex coll./Wasmann ‘96’/“No 289 Types/*Icerya formicarum*/n.sp. Newstead./with *Crematogaster/subnuda*, Mayr./Bombay district/Wroughton, Coll./Ex coll. Wasmann ‘9’” (BMNH).

**Other material examined.** INDIA: ad ♀, Andhra Pradesh, Narsapur Forest, ex unidentified plant, 26.x.2004 (*N.B. Hardy*) (BME, CMU107).

**Taxonomic notes.** Refer to *I. seychellarum* group for discussion of similar species.

The paralectotype slide also has the type of *Ripersia formicola* Newstead. Handwritten notes accompany the lectotype and paralectotype slides. Note accompanying lectotype: “*Icerya formicarum* Newst/India Cotypes./=Preadult stage of *Icerya peninsularensis*/Sp.nov. Rao MS/F. Cat. p. 24/V.P. Rao”. Note accompanying paralectotypes: “*Icerya formicarum*, Newst./and/*Ripersia formicola* Newst Mask. ?/Bombay. Cotypes/*Icerya formicarum* Newstead/=Preadult stage of *I. peninsularensis* sp.nov./Rao a/s/V.P. Rao”. *Icerya peninsularensis* is here considered a *nomen nudum* (see below).

### ***Icerya hanoiensis* Jashenko & Danzig**

*Icerya hanoiensis* Jashenko & Danzig, 1992: 90.

**Diagnosis (adapted from Jashenko & Danzig, 1992).** Appearance of adult female in life unknown. Slide-mounted adult female oval (holotype 3.7 mm long). Antennae 11 segmented, basal segment widest, apical segment elongate; each segment covered with hair-like setae. Legs as for tribe. Hair-like setae scattered over entire body, longest around margin. Open-centre pores, each with 20–30 outer loculi, present around margin of body and in transverse rows on dorsum. Simple multilocular pores of two types: larger pores, each with bilocular centre and 10–15 outer loculi, and smaller pores, each with bilocular centre and 7–8 outer loculi. Ovisac band made of both types of simple multilocular pores. Simple multilocular pores present in wide transverse bands on dorsum and submarginal abdomen. Cicatrices (=“abdominal stigmata”) numbering 3, central cicatrix largest. Anal opening surrounded by long, hair-like setae.

**Type data.** VIETNAM: Hanoi, Decorative Plants Nursery, ex *Citrus* sp., 3.i.1986 (G. Konstantinova & M. Kravchenko) (preparation number 40–88).

**Type material. Holotype:** ad ♀ (ZMAS).

**Taxonomic notes.** Refer to *I. seychellarum* group for discussion of similar species.

In the Systematic Remarks section of the original description, Jashenko and Danzig (1992: 7) stated that *I. hanoiensis* differs from all species of *Icerya* by the presence of open-centre pores in transverse rows on the dorsal surface. We suspect *I. hanoiensis* is a synonym of either *I. seychellarum* or *I. crocea*. The description and illustration of the open-centre pores are closer to *I. crocea*, but *I. seychellarum* is a common pest and this species was collected on *Citrus* sp. in a plant nursery in Vietnam. As we were unable to examine the holotype, we refrain from making a synonymy.

The World Catalogue incorrectly listed Konstantinova & Danzig as collectors (Ben-Dov, 2005: 197). The collectors as listed in the original description are G. Konstantinova and M. Kravchenko (Jashenko & Danzig, 1992: 90).

### ***Icerya imperatae* Rao**

*Icerya imperatae* Rao, 1951a: 58.

**Unmounted material.** Adult female brownish, covered with thin white secretion of wax with hair-like setae projecting out from wax (adapted from Rao, 1951a). In contrast, Williams *et al.* (2006) described the live adult female as follows: body reddish orange, legs black, dorsum covered with white wax which also projects as short, thick filaments at posterior end (loc. cit., fig. 1); a white wax ovisac (loc. cit., fig. 2) produced ventrally but not protruding far beyond end of abdomen.

**Slide-mounted material.** Adult female elliptical, widest across thorax, 4.9–5.2 mm long, 2.7–2.8 mm wide (holotype 4.9 mm long, 2.7 mm wide). Antennae 8 segmented. Robust hair-like setae of varying lengths

covering derm, longest setae between antennae and forming marginal clusters around abdomen. Open-centre pores absent. Ovisac band consisting of an anterior transverse row only, 3 or 4 pores wide, made of simple multilocular pores, each 9–10 µm in diameter, with bilocular (very rarely trilocular) centre and 8–12 outer loculi; similar pores forming marginal clusters on abdomen, scattered on marginal head and thorax and across dorsal surface. Simple multilocular pores, each 7–8 µm in diameter, with bilocular centre and 4–6 reniform outer loculi, scattered on ventromedial head, thorax and abdomen. Vulva as for genus, surrounded by short, fine hair-like setae and relatively few typical multilocular pores each 11–12 µm in diameter with bilocular centre and 4–8 reniform outer loculi. Cicatrix round. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by typical multilocular pores, each 8–9 µm in diameter, with bilocular or trilocular centre and 8–12 outer loculi.

**Type data.** PHILIPPINES: Occidental Negros, Sagay, Victorias and Manapla, ex *Imperata exaltata*, *Saccharum spontaneum* and *Bambusa spinosa* (W.D. Pierce).

**Type material. Holotype:** ad ♀, “*Icerya* n. sp/imperatae Rao/holotype./on Saccharum/spontaneum/Ada. Tanao, Sagay/Occ. Negros./fr. W.D. Pierce/Oct. 10, 1928/A18 Tube 14” (USNM). **Paratypes:** 3 1<sup>st</sup>-instar nymphs (same slide as holotype); ad ♀, “*Icerya imperatae* Rao/1 [encircled]/on Imperata exaltata/Victorias, Occ. Negros/P.I./W.D. Pierce, Coll./Jan. 24, 1928./A26”/“A26/ON IMPERATA/EXALTATA/P21/VICTORIAS/OCC. NEGROS/P.I./1/24/28/BY/W.D. PIERCE” (USNM); ad ♀, 4 1<sup>st</sup>-instar nymphs, 2 embryos (nymphs and embryos on one slide), “*Icerya* nsp/imperatae Rao/on sugar cane/Victorias, Occ. Negros/fr. W.D. Pierce/April 10, 1928/A18 Tube 12” (USNM); 2 ad ♀♀, 3 embryos (embryos on one slide), “*Icerya* nsp/imperatae Rao/on Imperata exaltata/Victorias, Occ. Negros/fr. W.D. Pierce/Jan. 24, 1928./A26 Tube 17” (USNM); ad ♀, “*Icerya imperatae*/Rao/2 [encircled]/on sugarcane/Hda. Cayang, Manapla./Occ. Negros/fr. W.D. Pierce/Aug. 6, 1928/A18 Tube 16” (USNM); 7 1<sup>st</sup>-instar nymphs (one slide), “*Icerya* nsp/imperatae Rao/on sugarcane/Hda. Cayang, Manapla./Occ. Negros/fr. W.D. Pierce/Aug. 6, 1928/A18 Tube 16”/“A18/PRENOCOCCUS/AND its destroyers/2 CocieneLLIDS/CANE/VICTORIAS/OCC. NEGROS/4/10/28” (USNM); 2<sup>nd</sup>-instar nymph, “A18 *Icerya*/n.sp./on cane/Lagos an/Cadiz, Oc. Negros/3/13/29/WD Pierce” (USNM); ad ♀, “*Icerya* n sp./imperatae Rao/3 [encircled]/On Bambusa spinosa/Manapla, Occ. Negros/fr. W.D. Pierce/July 11, 1928./A18 Tube 15”/“A-J8/On BAMboo/MANAPLA/Occ. NeGROS. P.I./7/13/28” (USNM); ad ♀, 6 1<sup>st</sup>-instar nymphs, 6 embryos (nymphs and embryos on one slide), “*Icerya* n sp/imperatae Rao/on sugar cane/Hda. Salome, Manapla/Occ. Negros/Fr. W.D. Pierce/April 24, 1928./A18 Tube 13” (ad ♀ at BME; nymphs end embryos at USNM); 4 boxes of dry material (USNM).

**Other material examined.** PALAU: ad ♀, Babeldaob Island, ex *Brachiaria decumbens*, 29.iv.2005 (*F. Sengebau*) (BME, CMU127).

**Taxonomic notes.** *Icerya imperatae* looks unlike any other iceryine species and is distinguished by the presence of an ovisac band consisting only of an anterior transverse row of pores.

The World Catalogue did not provide complete type information, as it gave only the collection information of the holotype (Ben-Dov, 2005: 197). Rao (1951a: 60) explained, “This species is described from specimens collected by W.D. Pierce on *Imperata exaltata*, *Saccharum spontaneum* and *Bambusa spinosa* in Occidental Negros (Philippines).” Complete type data are listed above. For more information about this species refer to Williams *et al.* (2006).

### *Icerya jacobsoni* Green

*Icerya jacobsoni* Green, 1913: 316.

*Crypticerya jacobsoni* (Green); Morrison (1928: 203).

*Icerya jacobsoni* Green; Unruh & Gullan (2008: 41).

**Unmounted material.** Adult female flattish, reddish orange and covered in white mealy secretion arranged in tufts on median and submedian areas, leaving submarginal area bare, forming 20 long curling waxy extensions around margin, stoutest at anterior end, becoming more slender towards posterior end. Legs and antennae reddish (adapted from Green, 1913).

**Slide-mounted material.** Adult female elongate to oval, 5.6–6.3 mm long, 3.8–4.7 mm wide (lectotype 6.3 mm long, 4.7 mm wide). Antennae 10 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm around atrial opening with 5 or 6 simple multilocular pores, each 10–11  $\mu\text{m}$  in diameter, with bilocular or trilocular centre and 6–8 outer loculi. Short hair-like setae completely covering derm, longest forming marginal clusters and clustered around anal opening. Flagellate setae as for genus, longest in clusters around ventral margin and ventral head and thorax. Open-centre pores absent. Ovisac absent. Marsupium absent. Simple multilocular pores, each 10–11  $\mu\text{m}$  in diameter, with bilocular (rarely trilocular) centre and 6–10 outer loculi and appearing stalked in profile, covering dorsal surface. Simple multilocular pores, each 12–13  $\mu\text{m}$  in diameter, with trilocular (rarely quadrilocular) centre and 6–10 outer loculi and appearing stalked with protruding projection visible in profile, forming dense band around margin. Simple multilocular pores, each 10–12  $\mu\text{m}$  in diameter, with thickened outer rim and with bilocular or trilocular centre and 4–8 outer loculi, scattered on ventral head and thorax; similar pores, each with trilocular, quadrilocular or quinquelocular centre and 4–8 outer loculi, scattered on ventral abdomen. Vulva as for genus, surrounded by short hair-like setae and typical multilocular pores, each pore 12–13  $\mu\text{m}$  in diameter, with bilocular centre and 8–12 outer loculi. Cicatrices oval, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical pores, each pore 10–12  $\mu\text{m}$  in diameter, with bilocular or trilocular centre and 8–10 outer loculi.

**Type data.** INDONESIA: Java, Semarang, ex *Dombeya acutangula*.

**Type material.** **Lectotype** here designated: ad ♀, “*Icerya/jacobsoni/seminuda*, Green/From/*Dombeya acutangula*/Samarang, Java./coll. E. Jacobson./no.1301 etc.” (BMNH). **Paralectotypes:** 2 ad ♀♀, 3 1<sup>st</sup>-instar nymphs (same slide as lectotype).

**Taxonomic notes.** Refer to the *I. jacobsoni* group for further discussion of similar species. The lectotype on far right of slide when slide label is held to the left.

### *Icerya jaihind* (Rao)

*Crypticerya jaihind* Rao, 1951b: 148.

*Icerya jaihind* (Rao); Unruh & Gullan (2008: 41).

**Unmounted material.** Adult female covered by wax on dorsum with marginal wax fringes, subequal in length, sometimes considerably longer than body (adapted from Rao, 1951b).

**Slide-mounted material.** Adult female elongate to oval, 5.2–10.6 mm long, 3.4–6.2 mm wide. Antennae 10 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm around atrial opening with 5 or 6 simple multilocular pores, each 10–11  $\mu\text{m}$  in diameter, with bilocular or trilocular centre and 6–8 outer loculi. Short hair-like setae completely covering derm, longest forming marginal clusters and clustered around anal opening. Flagellate setae as for genus, longest in clusters around ventral margin and ventral head and thorax. Open-centre pores absent. Ovisac absent. Marsupium absent. Simple multilocular pores, each 10–11  $\mu\text{m}$  in diameter, with bilocular (rarely trilocular) centre and 6–10 outer loculi and appearing stalked in profile, covering dorsal surface. Simple multilocular pores, each 12–13  $\mu\text{m}$  in diameter, with trilocular (rarely quadrilocular) centre and 6–10 outer loculi and appearing stalked with protruding projection visible in profile, forming dense band around margin. Simple multilocular pores, each 10–12  $\mu\text{m}$  in diameter, with thickened outer rim and bilocular or trilocular centre and 4–8 outer loculi, scattered on ventral head and

thorax; similar pores with trilocular, quadrilocular or quinquelocular centre and 4–8 outer loculi, scattered on ventral abdomen. Vulva as for genus, surrounded by short hair-like setae and typical multilocular pores, each pore 12–13 µm in diameter, with bilocular centre and 8–12 outer loculi. Cicatrix oval. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical pores, each pore 10–12 µm in diameter with bilocular or trilocular centre and 8–10 outer loculi.

**Type data.** INDIA: Madras, South Kanara District, Mangalore, ex *Ficus asperrima* (V.P. Rao); Cochin State, Nelliampathy Hills, Chandramalai Estate, ex guava [= *Psidium guajava*] (V.P. Rao).

**Type material. Holotype:** ad ♀ (INPC). **Paratype:** ad ♀ (INPC).

**Material examined.** HONG KONG: ad ♀, HK, Aberdeen Country Park, ex *Litsea glutinosa*, 8.xii.2003 (J. H. Martin) (BME, CMU 047); THAILAND: ad ♀, Prae, Wieng Kosai National Park, ex *Streblus asper*, 14.iii.2002 (P.S. Cranston) (BME, CMU036).

**Taxonomic notes.** Refer to the *I. jacobsoni* group for discussion of similar species.

We were unable to examine type material of this species. According to Rao (1951b:150), the holotype specimen was collected in Madras and the paratype is from Cochin State. Based on Rao's description, we believe that probably he confused the dorsal and ventral surfaces. On specimens from Hong Kong and Thailand, we found that pores with a bilocular centre were found mostly on the dorsal surface, and pores with a trilocular or quadrilocular centre were found on the ventral surface, which is opposite to what Rao stated.

### *Icerya koebelei* Maskell

*Icerya koebelei* Maskell, 1892: 184 [not Maskell (1893: 245), as in Ben-Dov (2005: 198)].

**Unmounted material.** Adult female bright red, dorsum covered with patches of mealy wax, often thick in some areas, forming a cylinder of wax nearly as long as body, projecting from middorsum; glassy filaments projecting from body; ovisac made of yellow wax, relatively short, scarcely extending from abdomen, and causing abdomen to appear raised (adapted from Maskell, 1893, and Morrison, 1927).

**Slide-mounted material.** Adult female oval, 3.7–4.4 mm long, 2.5–3.0 mm wide. Antennae 9 or 10 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, derm outside atrial opening of anterior spiracles with cluster of 3 or 4 simple multilocular pores, posterior spiracles with cluster of 6 or 7 pores, each pore with bilocular centre and 6–8 outer loculi. Blackish, curly hair-like setae covering dorsal surface, densest across head and thorax, and clustered with open-centre pores around margin; scattered across ventral head and thorax. Flagellate setae distributed as for genus. Open-centre pores, each 16–18 µm in diameter, 15–17 µm long, with 6–8 outer loculi, forming marginal clusters and dense across dorsal head. Simple multilocular pores, each 9–10 µm in diameter, with bilocular centre and 6–8 outer loculi, covering dorsal surface; cluster of 30–50 pores on middorsum. Ovisac band made of simple multilocular pores of two types: (i) pores, each with bilocular centre and 8–10 outer loculi, forming inner band 3–5 pores wide at anterior edge, and in clusters of 10–12 pores around lateral and posterior edges, and (ii) smaller pores, each with bilocular or trilocular centre and 4–6 outer loculi, forming outer band on anterior edge, 1 or 2 pores wide, and in segmental clusters on submarginal ventral abdomen. Simple multilocular pores, each 9–10 µm in diameter, with bilocular centre (appearing reniform) and 4 or 5 outer loculi, scattered on ventromedial head and thorax, and scattered across ventromedial to submedial abdomen. Vulva as for genus. Cicatrices round to oval, numbering 3, central cicatrix largest or all subequal in size. Abdominal spiracles in 2 pairs. Anal tube as for genus; anal opening as for genus, surrounded by long, robust hair-like setae.

**Type data.** AUSTRALIA: New South Wales, Sydney and Brisbane, ex *Leptospermum laevigatum* (Mr. Koebele).

**Type material. Lectotype** here designated: ad ♀, "Icerya Koebelei/adult female/1892 W.M.M./Entomol-

ogy Div., DSIR, NZ" (ANIC). **Paralectotypes:** 2<sup>nd</sup>-instar nymph, "Icerya Koebelei/2nd Stage female/1892 W.M.M./Entomology Div., DSIR, NZ" (NZAC); 1 wing, 1 antennae and part of head (1 eye), apex of abdomen (one slide), "Icerya Koebelei/wing, abdomen/and antenna of male/1892 W.M.M./Entomology Div., DSIR, NZ" (NZAC); 3 1<sup>st</sup>-instar nymphs (one slide), 1 1<sup>st</sup>-instar nymph, "Icerya Koebelei/larvae/1892 W.M.M./Entomology Div. DSIR, NZ" (NZAC); 1 1<sup>st</sup>-instar nymph, "Icerya/koebelei/Entomology Div., DSIR, NZ"/"Icerya 283/from Kobele/Jan/92/larva" (NZAC); 2 1<sup>st</sup>-instar nymphs, "Icerya/Koebelei Mask./Larvae/Australia/Mask. Coll. #283/Cotype Cat.No.25273/U.S.N.M" (USNM).

**Other material examined.** AUSTRALIA: ad ♀, New South Wales, Wattamolla, ex *Persoonia* sp., 4.ii.2003 (C.A.M. Reid) (BME, CMU012).

**Taxonomic notes.** Refer to the "Pericerya" group for discussion of similar species.

The paralectotype slide present in the USNM collection is included because the collection number ("Mask. Coll. #283") matches the collection number on one paralectotype slide from the NZAC.

### ***Icerya kumari* (Rao)**

*Crypticerya kumari* Rao, 1951b: 152.

*Icerya kumari* (Rao); Unruh & Gullan (2008: 41).

**Diagnosis (adapted from Rao, 1951b).** Body of female brown to brick-red, dorsum covered with pale yellow waxy secretion; glassy filaments scattered; white pencils of wax projecting from anal region; no fluted ovisac present, but layer of thin wax present at posterior end. Antennae 9 segmented, each segment covered with hair-like setae. Legs as for tribe, claw digitules knobbed. Hair-like setae covering derm, longest forming marginal clusters. Open-centre pores present on dorsal surface, each with highly chitinized outer rim and 5 or 6 much reduced and widely spaced outer loculi. Simple multilocular pores scattered on dorsal surface with elongate [likely bilocular] centre and 6–8 outer loculi. Micropores scattered amongst other pores on dorsal surface with trilocular or quadrilocular centre and lacking outer loculi. Simple multilocular pores on venter of three types: (i) pores with trilocular to quadrilocular centre and 4–6 outer loculi, (ii) pores with elongate to bilocular centre and 4 outer loculi, and (iii) pores with trilocular centre and 3 outer loculi [these pores with indistinctly separated centre]. Ovisac band absent. Marsupium absent. Cicatrix round, with sclerotized outer edge. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus. Derm on both surfaces with highly chitinized "blotches" of cuticle.

**Type data.** INDIA: Mysore State, Gopaldaswamy Hill, ex Darbha grass [= *Desmostachya bipinnata*].

**Type material. Holotype:** ad [?] ♀ (INPC).

**Taxonomic notes.** Refer to the *I. pilosa* group for a discussion of similar species.

Rao (1951b: 152) described this species from a single specimen collected on grass. Rao stated that this species has resemblance to a young *I. pilosa*, but can be separated by the absence of an ovisac band, the presence of the chitinised rim of the ventral cicatrix and the shape of the disc pores. Unfortunately, we were unable to examine the holotype of this species, but strongly suspect that this is identical to *I. pilosa*. In the blurred photos in Rao's manuscript, the vulvar opening is not apparent and the slightly chitinised rim of the cicatrix is characteristic of third-instar nymphs of the Iceryini.

### ***Icerya mangiferae* (Tang & Hao)**

*Crypticerya mangiferae* Tang & Hao, 1995: 151.

*Icerya mangiferae* (Tang & Hao); Unruh & Gullan (2008: 41).

**Diagnosis (adapted from Tang & Hao, 1995).** Appearance of adult female in life unknown. Slide-mounted adult female oval, 7.0 mm long, 5.0 mm wide. Antennae 10 segmented, each segment with hair-like setae. Legs as for genus. Hair-like setae short and slender on both dorsal and ventral surfaces, longest setae forming marginal clusters. Simple multilocular pores with elongate to trilobular centre, these pores densest around margins. Ovisac band absent. Marsupial band absent. Open-centre pores absent. Cicatrices oval to reniform, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs.

**Type data.** CHINA: Yunnan Province, Jinghong, ex *Mangifera indica* and “Xiang-ti-guo” [=elephant’s shoe-shaped fruit] [= *Ficus auriculata*].

**Type material. Holotype:** ad ♀ (ex *Mangifera indica*, EISC). **Paratypes:** 13 ad ♀♀ (EISC).

**Taxonomic notes.** Refer to *I. jacobsoni* group for a discussion of similar species.

The holotype and four paratypes were collected on *Mangifera indica* and nine paratypes were collected on *Ficus auriculata*.

This species was transferred to *Icerya* based on the shape of the derm pores, and especially based on the enlargement of the derm pore that appears to be on a stalk, similar to those of *I. jacobsoni*, *I. jaihind* and *I. assamensis*. We suspect this species is probably identical to *I. jacobsoni*. Tang and Hao (1995: 564–565) stated that this species differs from *I. jacobsoni* by the shape of the cicatrices and the presence of simple multilocular pores with quadrilobular centre. A description of this pore is not present in the description of the species, but the pore is figured as an enlargement in the illustration of the adult female (Tang & Hao, 1995: 684). We have examined several specimens of *I. jacobsoni* and have seen simple multilocular pores with a quadrilobular centre on the derm of the adult female. This pore type is rarely encountered, but present on almost all of the specimens that we examined. Unfortunately, we have not examined the type material of *I. mangiferae* and refrain from synonymizing this species with *I. jacobsoni*.

### *Icerya menoni* Rao

*Icerya menoni* Rao, 1951a: 60.

**Diagnosis (adapted from Rao, 1951a).** Adult female covered in fluffy, woollen, white wax and glassy filaments. Posterior end with two waxy pencils projecting from anal area. Ovisac not fluted, consisting of fluffy wax secretion beneath abdomen, projecting 3 to 4 mm from posterior end of body, but partly concealed by many long, glassy filaments projecting from dorsal surface and margin. Slide-mounted adult female oval. Antennae 11 segmented. Legs slender, as for genus, claw digitules acute. Open-centre pores present, forming longitudinal bands on dorsum, in clusters around margin, dense on dorsal head. Ovisac band made of simple multilocular pores of two types: larger pores with bilobular to trilobular centre and 6–8 outer loculi and smaller pores with bilobular centre and 6–7 outer loculi. Simple multilocular pores with bilobular centre and 4 outer loculi on venter. Vulva as for genus. Cicatrix circular. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening surrounded by long, hair-like setae.

**Type data.** INDIA: Cochin State [=Kerala], Maradu, ex *Cocos nucifera*, 7.xii.1943.

**Type material. Holotype:** ad ♀ (INPC). **Paratype:** ad ♀ (INPC).

**Taxonomic notes.** We were unable to examine material of this species. Refer to *I. seychellarum* group for a discussion of similar species.

## *Icerya minor* Green

*Icerya minor* Green, 1908: 17.

*Leachia festiva* Kieffer, 1909: 163. Synonymy by Morrison (1928: 223).

**Unmounted material.** Adult female covered with thick secretion of white wax arranged in groups on median, submarginal and marginal dorsum; tassels of wax present around margin (much shorter than tassels seen in *I. aegyptiaca*); length of ovisac less than half length of body, projecting from posterior end (adapted from Rao, 1951a).

**Slide-mounted material.** Adult female oval, 3.4 mm long, 2.3–2.5 mm wide (lectotype 3.4 mm long, 2.5 mm wide). Antennae 10 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae distributed as for genus, longest in marginal clusters. Flagellate setae distributed as for genus. Simple multilocular pores, each with bilocular or trilocular centre and 6–8 outer loculi, covering dorsal surface, each pore 8–9 µm in diameter on head and thorax, each pore 7–8 µm in diameter on abdomen. Simple multilocular pores, each 8–10 µm in diameter, with hexalocular centre and 4–6 outer loculi, forming marginal clusters and associated with long, hair-like setae. Simple multilocular pores, each 8–9 µm in diameter with trilocular or quadrilocular centre and 8–10 outer loculi, scattered on ventromedial head and thorax. Ovisac band, 2–4 pores wide, made of simple multilocular pores, each 8–9 µm in diameter, with quadrilocular or quinquelocular centre and 7–8 outer loculi. Simple multilocular pores, each 6–7 µm in diameter, with trilocular centre and 3 outer loculi, closely abutting inner edge of ovisac band. Simple multilocular pores, each 6–7 µm in diameter, with trilocular centre (appearing reniform) and 4 outer loculi, scattered across ventromedial abdomen. Vulva as for genus. Cicatrices round to oval, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus.

**Type data.** *Icerya minor*: INDIA: Bengal, Pusa, ex mango (*H.M. Lefroy*). *Leachia festiva*: INDIA: Bengal, Manresa House near Ranchi, on underside of leaves of *Mangifera indica*.

**Type material.** **Lectotype** of *I. minor* here designated: ad ♀, “*Icerya/minor*, Gree/(type)/on Mango/Bengal, India/coll. H.M. Lefroy/(~~Phen.~~ mangiferae)” (BMNH). **Paralectotypes** of *I. minor*: ad ♀, ad ♂ (same slide as lectotype); ad ♀, “*Icerya/minor*, Green/(cotype)./on Mango/Bengal, India/coll. H.M. Lefroy” (BMNH).

**Syntypes** of *Leachia festiva*: ♂, type material lost (Ben-Dov, 2005: 201).

**Taxonomic notes.** Refer to *I. pulchra* group for a discussion of similar species.

The lectotype is the adult female to the lower left of the adult male. The lectotype slide also has a mealybug mounted on it (subfamily Phenacoccinae, Det. N.B. Hardy, x.2006). Green (1908: 18) described the adult female, adult male, pupal male, “nymph” exuviae, and “larva” of *I. minor*. Only adult females and an adult male are present in the BMNH collection.

## *Icerya morrisoni* Rao

*Icerya morrisoni* Rao, 1951a: 64.

**Unmounted material.** Appearance of adult female in life unknown.

**Slide-mounted material.** Adult female 3.5–6.0 mm long, 2.5–4.0 mm wide (holotype 3.5 mm long, 2.5 mm wide). Antennae 11 segmented, all segments with setae, apical segment with most setae. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae distributed as for genus, longest in marginal clusters. Flagellate setae distributed as for genus. Simple multilocular pores each with bilocular or trilocular centre and 6–8 outer loculi, covering dorsal surface, each pore 8–9 µm in diameter on head and thorax, each pore 7–8 µm in diameter on abdomen. Simple multilocular pores, each 8–10 µm in diameter, with

hexalocular centre and 4–6 outer loculi, forming marginal clusters and associated with long, hair-like setae. Simple multilocular pores each 8–9 µm in diameter with trilocular or quadrilocular centre and 8–10 outer loculi, scattered on ventromedial head and thorax. Ovisac band 2–4 pores wide, made of simple multilocular pores, each 8–9 µm in diameter, with quadrilocular or quinquelocular centre and 7–8 outer loculi. Simple multilocular pores, each 6–7 µm in diameter, with trilocular centre and 3 outer loculi, closely abutting inner edge of ovisac band. Simple multilocular pores, each 6–7 µm in diameter, with trilocular centre (appearing reniform) and 4 outer loculi, scattered across ventromedial abdomen. Vulva as for genus. Cicatrix round to oval. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus.

**Type data.** PHILIPPINES: Manila, ex coconut [= *Cocos nucifera*], intercepted at the Plant Quarantine Station in Seattle, Washington, U.S.A. (*M.J. Forsell*); CHINA: Loh Kong Tsa, ex *Litsea glutinosa*, intercepted at the Plant Quarantine Station in Seattle, Washington, U.S.A. (*C.W. Howard*).

**Type material. Holotype:** ad ♀, “*Icerya tangalla/aegyptiaca* Gn/(Dougl.)/On Coconut./From. Manila. P.I./At – Seattle./M.J. Forsell, Collr./Jan. 28, 1925/Seattle #174” (USNM). **Paratype:** ad ♀, “*Icerya/aegyptiaca*/Dougl./*tangalla* fr. ?/On *Litsea glutinosa*/Loh Kong Tsa, China/C.W. Howard, Coll./Dec. 7, 21 #212” (USNM).

**Other material examined.** ad ♀, “*Icerya/aegyptiaca*/(Dougl.)/On. Coconut./From. Manila, P.I./At – Seattle./M.J. Forsell, Collr./Jan. 28, 1925./Seattle # 174.” (USNM).

**Taxonomic notes.** Refer to *I. pulchra* group for a discussion of similar species.

Rao originally identified the type material of this species as *Icerya tangalla*. Only after examining material of *I. tangalla* while visiting BMNH, did he discover that it should be considered a new species. Ben-Dov (2005: 203) only listed type data for the holotype and not the paratype. Complete type data are listed above; the holotype is from the Philippines and the paratype is from China. Another slide of an adult female with the same collection data as the holotype is present in the USNM collection and listed under other material examined. This slide, however, is not labelled *I. tangalla* and Rao named only a single paratype for this species. Therefore, we cannot consider it a paratype. Presumably, Rao overlooked this slide when he examined the USNM material.

### *Icerya natalensis* (Douglas)

*Ortonia natalensis* Douglas, 1888: 86.

*Icerya natalensis* (Douglas); Cockerell (1896a: 323).

*Crypticerya natalensis* (Douglas); Morrison (1928: 203).

*Icerya natalensis* (Douglas); Unruh & Gullan (2008: 41).

**Unmounted material.** Adult female oval, 7–8 mm long, 4–5 mm wide, broadest across abdomen; body chrome-yellow, covered in short, flocculent white wax, margin with close fringe of delicate hairs (adapted from Douglas, 1888).

**Slide-mounted material.** Adult female elliptical, 6.8 mm long, 2.8 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe; claws very long and slender. Hair-like setae completely covering derm, longest at posterior margin and associated with clusters of open-centre pores. Open-centre pores, each 18–19 µm in diameter, 15–18 µm long, with 8–10 outer loculi, forming marginal clusters. Simple multilocular pores, each 7–8 µm in diameter, with bilocular (appearing reniform) or trilocular centre and 3–5 outer loculi scattered on ventromedial head and thorax. Simple multilocular pores, each 10–11 µm in diameter, with bilocular centre and 8–12 outer loculi, covering dorsal surface and ventral submargin and margin. Ovisac band absent. Marsupium absent. Simple multilocular pores, appearing slightly bluish when stained, each pore 14–15 µm in diameter, with bilocular or trilocular centre and 8–12 outer loculi, scattered across ventromedial abdomen. Vulva as for tribe. Cicatrices round, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal

tube and anal opening as for genus.

First-instar nymph as for genus, except with 2 pairs of long, hair-like setae at abdominal apex.

**Type data.** SOUTH AFRICA: Natal, Richmond, ex *Cliffortia serrulata*, 1888 (J.R. Ward).

**Type material. Syntypes:** ad ♀♀, 1<sup>st</sup>-instar nymphs (BMNH?).

**Material examined.** ad ♀, “*I. natalensis*/Richmond, Africa/Aug. 20 ‘95/(Cooper)’//‘6661’//‘132/19’” (USNM); exuviae of 3<sup>rd</sup>-instar nymph, “*Icerya natalensis* (Dougl.)/Natal/A.W. Cooper, Coll./Aug. 30, 1895” (USNM); 5 1<sup>st</sup>-instar nymphs, “*Icerya Natalensis/Larva/awl/Richmond, Natal .95’//‘6661’//‘140/23’*” (USNM); 1 1<sup>st</sup>-instar nymph, “4501/Larva of/ORTONIA NATALENSIS/hatched in England from/egg laid by adult insect/sent from Natal./1889. R. T. Lewis.”//“Fresh Specimen,/killed on slide by mounting medium./132/18” (USNM).

**Additional material (not examined).** 2 1<sup>st</sup>-instar nymphs, “Larvae of Ortonia Natalensis (Richmond, Natal), hatched in England December 1888, R T Lewis” (BMNH); ad ♀, “mounted from material in the Douglas collection, 1904/120” and “7.x.1915” (BMNH).

**Taxonomic notes.** Refer to *I. natalensis* group for discussion of similar species.

We placed this species in *Icerya* rather than *Gigantococcus* based on the types of pores present on the adult female, especially the open-centre pores around the body margin.

Douglas (1888) explained that several specimens of this species were first collected in May, 1888 by J.R. Ward, who sent them to G. Henderson (then editor of “British Bee Keepers”), who sent them to R.T. Lewis, who then sent Douglas five live specimens. Douglas received them on June 23, 1888 and promptly killed all five of them. Lewis kept some alive and reported that several adult females, “have each made a mass of flocculent matter behind them...in the midst of which numerous ova are deposited” (Douglas, 1888: 88).

A year later, Douglas (1889) published Lewis’s illustrations and comparisons of the first-instar nymph of *Ortonia natalensis* and *I. purchasi*. Lewis’ notes and drawings were based on first-instar nymphs that hatched from material of *O. natalensis* sent to him in May, 1889. He explained that the adult females were not covered in flocculent white wax, but rather produced white cottony wax composed of long threads and a “train” of wax that extended from the posterior end of the body and into which eggs were laid. Lewis sent Douglas two adult females with their “woolly trains” intact and full of first-instar nymphs (Douglas, 1889). Based on Lewis’s account of the differences between the first-instar nymphs of the two species and Douglas’ own comparison of *O. natalensis* to Signoret’s description of *I. sacchari* (now *I. seychellarum*), Douglas reaffirmed his belief in the placement of the species in *Ortonia* (1889: 233).

As pointed out to Brain (1915: 105) by A.W. Cooper, Fernald (1903) listed *Acacia*, orange and lemon incorrectly as hosts of *I. natalensis*. Those plants are listed as hosts of *I. purchasi* in Douglas’s (1889) paper directly above his section about *O. natalensis*.

The five specimens that Lewis sent to Douglas in 1888 have not been located in the collection at BMNH (J.H. Martin, BMNH, pers. comm.). Both BMNH and USNM have specimens dated 1889, but we presume this material is from the second batch of specimens sent to Douglas by Lewis.

### ***Icerya nuda* Green**

*Icerya (Crypticerya) nuda* Green, 1930: 282.

*Crypticerya nuda* (Green); Rao (1951b: 154).

*Icerya nuda* Green; Unruh & Gullan (2008: 41).

**Diagnosis (based on poorly mounted lectotype, Green, 1930 and Rao, 1951b).** Adult female oval, broadest at posterior end, 13 mm long, 11 mm wide. Antennae 11 segmented. Legs as for genus except relatively small and thin. Short hair-like setae on dorsal surface scattered, sparse; probably present in clusters at posterior mar-

gin. Open-centre pores, each with 6–10 outer loculi, present on dorsum and venter. Simple multilocular pores with elongate centre [possibly bilocular] and 4–6 outer loculi. Marsupial band and ovisac band absent. Vulva as for genus. Cicatrices not visible. Abdominal spiracles not visible. Anal tube as for genus; anal opening surrounded by a fair number of setae.

First-instar nymph with 3 pairs of long hair-like setae at abdominal apex. Abdominal spiracles in 3 pairs.

**Type data.** INDONESIA: Sumatra, ex *Gigantochloa aspera* (E. Jacobson).

**Type material.** **Lectotype** here designated: ad ♀, “*Icerya/nuda/Green/on Gigantochloa/aspera/Sumatra/* Coll. E Jacobson. 10” (BMNH). **Paralectotypes:** 10 embryos (one slide), 8 embryos (one slide), 10 embryos (one slide), “*Icerya/nuda/Green/(embryonic larvae)/on Gigantochloa/aspera/Sumatra/coll. E. Jacobson 10*” (BMNH); 10 embryos (one slide), same data as above, except with, “let stend/Green det” written in red on top of slide (USNM).

**Taxonomic notes.** The poor condition of the lectotype and the meagre original description make it difficult to provide an adequate comparison of this species to any other iceryine. However we believe that this species belongs to the *Iceryini* because the first-instar nymphs have 3 pairs of abdominal spiracles.

Green's original description of this species was based on a single adult female and embryonic first-instar nymphs extracted from the body of the female. The slide-mounted lectotype is an old, sclerotized individual and the slide-mount is in terrible condition. It is very difficult to discern cuticular features, especially pore structure and distribution. Green (1930) believed this species to be ovoviviparous because he extracted embryos from the body of the adult female. This is unusual for iceryine adult females, which either lay eggs into a marsupium or deposit the eggs beneath the body or in an ovisac. Thus iceryine eggs develop into embryos outside of the body rather than inside.

The original description does not give a specific locality, but states that the specimen was collected by Edward Jacobson in Sumatra between the years 1923 to 1927. The host plant is a bamboo species (Poaceae).

### ***Icerya nudata* Maskell**

*Icerya nudata* Maskell, 1896: 405.

*Crypticerya nudata* (Maskell); Cockerell (1899a: 390).

*Palaeococcus nudata* (Maskell); Cockerell (1902a: 233).

*Icerya hyperici* Froggatt, 1919: 472. Synonymy by Unruh & Gullan (2008: 43).

*Palaeococcus dymocki* Froggatt, 1921: 36. Synonymy by Unruh & Gullan (2008: 43).

*Steatococcus nudatus* (Maskell); Morrison & Morrison (1923: 28).

*Steatococcus dymocki* (Maskell); Vayssière (1926: 307).

*Steatococcus hyperici* (Maskell); Williams & Watson (1990: 33).

*Icerya nudata* Maskell; Unruh & Gullan (2008: 41).

**Unmounted material.** Adult female yellowish-red to brick red, covered in thin, white, mealy wax that can form tufts. Dorsal surface convex, ventral region swollen, submargin enlarged, forming a ridge (adapted from Maskell, 1896).

**Slide-mounted material.** Adult female oval. Antennae 10 segmented. Eyes, mouthparts and legs as for tribe; legs with thickened femora. Thoracic spiracles as for genus; derm around atrial opening with 8–12 simple multilocular pores clustered at opening. Hair-like setae scattered on derm, longest marginally and ventromedially. Flagellate setae distributed as for genus. Open-centre pores, each 12–15 µm in diameter, appearing slightly tubular with 5–7 outer loculi and a small cleft, forming clusters on head and margins, densest at posterior abdomen. Simple multilocular pores, each with bilocular (rarely trilocular) centre and 6–12 outer loculi, scattered on derm of dorsum and ventral margins. Marsupial band, incomplete anteriorly, made of short hair-like setae and simple multilocular pores, each with bilocular centre and 4–6 outer loculi. Marsupial cavity with multilocular pores, similar to vulvar pores, each with bilocular centre and 5–8 outer loculi. Simple mul-

tilocular pores, each 8–9 µm in diameter, with bilocular centre and 4 or 5 outer loculi, scattered on ventromedial head and thorax. Vulva as for genus. Cicatrices round, numbering 1–3; central cicatrix always present and much larger than lateral ones. Abdominal spiracles in 3 pairs. Anal opening and anal ring as for genus.

**Type data.** *Icerya nudata*: AUSTRALIA: New South Wales, ex *Cosmos* sp. and *Verbena* sp. (Mr. Olliff). *Icerya hyperici*: AUSTRALIA: New South Wales, Mudgee, ex St. John's Wort [= *Hypericum perforatum*], 4.x.1917 (W.W. Froggatt). *Palaeococcus dymocki*: AUSTRALIA: Queensland, Spring Valley, near Hughenden, on basal stems above the roots of a small shrubby plant (*M. Dymock*).

**Type material. Lectotype** of *Icerya nudata* here designated: ad ♀, "Icerya/nudata/adult female/1895/W.M.M./Entomology Div., DSIR, NZ" (ANIC). **Paralectotypes**: 5 embryos (same slide as lectotype); 1 1<sup>st</sup>-instar nymph, "Icerya/nudata/adult female/1895/W.M.M./Entomology Div., DSIR, NZ" (NZAC); 3 ad ♀♀, "Family Margarodidae/*Steatococcus nudatus*/(Maskell), adult female/from pillbox labelled:/"Icerya / nudata / Australia"/in Maskell's collection/in NZAC, New Zealand/syntype"/"Acid fuchsin stain./Mounted in Canada balsam/in xylene. Slide prepared/by P.J. Gullan 1993" (NZAC); 1 ad ♀, 9 1<sup>st</sup>-instar nymphs (one slide), "Icerya/nudata/Mask./Australia/ex coll. W.M. Maskell" (BMNH).

**Lectotype** of *Icerya hyperici* here designated: ad ♀, "Aust. Entomology/Icerya n sp./on St John's Wort/W.W. Froggatt/Loc. Mudgee/NSW/Coll. 10/4/17" (ANIC). **Paralectotypes**: 2 2<sup>nd</sup>-instar nymphs, 2 1<sup>st</sup>-instar nymphs (all specimens on one slide), "Aust. Entomology/Icerya hyperici/n.sp./on St John Wort/10/4/18/Loc. Mudgee/Coll. W W F" (ASCU).

**Lectotype** of *Palaeococcus dymocki* here designated: ad ♀, "Family Margarodidae/*Steatococcus dymocki*/(Froggatt), ad ♀ (with marsupium)/Det. P.J. Gullan/ex drymount with labels:/'Palaeococcus / dymocki/Frogg / Queensland',/ 'Queensland / Hughendon//Miss M Dymock/ 20.5./1916' and 'Type / Cat./Coc. / WWF' ASCT"/"Acid fuchsin stain/Mounted in Canada balsam/in xylene. Slide prepared/by P.J. Gullan 1999" (ASCU). **Paralectotypes**: 10 1<sup>st</sup>-instar nymphs (one slide), same data as lectotype except: "from ad. ♀" (ASCU); 2 1<sup>st</sup>-instar nymphs (one slide), "666/Palaeococcus/dymocki n sp/Hughenden/Qued/WWF"/"666/Palaeococc/larva/Hughen.../26.5.16" (ASCU); 2 ad ♀♀, "Family Margarodidae/*Palaeococcus dymocki*/Froggatt, adult ♀/Syntype, ♀ removed from/mount labelled – '666//Queensland / Hughenden / /*Palaeococcus / dymocki*/1921 / WWF.'/*Steatococcus dymocki* (Froggatt)/Det. P.J. Gullan, 1896."/"Acid fuchsin stain/Mounted in Canada balsam in/xylene. Slide prepared by/P.J. Gullan, 1896, from dry/nymphs ex ♀ glued to card/on pin-mount. ANIC, CSIRO/specimen ex collection of/W.W. Froggatt." (ANIC); 2 1<sup>st</sup>-instar nymphs (one slide), same data as previous 2 ad ♀♀ except: "first instar nymphs/ex marsupium of adult ♀/Syntype" (ANIC).

**Other material material.** AUSTRALIA: ad ♀, 9 1<sup>st</sup>-instar nymphs (1 slide), "Icerya/nudata/Mask./Australia/ex coll. W.M. Maskell" (BMNH); ad ♀, 6 1<sup>st</sup>-instar nymphs (one slide) (same data as previous slide, except "Palaeococcus/nudata") (BMNH).

**Taxonomic notes.** Refer to the taxonomic note on *I. assamensis* and to *I. nudata* group for a discussion of similar species.

Refer to Unruh & Gullan (2008) for discussion of this species. Froggatt (1921) described the live appearance of both Maskell's *P. nudatus* and Froggatt's *P. dymocki*. His description of the former matches that given by Maskell (1896), but the adult female of *P. dymocki* was said to be "light biscuit brown to buff coloured, very lightly covered with mealy secretion, chiefly on the margin and under-surface". These differences may be due to the subterranean habit of the specimens of *P. dymocki*.

### *Icerya pilosa* Green

*Icerya pilosa* Green, 1896: 7.

*Icerya seychellarum nardi* Green, 1922: 441. Synonymy by Rao (1951b: 129).

*Icerya nardi* Green; Morrison (1928: 226).  
*Icerya pilosa nardi* Green; Green (1937: 281).

**Unmounted material.** Adult female covered by creamy white wax secretion, interspersed with erect tubular filaments. Mature female forming an indistinct ovisac that extends beyond body margin and is covered by long, stout waxy processes produced from ventromarginal area (adapted from Green, 1922).

**Slide-mounted material.** Adult female oval 2.6–7.5 mm long, 1.7–4.0 mm wide (lectotype of *I. pilosa*, 3.3 mm long, 1.9 mm wide; lectotype of *I. seychellarum nardi* 6.0 mm long, 3.6 mm wide). Antennae 8 or 9 segmented; antennal segments appearing more elongate in larger females. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus; derm at atrial opening lined by 5–9 simple multilocular pores with bilocular centre and 6–8 outer loculi. Very straight hair-like setae scattered on derm, longest around margins and at posterior end. Flagellate setae as for genus. Open-centre pores, each 25–30 µm in diameter, 20 µm long, with sclerotized outer rim and 6–8 small, widely spaced outer loculi, forming dense marginal clusters (densest at anterior and posterior margins) and transverse bands across dorsal head and thorax; derm immediately surrounding pore sclerotized. Simple multilocular pores, each 10–12 µm in diameter, with bilocular centre (rarely trilocular) and 6–10 outer loculi, covering dorsal surface and ventral submargin and margin. Ovisac band 2–4 pores wide, made of simple multilocular pores, each 10–12 µm in diameter, with bilocular (rarely trilocular) centre and 6–10 outer loculi. Simple multilocular pores, each 7–8 µm in diameter, with bilocular centre (appearing reniform) and 4 or 5 outer loculi, scattered on ventromedial head and thorax and across ventromedial abdomen. Vulva as for genus. Cicatrix round. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus.

Slide-mounted first-instar nymph with very long, straight hair-like setae on dorsal surface. Simple multilocular pores with large bilocular centre (appearing bilobed) and 6–8 outer loculi present around margin and across dorsal head and thorax. Hair-like setae at abdominal apex in 2 pairs.

**Type data.** *Icerya pilosa*: SRI LANKA: Chilaw, on a species of wiry grass growing on seashore. *Icerya seychellarum nardi*: SRI LANKA: Diyatalawa, ex *Andropogon nardus*.

**Type material.** Lectotype of *I. pilosa* here designated: ad ♀, “*Icerya/pilosa*/Green/on *Spinifex*/Chilaw/Ceylon” (BMNH). **Paralectotypes:** 2 ad ♀♀, 3 1<sup>st</sup>-instar nymphs (same slide as lectotype); 3 ad ♀♀, 3 2<sup>nd</sup>-instar nymphs, 1 1<sup>st</sup>-instar nymph (all on one slide, same data as lectotype) (BMNH); dry material (USNM). **Holotype** of *I. seychellarum nardi*, by monotypy: ad ♀, “*Icerya/pilosa nardi*/Green/on *Andropogon/nardus*/iv.1911/Ceylon. (Diyatalawa)” (BMNH).

**Other material examined.** SRI LANKA: ad ♂, Chilaw, iii.1897 (*E.E. Green*) (BMNH); INDIA: ad ♀, Andhra Pradesh, University of Hyderabad, ex unidentified grass, 2.xi.2004 (*N. B. Hardy*) (BME, CMU157).

**Taxonomic notes.** Refer to *I. pilosa* group for a discussion of similar species.

The lectotype female is on the far left of the slide when the original label is held on the left. Green’s (1896: 7) original description of *I. pilosa* is very brief and the host is “a species of wiry grass growing on seashore”. In a later description, Green (1922: 443) clarified that the host is *Spinifex squarrosus*, and the type material is labelled accordingly. The adult male is described and illustrated by Green (1922), but according to the information on the slide label, it was collected a year after the type material was described. This slide was incorrectly labelled “type”. This species has only been collected on grasses.

The holotype of *Icerya seychellarum nardi* is much larger than the specimens of *I. pilosa* (6.0 mm long, 3.6 mm wide and 2.6–3.3 mm long, 1.7–2.1 mm wide, respectively). The difference in size appears to be the only difference between specimens of *I. seychellarum nardi* and *I. pilosa*. They share the same pore types and distribution and the size of the open-centre pores found on both species is the same. We examined several specimens of *I. purchasi* and *I. seychellarum* in the BME slide collection to investigate the differences in open-centre pore size relative to changes in body size because both species vary greatly in size and have open-centre pores. Within each of these species, we found that a change in body size does not affect the size of the

open-centre pores.

Rao (1951b) redescribed this species and, in contrast to Green (1922), did not consider the adult female to produce an ovisac, but rather "a pad of wax secreted by the ovisac band of pores on the ventrum forming a sort of marsupium ..."

Green did not formally designate a holotype or type material in his description of *I. seychellarum nardi*. The present concept, however, is based on a single specimen. Article 72.1.2 of the ICZN states, "If the nominal species group taxon is based on a single specimen, either so stated or implied in the original publication, that specimen is the holotype fixed by monotypy" (ICZN, 1999: 79). Therefore, the single adult female used to describe this species is the holotype by monotypy.

### ***Icerya pulchra* (Leonardi)**

*Palaeococcus pulcher* Leonardi, 1907: 1.

*Icerya pulcher* (Leonardi); Vayssière (1926: 319) [not Morrison (1928: 227), as in Ben-Dov (2005: 206)].

*Icerya pulchra* (Leonardi); Lindinger (1932: 197).

**Diagnosis (based on Morrison, 1921 and Rao, 1951b).** Adult female 6–7 mm long, 3–4 mm wide. Body brown to dark brown, covered in white waxy secretion that appears in groups on dorsal surface. Waxy tassels project from margin, longest at posterior end and tapering to cover dorsal side of fluffy white ovisac. Slide-mounted adult female oval, broadest across abdomen. Antennae 9 to 11 segmented. Legs slender, as for tribe. Hair-like setae scattered across all segments, longest setae forming clusters around abdominal margins. Open-centre pores absent. Simple multilocular pores, each with trilocular (rarely bilocular) centre and 6–8 outer loculi, scattered on dorsal surface. Simple multilocular pores, each with 6-lobed centre and 5–7 outer loculi, scattered near margin. Ovisac band made of simple multilocular pores of two types: (i) larger pores with quadrilocular or quinquelocular centre, and (ii) smaller pores with trilocular centre and 3 outer loculi. Simple multilocular pores on venter, each pore with bilocular centre and 4 outer loculi. Cicatrices round to elliptical, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube and anal opening as for genus; anal opening surrounded by long, hair-like setae.

**Type data.** INDONESIA: Java, ex *Ilex* leaves.

**Type material. Syntypes:** ♀, ♂, 1<sup>st</sup>-instar nymph (IFSP).

**Taxonomic notes.** We were unable to examine type material of this species. Refer to *I. pulchra* group for a discussion of similar species.

### ***Icerya purchasi* Maskell**

*Icerya purchasi* Maskell, 1879: 221.

*Icerya purchasi crawii* Cockerell, 1897: 94.

*Icerya purchasi maskelli* Cockerell, 1897: 94.

*Icerya purchasi citriperda* Hempel, 1920: 337.

*Pericerya purchasi* (Maskell); Silvestri (1939: 649).

*Icerya purchasi purchasi* Maskell; Ben-Dov (2005: 208).

**Unmounted material.** In life, dorsum of adult female sparsely covered in waxy secretion with medial ridge of wax and segmental waxy tufts projecting from ventral margin around body; glassy filaments also projecting from margins. Ovisac fluted, projecting from posterior of body.

**Slide-mounted material.** Adult female oval, 5–10 mm long, 4–6 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Dark hair-like setae covering dorsal

surface in dense clusters and clustered with open-centre pores around margin; scattered across ventral head and thorax. Flagellate setae as for genus. Open-centre pores, each 16–18 µm in diameter, 15–17 µm long, with 6–8 outer loculi, present in marginal clusters and densely dispersed across dorsal head. Simple multilocular pores, each 9–10 µm in diameter, with bilocular centre and 6–8 outer loculi, covering dorsal surface. Ovisac band made of simple multilocular pores of two types: (i) pores forming inner ovisac band, 2–4 pores wide at anterior edge, 10–12 pores wide around lateral and posterior edges, each pore with bilocular centre and 8–10 outer loculi, and (ii) smaller pores forming outer ovisac band on anterior edge only, 1–3 pores wide, each pore with bilocular or trilocular centre and 4–6 outer loculi; also forming segmental clusters on submarginal ventral abdomen. Simple multilocular pores, each 9–10 µm in diameter, with bilocular centre (appearing reniform) and 4 or 5 outer loculi, scattered on ventromedial head and thorax and scattered across ventromedial to submedial abdomen. Vulva as for genus. Cicatrices round to oval, numbering 3, central cicatrix largest or all subequal in size. Abdominal spiracles in 2 pairs. Anal tube as for genus; anal opening as for genus, surrounded by long, robust hair-like setae.

**Type data.** *Icerya purchasi*: NEW ZEALAND: Auckland, ex kangaroo acacia [= *Acacia* sp.], iii.1877 (*Mr. T.F. Cheesman & Rev. Dr. Purchas*). *Icerya purchasi crawii*: USA: California, ex *Citrus* (*Alex Craw*). *Icerya purchasi maskelli*: USA: California, ex *Citrus* (*Alex Craw*). *Icerya purchasi citriperda*: BRAZIL: São Paulo State, Socorro, Jundiáhy, Campinas, Jahu, Sorocaba, ex oranges, roses and many other host plants, 1916.

**Type material.** **Lectotype** of *Icerya purchasi* designated by Morales (1991: 57): ad ♀ (NZAC). **Paralectotypes**: 3 ad ♀♀ (2 CMNZ, 1 NZAC), 1 intermediate ♀ (CMNZ), 2 1<sup>st</sup>-instar nymphs (1 CMNZ, 1 NZAC).

**Lectotype** of *Icerya purchasi citriperda* here designated: ad ♀ “*Icerya* 20.083/*purchasi* var./*citriperda*/n. var./S. Paulo, 1920” (MZSP). **Paralectotypes**: 3 ad ♀♀ (same slide as lectotype).

**Lectotype** of *Icerya purchasi crawii* here designated: ad ♀, “*Icerya/purchasi/v. crawii* Ckll./Type/Calif./A. Craw, Coll./Ckll. Coll.” (USNM). **Paralectotypes**: 9 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype) (USNM); ad ♀ “*Icerya/purchasi/v. crawii/Ckll./TYPE/UCD*” (BME); 2 1<sup>st</sup>-instar nymph, 6 eggs (all on one slide, left side of slide), “*Icerya/purchasi/var./Maskell Ckll/larva: type./B.M. 1931, 249*”// “*Icerya/purchasi/v. crawii, Ckll/larva/type.*” (BMNH); 6 ad ♀♀ (one box of dry material, USNM).

**Lectotype** of *Icerya purchasi maskelli* here designated: ad ♀, “*Icerya/purchasi maskelli/Ckll./Type/Calif./A. Craw/Ckll. Coll.*” (USNM). **Paralectotypes**: ad ♀ (same slide as lectotype); 11 1<sup>st</sup>-instar nymphs (one slide) (same data as lectotype, USNM); 3 ad ♀♀ (one slide), “*B.M. 1931, 249/Icerya/purchasi, Mask./var./maskelli, Ckll./TYPE*”// “*Icerya/purchasi/v. maskelli/Ckll./TYPE./B.M. 1931, 249*” (BMNH); 4 1<sup>st</sup>-instar nymphs, 10 eggs (all on one slide, right side of slide), “*Icerya/purchasi/var./Maskell Ckll/larva: type./B.M. 1931, 249*”// “*Icerya/purchasi/v. crawii, Ckll/larva/type.*” (BMNH); 16 ad ♀♀ (one box of dry material, USNM).

**Other material examined.** AUSTRALIA: ad ♀, New South Wales, Carwoola, ex *Grevillea juniperina* 4.i.2003 (*P.J. Gullan*) (BME, CMU014); USA: ad ♀, Alabama, Auburn University, ex *Fatsia japonica*, 28.ii.2002 (*T. Kondo*) (BME, CMU030); USA: ad ♀, California, Yolo County, Davis, University of California, Davis campus, in front of Mrak Hall, ex *Nandina domestica*, 3.v.2002 (*P.J. Gullan*) (BME, CMU050).

**Taxonomic notes.** Refer to “*Pericerya*” group for a discussion of similar species. Refer to Morales (1991: 57) for detailed information about type material of *I. purchasi*.

Type material of *I. purchasi* is listed incorrectly as syntypic in the World Catalogue (Ben-Dov, 2005: 208). One slide at the BMNH has first-instar nymphs and eggs of both *I. purchasi maskelli* and *I. purchasi crawii*. We have designated the material on the left side as paralectotypes of *I. purchasi maskelli* and material on the right side as paralectotypes of *I. purchasi crawii*. The original description of *I. purchasi citriperda* gives the year of collection (provided above), but the World Catalogue did not include this information (Ben-Dov, 2005: 207).

## *Icerya samaraia* (Morrison)

*Steatococcus samaraius* Morrison, 1927: 109.

*Icerya samaraia* (Morrison); Unruh & Gullan (2008: 42).

**Unmounted material.** Adult female with "pale-yellow body covered in white to sulphur-yellow flocculent wax, tinged with white" (Williams & Watson, 1990: 33).

**Slide-mounted material.** Adult female oval, 2.9–5.0 mm long, 2.4–4.0 mm wide (holotype 2.9 mm long, 2.4 mm wide). Antennae 9 to 11 segmented (holotype with 9 segments). Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered on derm, longest setae in clusters around margin. Flagellate setae distributed as for genus. Open-centre pores, each 20–24 µm in diameter, 21–23 µm long, with 12–14 outer loculi and sclerotized inner rim, present in clusters of 2–6 around margin. Simple multilocular pores, each with elongate or bilocular (rarely trilocular) centre and 6–10 outer loculi, scattered across dorsal surface. Marsupial band round at posterior end, 3 or 4 pores wide, becoming sclerotized with age, formed by simple multilocular pores, each 8–10 µm in diameter, with bilocular (rarely trilocular) centre and 4–8 outer loculi; anterior edge transverse, with a band of pores, 3 or 4 wide, not becoming sclerotized, formed by same pores as on posterior edge of band; anterior edges of posterior band not quite reaching anterior transverse row of marsupial band. Simple multilocular pores, each 7–9 µm in diameter, with bilocular, trilocular or quadrilocular centre (rarely quinquelocular) and 4–12 outer loculi, and appearing bluish when stained, scattered in marsupial cavity and around edges of marsupial band, and sparsely scattered on ventral surface; similar pores, but each pore with bilocular centre (appearing reniform) and 4–6 outer loculi, scattered on ventromedial head and thorax. Vulvar opening as for genus. Cicatrices oval to round, numbering 3, central cicatrix slightly larger than lateral cicatrices. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical simple multilocular pores with round centre and 8–12 round outer loculi.

**Type data.** PAPUA NEW GUINEA: Samarai (*G. Compere*).

**Type material. Holotype:** ad ♀, "Steatococcus/samaraius/n.sp./Samaria [sic],/New Guinea/Geo. Compere, Coll." (USNM). **Paratypes:** 2 ad ♀♀ (same slide as holotype); 6 1<sup>st</sup>-instar nymphs (one slide), 3 ♀, 2 1<sup>st</sup>-instar nymphs (nymphs and females on one slide) (same data as holotype) (USNM); partially destroyed ♀ and nymphs (one slide), "~~Icerya/Steatococcus/samaraius~~ nsp./On Citrus trees/Samria [sic], New Guine./Geo. Compere, Coll./Comp. Coll # Comp 343" (USNM); dry material (USNM).

**Taxonomic notes.** Refer to the taxonomic notes of *I. assamensis* and *I. nudata* group for a discussion of similar species.

The holotype female is encircled on the slide and has a line leading to it and the word "holotype". The holotype female has 6 first-instar nymphs present in her marsupium. Williams and Watson (1990) described the dorsal pores of this species as having a bilocular or trilocular centre. We found that pores with a trilocular centre are very rare and that the derm is covered with simple multilocular pores with an elongate or bilocular centre.

## *Icerya schrottkyi* Hempel

*Icerya schrottkyi* Hempel, 1900: 373.

**Unmounted material.** Adult female covered with dense white secretion of long, white filaments that point towards posterior; abdomen with two small tufts of white secretion; ovisac consisting of dense mass of cottony wax (adapted from Hempel, 1900).

**Slide-mounted material.** Adult female oval, lectotype 6.0 mm long, 5.0 mm wide. Antennae 11 seg-

mented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, derm around atrial opening with cluster of 4–6 pores, each with trilocular or quadrilocular centre and 4–6 outer loculi. Dorsal surface with simple multilocular pores of two types: (i) each pore 11–13 µm in diameter, with quadrilocular or quinquelocular centre and 7–10 outer loculi, arranged in medial longitudinal row and (ii) pores, similar to vulvar pores, each 12–13 µm in diameter, with trilocular or quadrilocular centre and 8–10 outer loculi that appear bluish when stained, scattered from medial to submarginal head, thorax and abdomen. Ovisac band made of simple multilocular pores of two types, (i) pores forming inner ovisac band 5–7 pores wide, each pore 11–12 µm in diameter, with trilocular or quadrilocular centre and 6–8 outer loculi, and (ii) pores forming outer band 1 or 2 pores wide, each pore with trilocular centre and 10–12 outer loculi. Simple multilocular pores, each 14–15 µm in diameter, with quinquelocular to hexalocular centre and 8–10 outer loculi, scattered on marginal to submarginal venter. Simple multilocular pores, appearing slightly bluish when stained, each 9–10 µm in diameter with bilocular or trilocular centre and 4–6 outer loculi, scattered across ventromedial abdomen. Vulva as for genus. Cicatrices oval to reniform, numbering 3, subequal in size. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus.

First-instar nymph as for genus, except with three pairs of abdominal spiracles and three pairs of long hair-like setae on abdominal apex.

**Type data.** BRAZIL: Sao Paulo State, Jundiáhy, ex "arvore das mattas" (*C. Schrottky*).

**Type material.** **Lectotype** here designated: ad ♀, "*Icerya/schrottkyi* Hemp./Type/S. Paulo/1900" (USNM). **Paralectotypes:** 28 1<sup>st</sup>-instar nymphs (one slide), "*Icerya 332/schrottkyi/n.sp./Type Juv./391a*" (MZSP); dry material (USNM).

**Taxonomic notes.** Refer to *I. aegyptiaca* group for a discussion of similar species.

The original description gave the host as "arvore das mattas" which translates to "bark of an indigenous tree" and provided the collector's name (Hempel, 1900: 375). The World Catalogue did not include this information in the type data (Ben-Dov, 2005: 219).

### ***Icerya seychellarum* (Westwood)**

*Dorthezia seychellarum* Westwood, 1855: 836.

*Coccus sacchari* Guérin-Méneville, 1867: 451. Synonymy by Fernald (1903: 27).

*Orthezia seychellarum* (Westwood); Targioni Tozzetti (1868: 30).

*Icerya sacchari* (Guérin-Méneville); Signoret (1876: 352).

*Icerya seychellarum* (Westwood); Maskell (1879: 329).

*Icerya candida* Cockerell, 1905: 128. Synonymy by Morrison (1928: 208).

*Icerya okadae* Kuwana, 1907: 178. Synonymy by Green (1922: 440).

*Icerya seychellarum cristata* Newstead, 1908a: 9.

*Icerya seychellarum seychellarum* Ben-Dov (2005: 219).

**Unmounted material.** Adult female with dorsal transverse rows of white to yellowish waxy secretion and marginal tufts; glassy filaments projecting from margins and medial dorsum; ovisac projecting from posterior end of body, covered dorsally by a series of long, cylindrical waxy tassels (adapted from Rao, 1951b, Williams & Watson, 1990).

**Slide-mounted material.** Adult female elliptical, 4.3–6.7 mm long, 3.0–4.4 mm wide. Antenna 11 segmented. Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus, derm at atrial opening with cluster of 7–9 simple multilocular pores, each pore with bilocular centre and 4–6 outer loculi. Robust hair-like setae densest on dorsal head and thorax; regular hair-like setae distributed as for genus, longest between antennae and in marginal clusters. Flagellate setae distributed as for genus, forming transverse rows on ventromedial abdomen. Open-centre pores, each 18–26 µm in diameter, with 14–16 outer loculi and small cleft, in medial clusters on head and thorax and marginal clusters on all body segments; pores in clusters with long,

hair-like setae. Simple multilocular pores, each 11–13 µm in diameter, with bilocular centre and 4–6 outer loculi, scattered on head and thorax; similar pores, each 9–10 µm in diameter, scattered on dorsal abdomen. Ovisac band with simple multilocular pores of two sizes: (i) larger pores forming inner ovisac band, each pore 9–10 µm in diameter with bilocular centre and 6–10 outer loculi, and (ii) smaller pores forming outer ovisac band, each pore 7–9 µm in diameter with bilocular centre and 4–6 outer loculi. Simple multilocular pores, similar to smaller pores in ovisac band, each 8–9 µm in diameter with bilocular centre and 4 outer loculi, scattered on ventromedial head and thorax and in transverse rows on ventromedial abdomen. Vulvar opening as for genus, surrounded by long hair-like setae and multilocular pores, each pore with bilocular to trilocular centre and 12–16 outer loculi. Cicatrices round, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal ring and anal opening as for genus.

First-instar nymph as for genus, except anal tube with 8 multilocular pores at opening.

**Type data.** *Dorthesia seychellarum*: ENGLAND: imported from the Seychelles Islands, ex palm. *Coccus sacchari*: MAURITIUS: ex sugar cane. *Icerya candida*: PHILIPPINES: Manila, ex cultivated tree with large oblong-ovate rough leaves, 4.vi. *Icerya okadae*: JAPAN: ex orange. *I. seychellarum cristata*: MADAGASCAR: Fenerive (East Coast Madagascar), vii.1904.

**Type material. Syntypes** of *Dorthesia seychellarum*: ad ♀♀, material lost (Unruh & Gullan, 2008: 43).

**Syntypes** of *Coccus sacchari*: ad ♀♀, material lost (Ben-Dov, 2005: 219).

**Lectotype** of *I. candida* designated by Unruh & Gullan (2008: 43): ad ♀ (USNM). **Paralectotypes** of *I. candida*: 2 ad ♀♀ (USNM, same slide as lectotype); body parts of 1<sup>st</sup>-instar nymphs, uncleared 2<sup>nd</sup>-instar nymph (1 slide, BME).

**Syntypes** of *I. okadae*: ad ♀♀ (ITLJ).

**Syntyne** of *I. seychellarum cristata*: dried ad ♀ (ZMB).

**Other material examined.** UNION OF THE COMOROS: 2 ad ♀♀ (one slide), “Lot-/H./Ex coll./Coll./Mus./Berlin”// “Icerya/seychellarum/var cristatum/Mayotte. let/Comoro Isl./VoelkRow S./BM 1945, 121” (BMNH); 2 ad ♀♀ (one slide), “Lot-/H./Ex coll./Zool./Mus./Berlin”//“Icerya/seychellarum/var. cristatum/n.var./Mayotte Comoro/Is. VoelkRow S./BM 1945, 121” (BMNH); 1 vial with 4 specimens, [3 labels] “Manuscript-No H/Icerya seychellarum Westw./ob nene Variet’at’/Newstead det.”// “Icerya seychellarum/?var cristatum, nov.var/(Newstead).”//“Coruoveu/Mayotte/VoelkRow S.” (ZMB).

**Taxonomic notes.** Refer to *I. seychellarum* group for discussion of similar species. Refer to Unruh & Gullan (2008) for detailed information about type material and material used to redescribe this species.

### *Icerya sumatrana* Rao

*Icerya sumatrana* Rao, 1951b: 137.

**Unmounted material.** Body of adult female dark brown, covered by thick cream-yellowish waxy secretion; ovisac fluted, nearly as long as body, projecting from posterior end of body (Rao, 1951b).

**Slide-mounted material.** Adult female oval, 3.6–4.8 mm long, 2.3–3.5 mm wide (holotype 3.9 mm long, 3.2 mm wide). Antennae 11 segmented (one paratype with 9-segmented antennae). Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae scattered across derm, longest around margin, between antennae and in vague transverse rows on dorsal surface. Flagellate setae as for genus. Open-centre pores, each 15–16 µm in diameter, 17–18 µm long, with 7 or 8 outer loculi, in clusters of 1–4 around margin. Simple multilocular pores, each 12–14 µm in diameter, with bilocular centre and 6–8 outer loculi, associated with open-centre pores. Simple multilocular pores, each 10–12 µm in diameter, with bilocular centre and 6–8 outer loculi, covering dorsal surface. Simple multilocular pores, appearing slightly bluish when stained, each 7–8 µm in diameter, with bilocular or trilocular centre and 5–8 outer loculi, forming submarginal longitudinal

row on ventral surface. Ovisac band made of simple multilocular pores of two types: (i) pores forming inner ovisac band 5 or 6 pores wide, each pore 8–9 µm in diameter, with bilocular centre and 6–8 outer loculi, and (ii) pores, appearing slightly bluish when stained, forming outer band 5–7 pores wide, each pore 7–8 µm in diameter with bilocular or trilocular centre and 5–8 slightly reniform outer loculi. Simple multilocular pores, each 9–10 µm in diameter, with bilocular centre (appearing reniform) and 4 or 5 outer loculi, forming transverse rows on ventromedial abdomen and scattered on ventromedial head and thorax. Vulvar opening as for genus. Cicatrices oval to round, numbering 3, central cicatrix slightly larger than lateral cicatrices. Abdominal spiracles in 2 pairs. Anal tube as for genus; anal opening as for genus, surrounded by robust hair-like setae and typical multilocular pores with trilocular centre and 10–14 outer loculi.

**Type data.** INDONESIA: Sumatra, Medan, ex *Citrus* (C.P. Clausen); WEST JAVA: Lembang, ex *Erythrina* (P. Van der Goot); WEST JAVA: Garoet, ex *Citrus* (K.W. Dammerman).

**Type material. Holotype:** ad ♀, "Icerya n.sp./sumatrana/[unintelligible writing]/Rao.n.sp./holotype/on orange/Medan, Sumatra/C.P. Clausen, Coll./Aug. 9, 1929./#32" (USNM). **Paratypes:** 12 1<sup>st</sup>-instar nymphs (same slide as holotype); 3 ad ♀♀ (one slide), 33 1<sup>st</sup>-instar nymphs (one slide), "Icerya/sumatrana Rao/on orange/Medan, Sumatra/C.P. Clausen, Coll./Aug. 9, 1929./#32" (USNM); ad ♀, "Icerya n./sumatrana Rao/on orange/Medan, Sumatra/C.P. Clausen, Coll./Aug. 9, 1929./#32" (USNM); 1 3<sup>rd</sup>-instar nymph, "Icerya n.sp./sumatrana Rao/on orange/Medan, Sumatra/C.P. Clausen, Coll./Aug. 9, 1929./#32" (USNM); 2 ad ♀♀ (one slide), 2 ad ♀♀, 1 1<sup>st</sup>-instar nymphs (one slide), 10 1<sup>st</sup>-instar nymphs (one slide), "Icerya/sumatrana Rao/MS./on orange/Medan, Sumatra/C.P. Clausen, Coll./June, 1930/No. 116" (slide with 2 ad ♀♀ at USNM; slide with 2 ad ♀♀ and 1<sup>st</sup>-instar nymph at BME); ad ♀, 3<sup>rd</sup>-instar nymph (one slide), 8 1<sup>st</sup>-instar nymphs (one slide), ad ♀, "Icerya sumatrana/Rao/On Citrus/Garoet, W. Java/K.W. Dammerman Coll./May. 1911/#3108" (USNM); 9 1<sup>st</sup>-instar nymphs (one slide), 2 ad ♀♀, "Icerya sumatrana/Rao/On Erythrina/Lembang W. Java./P.V. der Goot, Cool./July, 1936/#3107" (USNM).

**Taxonomic notes.** Refer to "Pericerya" group for a discussion of similar species.

The World Catalogue listed only the holotype collection information (Ben-Dov, 2005: 225). Rao (1951b: 139) described this species from several slides and dry specimens present in the USNM collection, but we did not find any dry material in the collection. Presumably, the dry material has since been slide-mounted. Complete type collection data are provided above.

### ***Icerya travancorensis* Rao**

*Icerya travancorensis* Rao, 1951b: 140.

**Unmounted material.** Adult female with tassels of white or pale yellow wax present around margin. Anterior tassels short, thick and projecting upward. Posterior tassels narrow, elongate and tapering, forming a covering over ovisac. Dorsal surface with 3–5 tufts of wax. Antennae and legs black (Rao, 1951b).

**Slide-mounted material.** Adult female 5.0–8.2 mm long, 3.0–4.4 mm wide (USNM paratype ♀ 8.2 mm long, 4.7 mm wide). Antennae 10 or 11 segmented (when 10 segmented, 4th and 5th segments fused). Eyes, mouthparts and legs as for tribe. Thoracic spiracles as for genus. Hair-like setae densely covering dorsal surface, longest around anal opening and at posterior abdomen; finer hair-like setae scattered on venter, longest and densest between antennae and surrounding mouthparts. Flagellate setae distributed as for genus. Open-centre pores absent. Simple multilocular pores, each 10–13 µm in diameter, with bilocular centre and 8–10 µm outer loculi, with or without protruding projection, scattered on dorsal surface, forming dense clusters around margin and medial and submarginal clusters on head and thorax. Ovisac band 4–6 pores wide at anterior edge, 8–10 pores wide around lateral edges, made of simple multilocular pores of one type, similar to pores on dorsum, each pore 10–12 µm in diameter, with bilocular centre and 6–8 outer loculi. Simple mul-

tilocular pores, each with round to bilocular or trilocular centre and 4–6 outer loculi, scattered on ventromedial head, thorax and abdomen; densely clustered around mouthparts. Cicatrices numbering 3, relatively small, reniform, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening surrounded by several hair-like setae.

**Type data.** INDIA: Travancore, Munnar, ex *Hypericum mysorensis*.

**Type material. Holotype:** ad ♀ (INPC). **Paratypes:** several slide-mounted and dry ad ♀♀ (INPC); 1 ad ♀ (one slide), dozens of crawlers (seven slides) (USNM).

**Taxonomic notes.** Refer to *I. natalensis* group for discussion of similar species.

Rao believed that this species externally resembled *I. aegyptiaca* but differed by the shape of the cicatrices, the absence of other pore types, the dense covering of dark setae and conspicuous tufts of setae on the derm.

The paratypes in the USNM collection were slide-mounted by PJG in September, 2007. The labels on the slides are a reduced photocopy of the label included with the dry material. The first-instar nymphs were found in the ovisac of the single adult female.

### *Icerya zimmermanni* Green

*Icerya zimmermanni* Green, 1932: 32.

**Unmounted material.** Adult female brown, dorsal surface covered in thin, white secretion, subequal waxy projections around margin; ovisac appearing as a pad of wax secretion on ventral abdomen (adapted from Rao, 1951b).

**Slide-mounted material.** Adult female oval, 4.7–7.3 mm long, 3.5–5.1 mm wide. Antennae 11 segmented. Eyes, mouthparts and legs as for genus. Thoracic spiracles as for genus; derm around atrial opening and surrounding area scattered with simple multilocular pores, each 10–11 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi. Hair-like setae sparsely scattered on dorsal surface, longest around margin, dense on ventral margin, around mouthparts and on ventromedial thorax. Flagellate setae distributed as for genus. Simple multilocular pores covering dorsal surface of two types: (i) larger pores, each 10–11 µm in diameter, with trilocular centre, 8–10 outer loculi and appearing stalked in profile, densest along median, especially on abdomen, and (ii) smaller pores appearing slightly bluish when stained, each pore 9–10 µm in diameter, with bilocular centre, 6–8 outer loculi and not appearing stalked, forming transverse rows across each segment. Simple multilocular pores similar to other dorsal pores, but not appearing stalked, each 12–13 µm in diameter with trilocular centre and 10–12 outer loculi, scattered around dorsal margin. Ovisac band 3–5 pores wide, made of simple multilocular pores, each 10–11 µm in diameter, with bilocular (sometimes trilocular) centre and 6–10 outer loculi. Simple multilocular pores, each 7–8 µm in diameter, with bilocular or trilocular centre and 6–8 outer loculi, sparsely scattered around ovisac band. Simple multilocular pores, similar to genital pores, each 16–17 µm in diameter, with round centre and 10–14 elongate outer loculi, forming a submarginal band around venter and transverse row across venter of each thoracic segment. Simple multilocular pores, each 12–14 µm in diameter, with large bilocular centre (appearing bilobed) and 4 outer loculi, scattered on marginal to submarginal venter. Simple multilocular pores, each 7–8 µm in diameter, with bilocular centre and 4–8 slightly reniform outer loculi, scattered on ventromedial abdomen and head and sparsely scattered on ventromedial thorax. Vulva as for genus, surrounded by typical genital pores, each 12–13 µm in diameter, with bilocular or trilocular centre and 12–16 outer loculi. Cicatrices elliptical to round, numbering 3, central cicatrix largest. Abdominal spiracles in 3 pairs. Anal tube as for genus; anal opening as for genus, surrounded by hair-like setae and simple multilocular pores, each pore 8–10 µm in diameter, with bilocular or trilocular centre and 9–12 (sometimes reduced to 5 or 6) widely spaced, elongate outer loculi.

**Type data.** INDONESIA: Java, ex *Melastoma* sp.

**Type material. Syntypes:** ad ♀ ♀ (slides and dry material) (BMNH).

**Material examined.** THAILAND: ad ♀, Phang Nga Province, Sri Phang Nga National Park, near Headquarters, 8°59'N, 98°27'E. 16.vi.2004 (*P.S. Cranston*) (BME, CMU 080); ad ♀, Loei Province, Na Haew National Park, Headquarters, garden, ex legume (*Cassia?* sp.), 10.iii.2002 (*P.S. Cranston*) (BME, CMU 023); INDONESIA: ad ♀, Lombok, Praja, ex *Achras zapata*, 21.v.1937 (*R.H. LePelley*) (USNM).

**Taxonomic notes.** Refer to the *I. jacobsoni* group for discussion of similar species.

In life, this species resembles *I. aegyptiaca* because both have marginal waxy projections. The waxy projections of *I. zimmermanni* are uniform in length, while those of *I. aegyptiaca* vary in length (longer anteriorly than posteriorly). Also, the ovisac of *I. zimmermanni* is a waxy pad of secretion on the ventral abdomen, while *I. aegyptiaca* secretes an ovisac which extends from the posterior end of the body. *Icerya zimmermanni* also has three ventral cicatrices (*I. aegyptiaca* has a single cicatrix) and “peculiar bilobed” pores absent from the derm of all other species.

In Rao's (1951b) description of *I. zimmermanni*, he correctly described the types of pores seen on the derm of the adult female. His description of the distribution of these pores, however, is incorrect. Among the material we examined was a cut-open female and we were able to correctly determine the distribution of pores.

BMNH has a single slide with the correct type data with a poorly displayed adult or late-stage nymph (J.H. Martin, BMNH, pers. comm.). From Green's original description, it is difficult to tell whether or not he looked at more than one specimen when describing this species.

### *Nomina nuda*

*Echinicerya echinatus*. *Nomen nudum* created by Ben-Dov (2005: 177), discovered by Unruh & Gullan (2008: 36).

*Guerinococcus*. *Nomen nudum* created by Berlese (1909: 498), discovered by Morrison & Morrison (1966: 88).

*Guerinococcus serratulae*. *Nomen nudum* created by Berlese (1909: 498).

*Icerya peninsularensis*. *Nomen nudum* created by Ben-Dov (2005: 195).

**Remarks.** Newstead described *I. formicarum* originally from immature specimens. Rao (1951a: 55) compared these specimens with third-instar nymphs from a collection of specimens that he had given “the manuscript name of *peninsularensis*,” a name he never published. According to Rao, the specimens were identical and he described adult females of *I. formicarum* from his (Rao's) own collection. “*Icerya peninsularensis*” is not a *nomen nudum* discovered by Rao, as stated in Ben-Dov (2005: 195). Thus, Ben-Dov has created a *nomen nudum*.

*Icerya ordinata*. *Nomen nudum* created [not discovered as in Ben-Dov (2005: 206)] by Vayssière (1926: 336).

**Remarks.** Morrison (1921: 639) examined specimens collected by I.H. Burkill on *Michelia champaca* at the Botanic Gardens, Singapore, April 9, 1916, and on *Rhopaloblasta* palm in Singapore, February 1917, that were given “the manuscript names *Icerya ordinata* and *I. palmarum*, respectively,” by E.E. Green. He compared these specimens with Leonardi's original description of *I. pulchra* and found no “differentiating characters” aside from wax colour. Vayssière (1926: 336) later reviewed *I. pulchra*, and stated that he also examined Green's specimens of *I. ordinata* and also found concordance with *I. pulchra*, but failed to specify that *I. ordinata* was a manuscript name of Green's, thus creating a *nomen nudum*.

*Steatococcus anonae*. *Nomen nudum* created by Vayssière (1926: 307), discovered by Foldi & Ben-Dov (2001: 461).

### ***Incertae sedis***

Refer to Unruh & Gullan (2008: 43–45) for complete taxonomic discussion of these species.

### ***Coccus hirticornis* Boyer de Fonscolombe**

*Coccus hirticornis* Boyer de Fonscolombe, 1834: 203.

*Monophloeus* [sic] *hirticornis*; Targioni Tozzetti (1868: 724).

*Palaeococcus fuscipennis* (Cockerell); Targioni Tozzetti (1868: 724). Incorrect synonymy discovered by Signoret (1876: 358).

*Gueriniella serratulae*; Signoret (1876: 358). Incorrect synonymy discovered by Hughes-Schrader and Tremblay (1966: 9).

**Type data.** FRANCE: vicinity of Aix-en-Provence, unknown host plants.

**Type material. Holotype** by monotypy, adult ♂. Type material lost (Ben-Dov, 2005: 182).

### ***Icerya chilensis* Hempel**

*Icerya chilensis* Hempel, 1920: 333.

**Type data.** CHILE: Central Chile, on leaves of a wild tree, i.1909 (A. *Hempel*).

**Type material. Syntypes:** ad ♀ ♀, third-instar nymphs (MZSP).

### ***Icerya insulans* Hempel**

*Icerya insulans* Hempel, 1923: 510.

**Type data.** BRAZIL: Ilhas dos Alcatrazes, ex composite plant and *Tibouchina holosericea* (*Luederwaldt* & *Fonseca*).

**Type material. Syntypes:** several immature specimens (MZSP).

### ***Icerya paulista* Hempel**

*Icerya paulista* Hempel, 1920: 336.

**Type data.** BRAZIL: São Paulo, Cantareira, near São Paulo, on the thorns of "taquaruçu" [= *Guadua* sp.], iv.1912 (*R.v.Iherwing* & *H. Luederwaldt*).

**Type material. Syntypes:** ad ♀ ♀, (MZSP).

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