

## Research article

[urn:lsid:zoobank.org:pub:57F49B4A-33D5-4D9C-94CB-85663BD7E1E1](https://zoobank.org/pub:57F49B4A-33D5-4D9C-94CB-85663BD7E1E1)

# Cleotychini planthoppers from Perth region in Western Australia: The new genus *Femotyche* gen. nov., and more... (Hemiptera: Fulgoromorpha: Dictyopharidae)

Jérôme CONSTANT<sup>1,\*</sup> & Linda SEMERARO<sup>2</sup>

<sup>1</sup> Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29, B-1000 Brussels, Belgium.

<sup>2</sup> Scientific collaborator, Royal Belgian Institute of Natural Sciences, O.D. Phylogeny and Taxonomy, Entomology, Vautier street 29, B-1000 Brussels, Belgium.

\* Corresponding author: [jerome.constant@naturalsciences.be](mailto:jerome.constant@naturalsciences.be)

<sup>2</sup> Email: [mantid@iinet.net.au](mailto:mantid@iinet.net.au)

<sup>1</sup> [urn:lsid:zoobank.org:author:6E6072A1-9415-4C8D-8E60-2504444DB290](https://zoobank.org/author:6E6072A1-9415-4C8D-8E60-2504444DB290)

<sup>2</sup> [urn:lsid:zoobank.org:author:DCAAD2E7-80F7-4EA9-98D9-167FE8B97C58](https://zoobank.org/author:DCAAD2E7-80F7-4EA9-98D9-167FE8B97C58)

**Abstract.** The new genus *Femotyche* gen. nov. is described to accommodate two new species from Western Australia: *Femotyche kerryae* sp. nov. from Perth area and *Femotyche hortorum* sp. nov. from York. Illustrations of male and female type specimens and a distribution map are provided. The male terminalia as well as the female terminalia, habitat, host plant and live specimens of the new species are illustrated when available. The tribe Cleotychini now contains two genera, the genus *Cleotyche* Emeljanov, 1997 with two subgenera and five species and the genus *Femotyche* gen. nov. with two species. Data are provided on an additional, undescribed genus from the same geographic area, recorded from two species known only from photographs.

**Keywords.** Fulgoroidea, Auchenorrhyncha, citizen science, Salticidae, mimicry.

Constant J. & Semeraro L. 2024. Cleotychini planthoppers from Perth region in Western Australia: The new genus *Femotyche* gen. nov., and more... (Hemiptera: Fulgoromorpha: Dictyopharidae). *European Journal of Taxonomy* 968: 98–118. <https://doi.org/10.5852/ejt.2024.968.2709>

## Introduction

The family Dictyopharidae Spinola, 1839 contains 160 genera and 748 species according to the FLOW database (Fulgoromorpha Lists On the Web; Bourgoïn 2024), representing about 5.3% of the species of Fulgoromorpha. The Australian Dictyopharidae fauna is currently very poorly documented and includes 18 species in 8 genera, representing only about 2% of the global diversity of the dictyopharid species. The tribe Cleotychini Emeljanov, 1997 is endemic to Australia and was recently reviewed, with the addition of three species from Queensland to the genus *Cleotyche* Emeljanov, 1997, the only genus in the tribe (Constant *et al.* 2022). As a result, the tribe now represents about 27% of the recorded diversity of Dictyopharidae from Australia. Cleotychini specimens were observed waving their forelegs with

contrasting white tarsi in a similar way as jumping spiders (Arachnida, Salticidae) move their forelegs and pedipalps, and this possible mimicry was reported by Moir & Fletcher (2012).

Recent contact with citizen scientists in Western Australia revealed several undescribed taxa of Cleotychni, some of them being only documented from photographs. However, some specimens of two new species, also representing an undescribed genus, were collected from Perth and the nearby area.

The present paper aims to describe the new genus *Femotyche* gen. nov. to accommodate the two new species, and to provide photographs and records of another undescribed genus of Cleotychni, containing two species, together with data on their habitat and host plants, a distribution map and an identification key to the genera and subgenera in the tribe Cleotychni.

## Material and methods

The terminalia were separated from the abdomen of the fresh / relaxed specimen and the fine dissection was done after soaking the organs for one night in a 10% solution of potassium hydroxide (KOH) at room temperature, then thoroughly rinsed in 70% ethanol. The aedeagus was dissected with a needle blade for examination. The whole was then placed in glycerine for preservation in a tube attached to the pin of the corresponding specimen.

The external morphological terminology follows O'Brien & Wilson (1985) with additions from Emeljanov (1997), for the male genitalia Bourgoïn & Huang (1990), and for the female genitalia Bourgoïn (1993) and Song *et al.* (2018). Morphometric characters were recorded including the metatibiotarsal formula which gives the number of spines on the (side of metatibia) apex of metatibia / apex of first metatarsus / apex of second metatarsus. For example, the metatibiotarsal formula: (1) 6 (2-4)/2/2 represents 1 spine on the side of metatibia, 6 teeth on the apex of metatibia (in two groups: 2 internal and 4 external, separated by a diastema), 2 spines on the apex of first metatarsus, and 2 spines on the apex of second metatarsus.

The photographs of the collection specimens and male genitalia were taken with a Leica EZ4W stereo microscope with integrated camera, stacked with CombineZ software and optimized with Adobe Photoshop CS3. The distribution map was produced with SimpleMappr (Shorthouse 2010). Other photographs were provided by their respective authors and accordingly credited.

The measurements were taken as in Constant (2004) and the following acronyms are used:

BF	=	maximum breadth of the frons
BPf	=	maximum breadth of the profemur
BPt	=	maximum breadth of the protibia
BTg	=	maximum breadth of the tegmen
BV	=	maximum breadth of the vertex
LF	=	length of the frons in median line
LPf	=	length of the profemur
LPt	=	length of the protibia
LT	=	total length (apex of head to apex of abdomen)
LTg	=	maximum length of the tegmen
LV	=	length of the vertex in median line

Acronyms used for collections are as follows:

RBINS	=	Royal Belgian Institute of Natural Sciences, Brussels, Belgium.
WAM	=	Western Australian Museum, Perth, Western Australia, Australia.

## Results

### Taxonomy

Class Insecta Linnaeus, 1758  
Order Hemiptera Linnaeus, 1758  
Suborder Auchenorrhyncha Duméril, 1806  
Infra-order Fulgoromorpha Evans, 1946  
Superfamily Fulgoroidea Latreille, 1807  
Family Dictyopharidae Spinola, 1839  
Subfamily Dictyopharinae Spinola, 1839

Tribe **Cleotychni** Emeljanov, 1997

### Genera included (type species)

*Cleotyche* Emeljanov, 1997 (*Cleotyche mariae* Emeljanov, 1997)  
subgen. *Cleotyche* Emeljanov, 1997 (*Cleotyche mariae* Emeljanov, 1997)  
subgen. *Griseotyche* Constant, Semeraro & Moir, 2022 (*Cleotyche blanda* Emeljanov, 2011)  
*Femotyche* gen. nov. (*Femotyche kerryae* sp. nov.)

### Identification key to the genera and subgenera of Cleotychni

1. Profemora with a strong tooth in ventroapical angle (Figs 1A–B, D, 2A–B, D); vertex more than 2.5 times as long as wide (Figs 1G, 2F) ..... ***Femotyche*** gen. nov.  
– Profemora without tooth in posterodistal angle, only with tubercles along posterior margin (Constant *et al.* 2022: fig. 1a–d); vertex less than 2.2 times as long as wide (Constant *et al.* 2022: fig. 1a–d) ..... ***Cleotyche*** Emeljanov, 1997
2. Ground colour pale grey (Constant *et al.* 2022: fig. 16a); transverse white stripe on frons continuing laterally along body, becoming less distinct on abdomen (Constant *et al.* 2022: fig. 16b–c); no white band along apical margin of tegmina (Constant *et al.* 2022: fig. 16a) ..... ***Cleotyche (Griseotyche)***  
– Ground colour dark brown (Constant *et al.* 2022: fig. 1); no transverse white stripe on frons nor lateral white stripe along side of body (Constant *et al.* 2022: fig. 2c); white band along apical margin of tegmina (Constant *et al.* 2022: fig. 1) ..... ***Cleotyche (Cleotyche)***

Genus ***Femotyche*** gen. nov.

[urn:lsid:zoobank.org:act:4468FAEF-9E8D-4956-96CD-604C6030F2BD](https://zoobank.org/act:4468FAEF-9E8D-4956-96CD-604C6030F2BD)

### Type species

*Femotyche kerryae* sp. nov. (here designated).

### Diagnosis

Ground colour pale grey with anterior femora and tibiae black (Figs 1A, 2A); profemora with a strong tooth in ventroapical angle (Figs 1A–B, D, 2A–B, D); vertex more than 2.5 times as long as wide (Figs 1G, 2F); posterior margin of the pygofer with a strong process (Fig. 3A, E); laterodorsal processes of the phallobase strongly sinuate (Fig. 3F, H, J).

### Differential diagnosis

The distinctive characters allowing the separation of *Femotyche* gen. nov. from both *Cleotyche (Cleotyche)* and *Cleotyche (Griseotyche)* are the presence of a strong posterodistal tooth on protibiae and the more

elongate vertex (more than 2.5 times as long as wide *vs* less than 2.2 times in all taxa of *Cleotyche*). Furthermore, it can be separated from *Cleotyche* (*Cleotyche*) by its pale grey body colour (dark brown with white band along apical margin of tegmina in *Cleotyche* (*Cleotyche*)), the strong process of the posterior margin of the pygofer (posterior margin rounded in *Cleotyche* (*Cleotyche*)) and the strongly sinuate laterodorsal processes of the phallobase (not sinuate in *Cleotyche* (*Cleotyche*)); from *Cleotyche* (*Griseotyche*), by a more pyriform shape of the body in dorsal view, with sides of abdomen parallel in basal  $\frac{3}{4}$  (body shape oval in *Cleotyche* (*Griseotyche*) with abdomen regularly tapering towards the posterior).

### Etymology

The new genus name is formed from '*femur -oris*' (noun, Latin) meaning 'thigh, femur', referring to the generic characters on the profemora, and '*-tyche*', arbitrarily chosen to remind of the genus name '*Cleotyche*' and the placement of the new genus in the same tribe Cleotychni. Gender feminine.

### Description

LENGTH. About 4–5 mm.

COLOUR (Figs 1A–E, 2A–E). Generally grey dorsally and black ventrally including clypeus; protarsi white.

HEAD (Figs 1G–I, 2F–H). Elongate and narrow. Vertex elongate, strongly projecting beyond eyes, roundly pointed anteriorly, with weak median carina and with lateral margins carinate; posterior margin roundly incurved. Frons elongate, weakly concave in lateral view, with sides subparallel, narrowing along eyes, anteriorly pointly rounded in perpendicular view, with median and lateral carinae (along lateral margin) extending to apex of clypeus and intermediate, incomplete, longitudinal carinae from margin of cephalic process reaching to level of middle of eye. Clypeus elongate and narrow, triangular, tricarinate. Eyes rather large, moderately protruding laterally. Antennae with scape short and cylindrical; pedicel short, inflated, barrel-shaped and with large sensory plates on ventral portion. Labium elongate and narrow, reaching posterior trochanters and with apical segment elongate, about half as long as penultimate one.

THORAX (Figs 1G–I, 2F–H). Pronotum smooth with anterior margin strongly bisinuate, roundly projecting anteriorly behind vertex and roundly emarginate behind eyes, and posterior margin weakly incurved; median longitudinal carina and two lateral carinae on disc merging anteriorly along anterior margin; paranotal lobe angularly rounded posteroventrally. Mesonotum short, about as long as pronotum, smooth with three hardly visible obsolete carinae prolongating pronotal ones. Tegulae absent.

TEGMINA (Figs 1G, I, 2F, H). Brachypterous; tegmina slightly elongate in dorsal view, about 1.5 times as long as broad, slightly broadening from base to apex, broadly, roundly truncate apically, convex, smooth; no trace of venation.

LEGS (Figs 1A–D, 2A–D). Profemora and protibiae elongate, dorsoventrally flattened, moderately foliaceous; profemora with ventroapical strong tooth; median legs elongate and slender, much shorter than anterior legs; posterior legs elongate and slender, metatibiae broadening towards apex, with two lateral spines, one near tibiofemoral joint and one in distal half of tibia, and 6 apical spines; first and second metatarsomeres with strong spine at each side and apical row of 12 platellae ventrally. Metatibiotarsal formula: (2) 6/2/2.

ABDOMEN (Figs 1A–D, 2A–D). Dorsoventrally flattened and smooth.

### Male terminalia (Fig. 3)

Pygofer (*Py*) (Fig. 3A–E) curved in lateral view, with strong process projecting posterad on posterior margin, suboval in posterior view. Gonostyli (*G*) (Fig. 3A–E) moderately developed, elongate in ventral



view; dorsal margin with lateral hook and dorsal process. Aedeagus (*ae*) (Fig. 3F–K) moderately elongate and rather wide in dorsal view, with strongly sinuate laterodorsal processes of phallobase in lateral view; connective (*cv*) with well-developed tectiductus. Anal tube (*An*) (Fig. 3A–E) massive, curved in lateral view and with large laterodistal lobe projecting ventrad.

#### Female terminalia (Fig. 4)

Anal tube (*An*) (Fig. 4A, C–F) wide and dorsoventrally flattened. Gonocoxae VIII (Fig. 4J–K) with two membranous and flattened endogonocoxal processes (*GxP*) on endogonocoxal lobe, both with inner elongate sclerotized plate. Gonapophyses VIII (Fig. 4J–K) with anterior connective lamina (*ACL*) elongate and sclerotized, with teeth of varying sizes and shapes. Gonapophyses IX (Fig. 4L) with posterior connective lamina elongate, symmetrical, fused basally with intergonocoxal plate. Gonoplas (*Gp*) (Fig. 4B–C, E–I) unilobous, largely sclerotized.

#### Species included (type locality)

*Femotyche hortorum* sp. nov. (Western Australia, York)

*Femotyche kerryae* sp. nov. (Western Australia, Perth)

#### *Femotyche kerryae* sp. nov.

[urn:lsid:zoobank.org:act:D0AF9098-2A18-47A5-A43F-D5A3986EF0B8](https://zoobank.org/urn:lsid:zoobank.org:act:D0AF9098-2A18-47A5-A43F-D5A3986EF0B8)

Figs 1–7A

#### Diagnosis

*Femotyche kerryae* sp. nov. can be easily separated from the other species of the genus, *F. hortorum* sp. nov., by a shorter head with vertex 2.64 times as long as wide in midline (Fig. 1G) (3.53 in *F. hortorum* – Fig. 8G); the pygofer in lateral view with a strong tusk-like, upcurved posterior process (Fig. 3A) (posterior process of pygofer smaller and slightly curved ventrad in *F. hortorum* – Fig. 9A); and the sides of the aedeagus in dorsal view regularly curved (Fig. 3I) (strongly sinuate in *F. hortorum* – Fig. 9J).

#### Etymology

The species epithet is dedicated to Mrs Kerry Stuart (Perth, WA) in acknowledgement for all her help to document this new species.

#### Type material

##### Holotype

AUSTRALIA • ♂; Western Australia, Roleystone; 32°07'25" S, 116°06'06" E; 12 Jan. 2021; K. Stuart leg.; WAM.

##### Paratypes

AUSTRALIA • 1 ♀; same collection data as for holotype; WAM • 2 ♂♂; Western Australia, Roleystone; 32°07'25" S, 116°06'06" E; 28 Jan. 2021; K. Stuart leg.; WAM • 3 ♂♂; same collection data as for preceding; RBINS.

#### Additional material examined from photographs

AUSTRALIA • 1 ex. (Fig. 5A–B); Western Australia, Araluen Botanic Park; 32°07'24.7" S, 116°06'05.5" E; 13 Feb. 2020; Kerry Stuart • 1 ex. (Fig. 5C–D); Western Australia, Araluen Botanic Park; 25 Feb. 2020; Kerry Stuart • 1 ex. (Fig. 5E); Western Australia, Perth, Mundaring; 31°54'57.7" S, 116°09'49.8" E; 1 Mar. 2020; Alexandra Miller • 1 ex (Fig. 5F); Western Australia, Perth, Lake Walyungup, Rockingham,

Old Mandurah Road; 32°19'35.4" S, 115°47'08.8" E; 18 Mar. 2017; Paul Irvine • 1 nymph (Fig. 6A–B), 1 ex (Fig. 6C–D); Western Australia, Roleystone; 20 Jan. 2021; Kerry Stuart.

## Description

### Measurements and ratios

LT: ♂ (n = 5): 4.70 mm (4.64–4.75); ♀ (n = 1): 4.60. LTg/BTg = 1.46; LV/BV = 2.64; LF/BF = 3.99; LPf/BPf = 3.51; LPt/BPt = 2.77.

COLOUR (Figs 1A–E, 2A–E). Pale grey dorsally including frons, lateral lobes of pronotum and meso- and metatibiae and tarsi; black ventrally including clypeus, all coxae and femora and protibiae; protarsi white.

HEAD (Figs 1G–I, 2F–H). Vertex narrow, about 2.6 times as long as wide, strongly projecting beyond eyes, about 1.15 times as long as eye in midline in dorsal view, roundly pointed anteriorly, with weak median carina and with lateral margins carinate; posterior margin not carinate, roundly incurved. Frons narrow, about 4.0 times as long as wide, weakly concave in lateral view, with sides subparallel, constricted at level of eyes, anteriorly roundly pointed in perpendicular view, with median and lateral carinae (along lateral margin) extending to apex of clypeus and intermediate, incomplete, longitudinal carinae from margin of cephalic process reaching to level of middle of eye. Clypeus elongate and narrow, triangular, tricarinate. Eyes rather large, moderately protruding laterally. Antennae with scape short and cylindrical; pedicel short, inflated, barrel-shaped and with large sensory plates on ventral portion. Labium elongate and narrow, reaching posterior trochanters and with apical segment elongate, about half as long as penultimate one.

THORAX (Figs 1G–I, 2F–H). Pronotum about 2.5 times as wide as long in midline, smooth with anterior margin strongly bisinuate, roundly projecting anteriorly behind vertex and roundly emarginate behind eyes, and posterior margin weakly incurved; median longitudinal carina and two lateral carinae on disc merging anteriorly along anterior margin; paranotal lobe angularly rounded posteroventrally. Mesonotum short, about 2.5 times as wide as long in midline and about as long as pronotum, smooth with three hardly visible obsolete carinae prolongating pronotal ones. Tegulae absent.

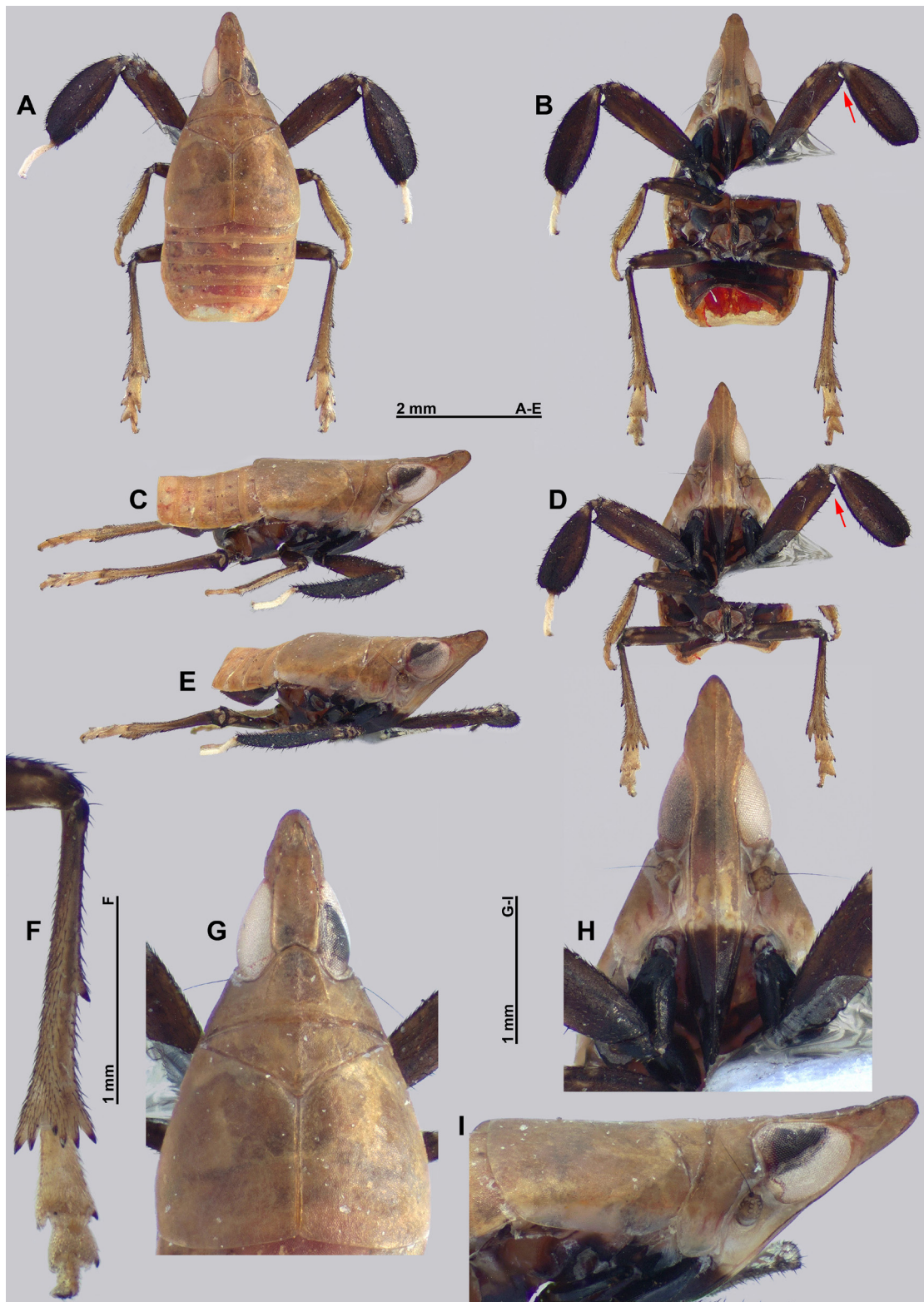
TEGMINA (Figs 1G, I, 2F, H). Brachypterous; tegmina slightly elongate in dorsal view, about 1.5 times as long as broad, sides broadly rounded in dorsal view, slightly broadening from base to apex, broadly, roundly truncate apically, convex, smooth; no trace of venation.

LEGS (Figs 1A–D, 2A–D). Profemora elongate, moderately foliaceous, about 3.5 times as long as wide, with ventroapical strong tooth; protibiae elongate, moderately foliaceous, about 2.8 times as long as wide; median legs elongate and slender, much shorter than anterior legs, with mesotibiae more slender than mesofemora; posterior legs elongate and slender; metatibiae broadening towards apex, with two lateral spines, one near tibiofemoral joint and one in distal half of tibia, and six apical spines; first and second metatarsomeres with strong spine at each side and apical row of 12 platellae ventrally. Metatibiotarsal formula: (2) 6/2/2.

ABDOMEN (Figs 1A–D, 2A–D). Dorsoventrally flattened and smooth, largely visible in dorsal view.

### Male terminalia (Fig. 3)

Pygofer (*Py* – Fig. 3A–E) curved in lateral view, with anterior margin strongly bisinuate in lateral view and with strong tusk-shaped process projecting posterad and slightly curved dorsad on posterior margin; pygofer suboval in posterior view. Gonostyli (*G* – Fig. 3A–E) moderately developed, elongate and tapering towards the posterior in ventral view; dorsal margin with strongly recurved lateral hook (*lh*) directed ventrad and pointed, curved dorsal process (*dpg*) directed cephalodorsad. Aedeagus (*ae* – Fig. 3F–K)



**Fig. 1.** *Femotyche kerryae* sp. nov., holotype, ♂ (WAM). **A.** Habitus, dorsal view. **B.** Habitus, ventral view. **C.** Habitus, lateral view. **D.** Habitus, perpendicular view of frons. **E.** Habitus, anterolateral view. **F.** Metatibia and tarsus, ventral view. **G.** Head and thorax, dorsal view. **H.** Frons, perpendicular view. **I.** Head and thorax, lateral view. Red arrows showing tooth in ventroapical angle of profemur.

moderately elongate, dorsoventrally flattened and rather wide in dorsal view, with strongly sinuate laterodorsal processes (*ldp*) of phallobase (*phb*) in lateral view, in distal portion strongly tapering and curved posteroventrad, with lateral margin bearing numerous pointed teeth directed caudad; connective (*cv*) moderate, with well-developed, laterally flattened suboval tectiductus (*td*). Anal tube (*An* – Fig. 3A–E) massive, curved and widening towards the posterior in lateral view and with large, triangular apicolateral tooth (*alt*) projecting ventrad; in dorsal view, about 1.15 times as long as broad in midline; broadest slightly before midlength; lateral margins forming a round lobe in basal half in dorsal view.

#### **Female terminalia** (Fig. 4)

Sternite VII (*St VII*) (Fig. 4E, G) weakly sclerotized in anteromedian portion; with posterior margin with sclerotized rounded median concavity accommodating the endogonocoxal lobes. Anal tube (*An*) (Fig. 4A, C–F) wide, dorsoventrally flattened, bent ventrad after anal opening and with apical margin rounded. Gonocoxae VIII (Fig. 4J–K) with two membranous, elongate and flattened endogonocoxal processes (*GxP*) on endogonocoxal lobe (*GxL*), both with inner elongate sclerotized plate; endogonocoxal lobe (*GxL*) strongly sclerotized and projecting cephalad. Gonocoxae VIII (*Gx VIII*) (Fig. 4B, G, J–K) transverse, strongly curved and with distinct digitiform projection at inner posterior angle. Gonapophyses VIII (Fig. 4J–K) with anterior connective lamina (*ACL*) elongate and sclerotized, oblique and narrow in ventral view and, in lateral view, sinuate with weak, blunt teeth in distal half up to preapical strong blunt tooth followed by strong, apical, open hook. Gonapophyses IX (Fig. 4L) with posterior connective lamina elongate, symmetrical, touching each other distally and fused basally with intergonocoxal plate. Gonoplags (*Gp*) (Fig. 4B–C, E–I) unilobous, large, strongly concave, largely sclerotized with posterodorsal margin membranous.

#### **Biology**

The species lives near ground level and is very mobile, moving quickly and jumping from one leaf to the next in a jerky way typically similar to jumping spiders (Salticidae). Additionally, they wave their forelegs with contrasting white tarsi in a similar way as jumping spiders move their forelegs and pedipalps, adding to an almost perfect confusion (Figs 5, 6A–D; K. Stuart, pers. com. and video footage, Jan. 2022).

The specimens were collected from and observed on Tall Saw-sedge, *Gahnia clarkei* Benl, an evergreen Cyperaceae (Fig. 6E–F; K. Stuart, pers. com., Jan. 2022). The species was recorded in the months from January to March, in Greater Perth.

#### **Distribution**

Australia, SW Western Australia, Greater Perth (Fig. 7A).

#### *Femotyche hortorum* sp. nov.

[urn:lsid:zoobank.org:act:D48546AB-02C9-4A67-BFC8-AFF19E8EB00D](https://doi.org/10.21203/rs.3.rs-1234567/v1)

Figs 7A, 8–9

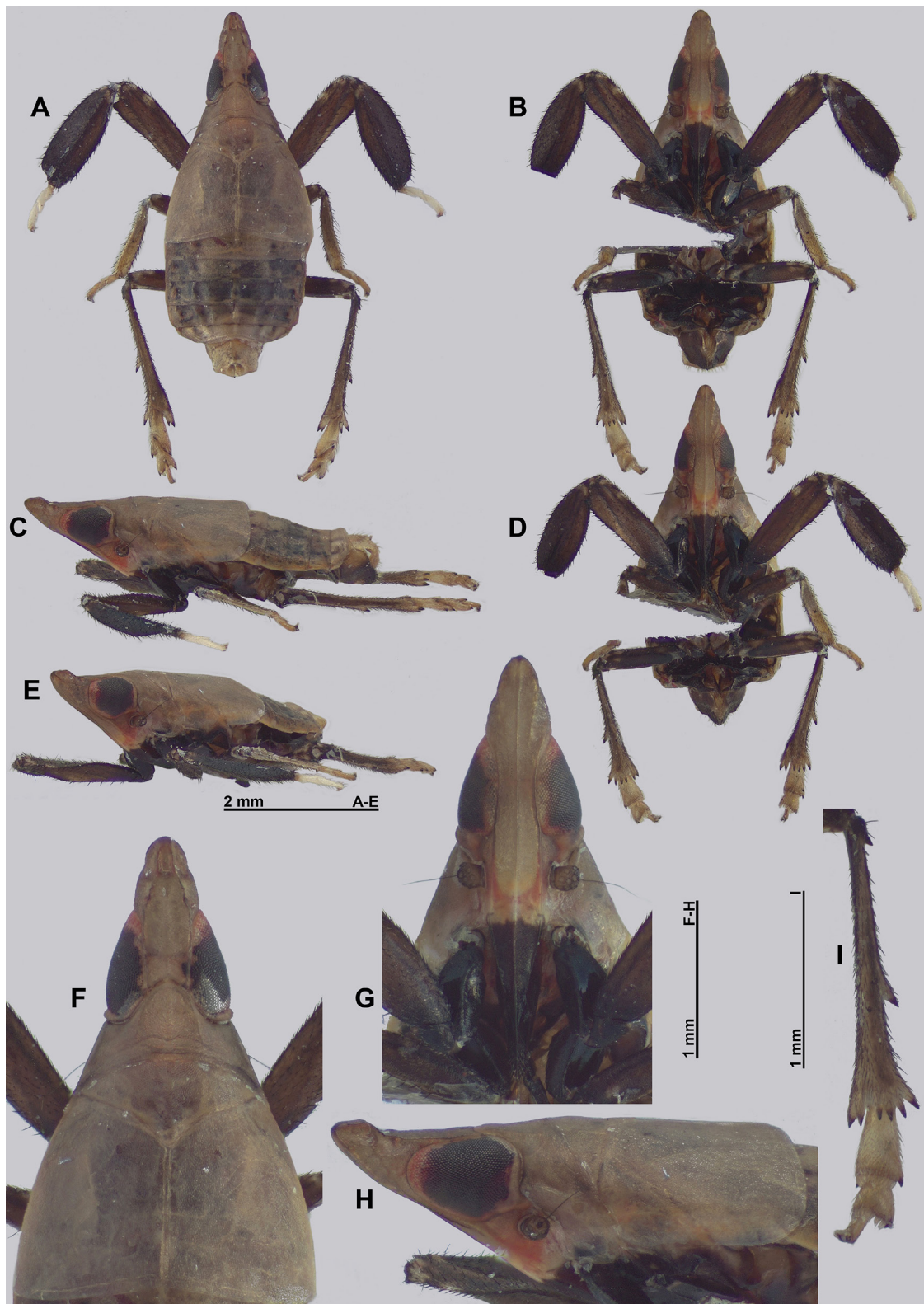
#### **Diagnosis**

*Femotyche hortorum* sp. nov. can be easily separated from the other species of the genus, *F. kerryae* sp. nov., by a longer head with vertex 3.53 times as long as wide in midline (Fig. 8G) (2.64 in *F. kerryae* – Fig. 1G); the pygofer in lateral view with a moderate and slightly curved ventrad posterior process (Fig. 9A) (posterior process of pygofer strong, tusk-like and upcurved in *F. kerryae* – Fig. 3A); and the sides of the aedeagus in dorsal view strongly sinuate (Fig. 9J) (regularly curved in *F. kerryae* – Fig. 3I).

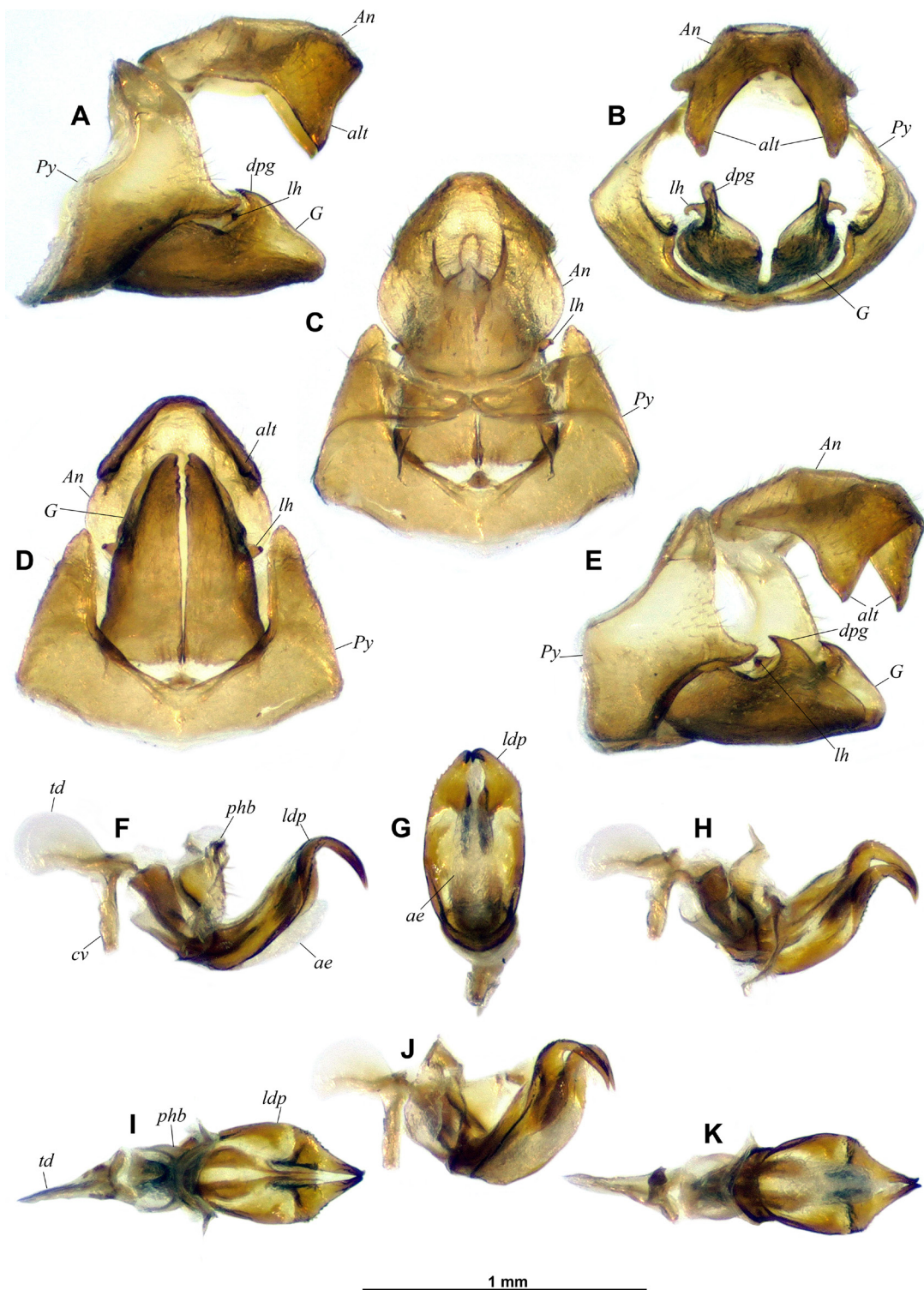
#### **Etymology**

The species epithet is a patronym dedicated to Fred and Jean Hort (Perth, WA), who collected the type specimen and provided information and photographs of several Cleotychni from Western Australia.



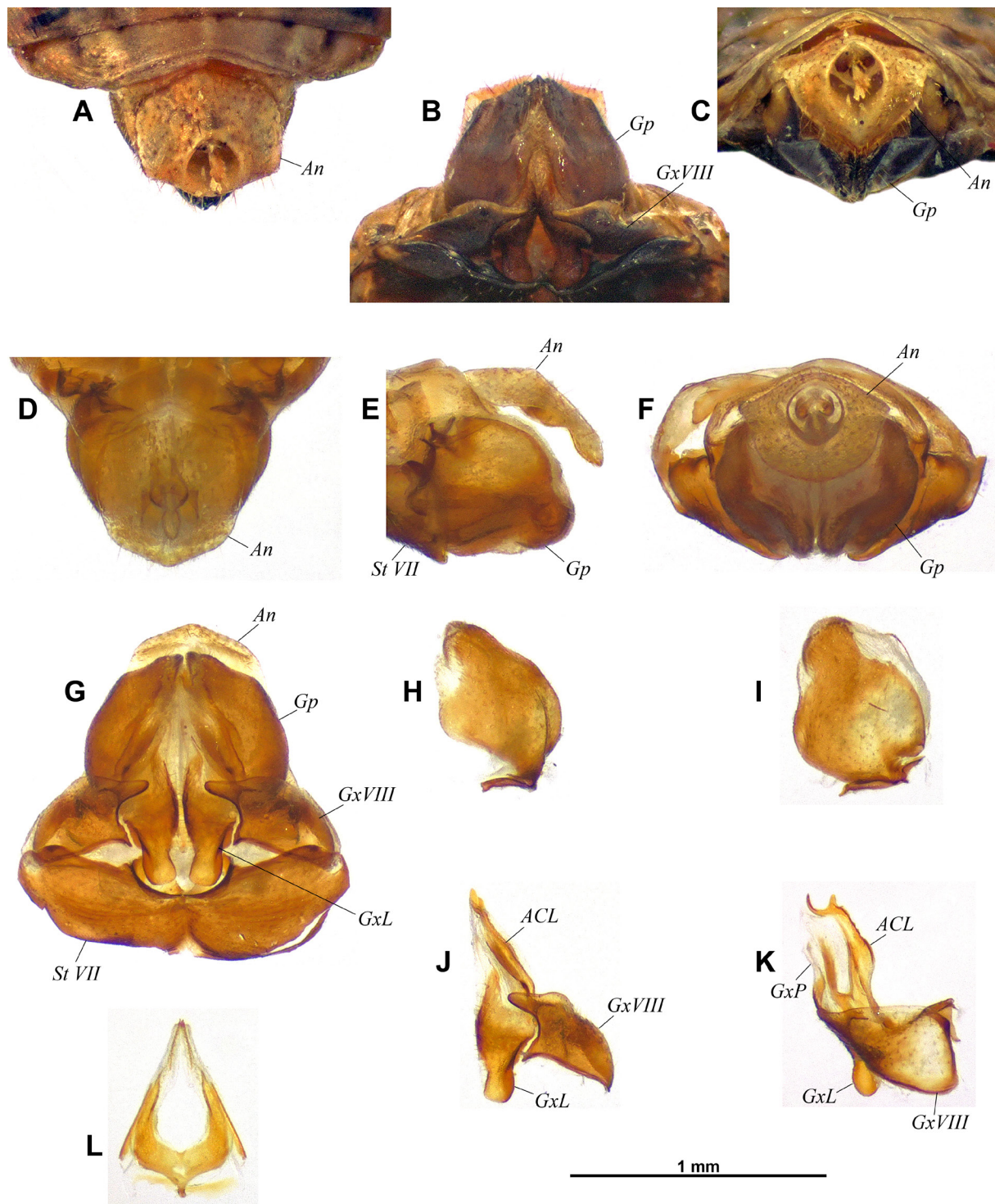


**Fig. 2.** *Femotyche kerryae* sp. nov., paratype, ♀ (WAM). **A.** Habitus, dorsal view. **B.** Habitus, ventral view. **C.** Habitus, lateral view. **D.** Habitus, perpendicular view of frons. **E.** Habitus, anterolateral view. **F.** Head and thorax, dorsal view. **G.** Frons, perpendicular view. **H.** Head and thorax, lateral view. **I.** Metatibia and tarsus, ventral view.

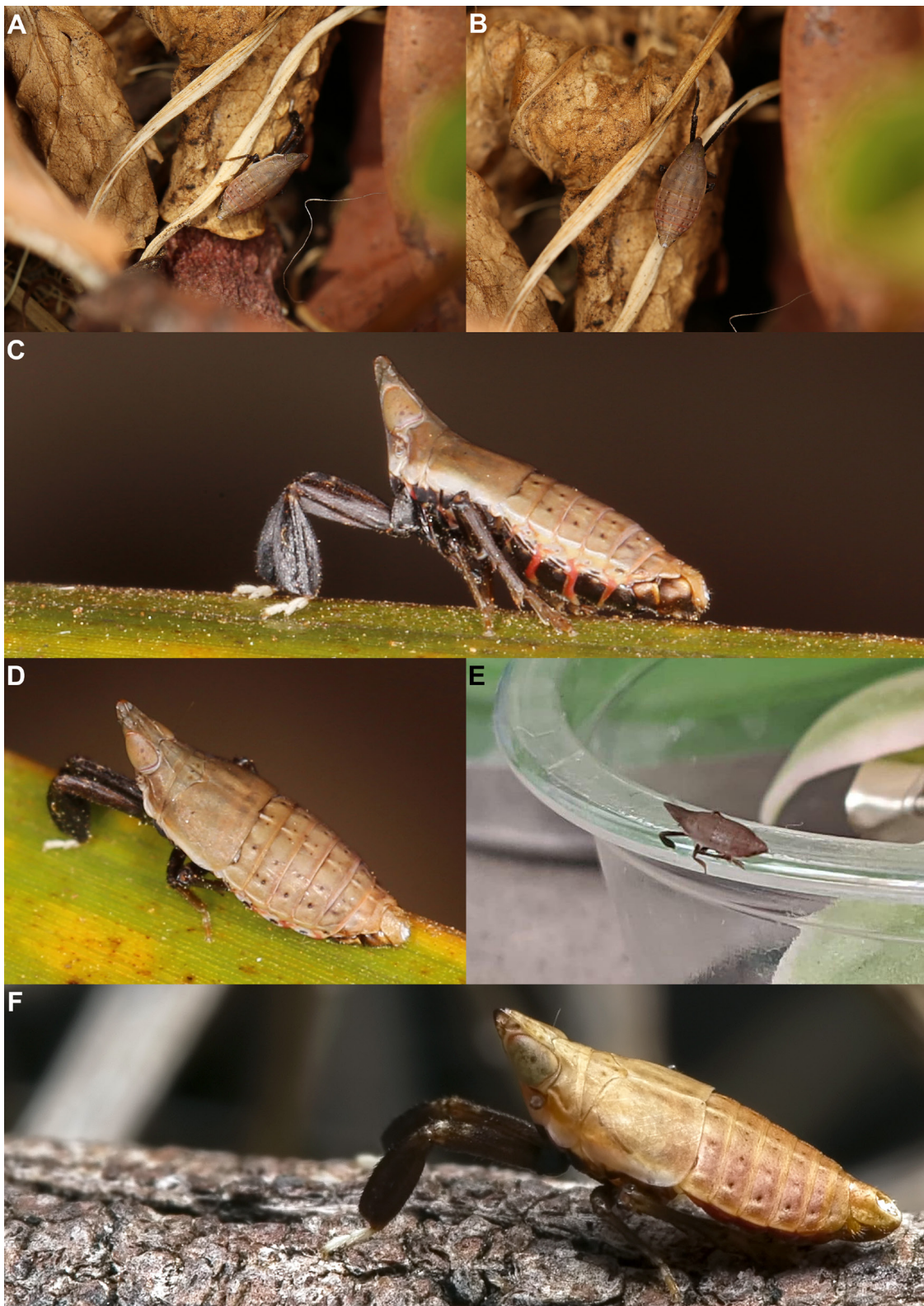


**Fig. 3.** *Femotyche kerryae* sp. nov., terminalia of holotype, ♂ (WAM). A–E. Pygofer, anal tube and gonostyli. A. Left lateral view. B. Caudal view. C. Dorsal view. D. Ventral view. E. Laterocaudal view. F–K. Aedeagus. F. Left lateral view. G. Caudal view. H. Dorsolateral view. I. Dorsal view. J. Posterolateral view. K. Ventral view. Abbreviations: *ae*=aedeagus; *alt*=apicolateral tooth of anal tube; *An*=anal tube; *cv*=connective; *dpg*=dorsal process of gonostylus; *G*=gonostylus; *ldp*=laterodorsal process of phallobase; *lh*=lateral hook of gonostylus; *phb*=phallobase; *Py*=pygofer; *td*=tectiductus.





**Fig. 4.** *Femotyche kerryae* sp. nov., terminalia of paratype, ♀ (WAM). A–C. Not cleared. A. Dorsal view. B. Ventral view. C. Caudal view. D–L. Cleared. D. Dorsal view. E. Lateral view. F. Caudal view. G. Ventral view. H–I. Gonoplocs. H. Posteroventral view. I. Lateral view. J–K. Gonapophysis VIII. J. Ventral view. K. Lateral view. L. Gonapophysis IX, ventral view. Abbreviations: *ACL*=anterior connective lamina; *An*=anal tube; *Gp*=gonoploc; *GxVIII*=gonocoxa VIII; *GxL*=endogonocoxal lobe of gonocoxa VIII; *GxP*=endogonocoxal process of gonocoxa VIII; *St VII*=sternite VII.



**Fig. 5.** *Femotyche kerryae* sp. nov., live specimens in Western Australia. **A–B.** Araluen Botanic Park, 13 Feb. 2020, © Kerry Stuart. **C–D.** Araluen Botanic Park, 25 Feb. 2020, © Kerry Stuart. **E.** Perth, Mundaring, 1 Mar. 2020, © Alexandra Miller. **F.** Perth, Lake Walyungup, Rockingham, Old Mandurah Rd, 18 Mar. 2017, © Paul Irvine.





**Fig. 6.** *Femotyche kerryae* sp. nov., live specimens and habitat in Western Australia, © Kerry Stuart. A–D. Roleystone, 20 Jan. 2021. A–B. Nymph. C–D. Adult. E–F. Habitat and host plant, Araluen Botanic Park, 19 Jan. 2021.



## Type material

### Holotype

AUSTRALIA • ♂; Western Australia, York; 32°03'36.7" S, 116°31'03.0" E; 25 Jan. 2018; F. and J. Hort leg.; #4888; WAM.

## Description

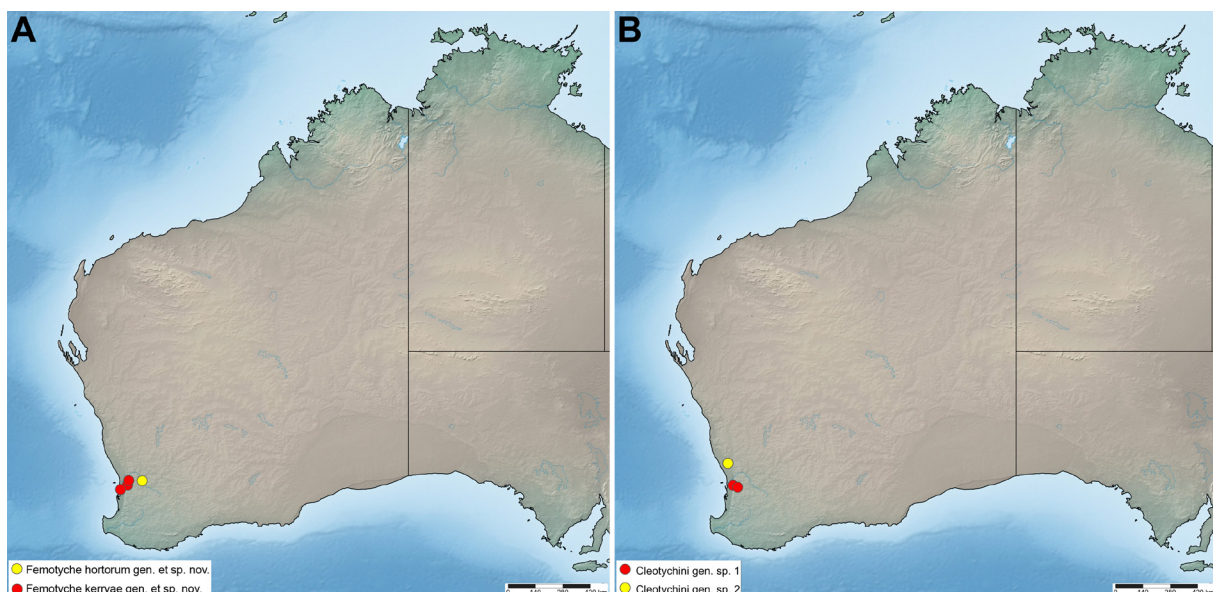
### Measurements and ratios

LT: ♂ (n = 1): 4.63 mm. LTg/BTg = 1.59; LV/BV = 3.53; LF/BF = 4.87; LPf/BPf = 3.88; LPt/BPt = 2.70.

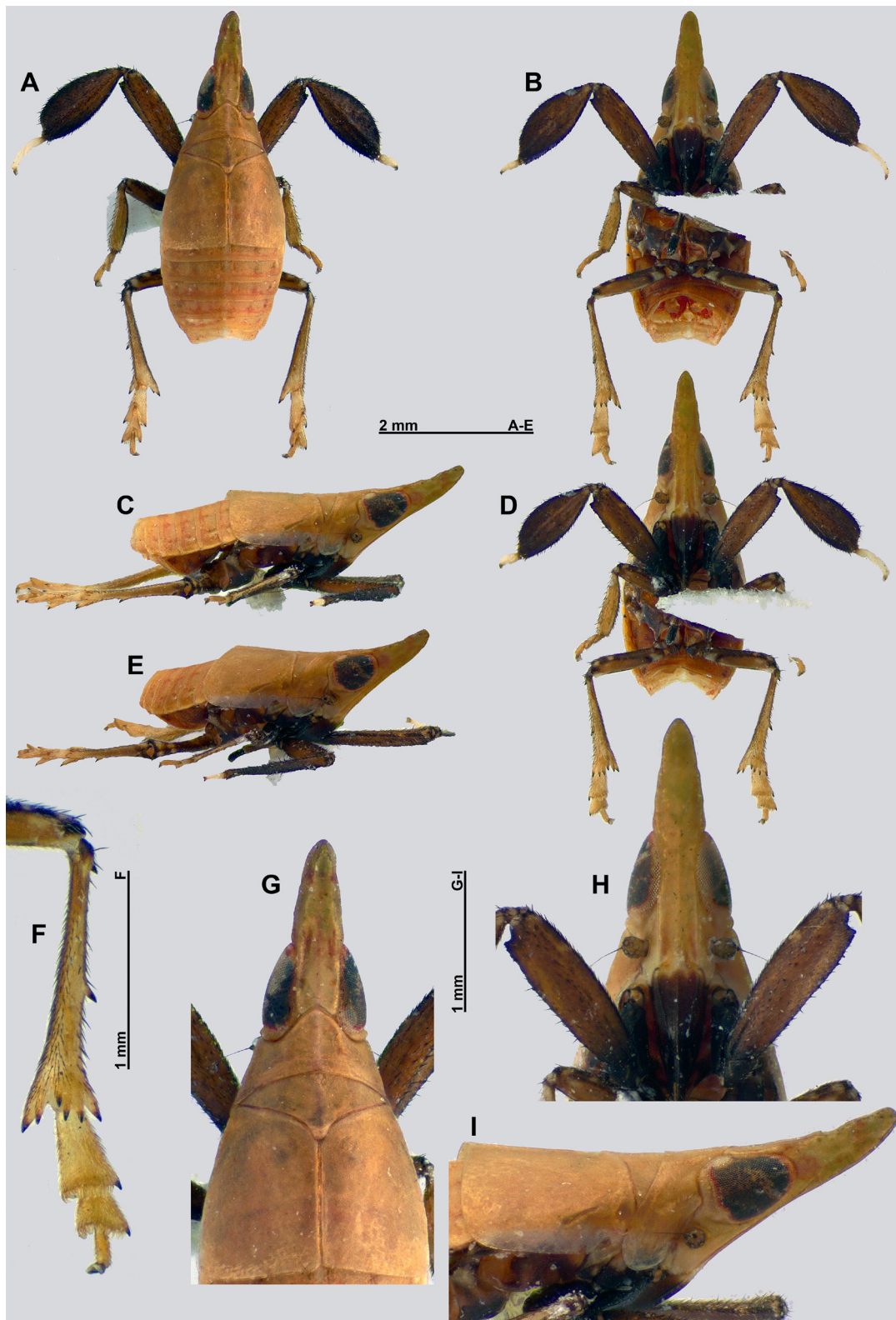
COLOUR (Fig. 8A–E). Pale yellowish grey dorsally including frons, lateral lobes of pronotum, abdominal sternites, and meso- and metatibiae and tarsi; clypeus, all coxae and femora and protibiae black or blackish brown; protarsi white with black claws.

HEAD (Fig. 8G–I). Vertex very narrow, about 3.5 times as long as wide, strongly projecting beyond eyes, nearly twice as long as eye in midline, in dorsal view, roundly pointed anteriorly, with weak median carina and with lateral margins carinate; posterior margin not carinate, angularly incurved. Frons narrow, about 4.9 times as long as wide, weakly sinuate in lateral view; sides subparallel, constricted at level of eyes, anteriorly roundly pointed in perpendicular view, with median and lateral carinae (along lateral margin) extending to apex of clypeus; intermediate, incomplete, longitudinal carinae from margin of cephalic process, reaching to level of anterior margin of eye. Clypeus elongate and narrow, triangular, tricarinate. Eyes rather large, moderately protruding laterally. Antennae with scape short and cylindrical; pedicel short, inflated, barrel-shaped and with large sensory plates on ventral portion. Labium elongate and narrow, reaching posterior trochanters and with apical segment elongate, about half as long as penultimate one.

THORAX (Fig. 8G–I). Pronotum about 2.5 times as wide as long in midline, smooth with anterior margin strongly bisinuate, roundly projecting anteriorly behind vertex and roundly emarginate behind eyes, and posterior margin weakly incurved; median longitudinal carina and two lateral carinae on disc merging anteriorly along anterior margin; paranotal lobe rounded posteroventrally. Mesonotum short, about



**Fig. 7.** Distribution maps. A. *Femotyche hortorum* gen. et sp. nov. and *F. kerryae* gen. et sp. nov. B. *Cleotychni* gen. et sp. ind. from Western Australia.



**Fig. 8.** *Femotyche hortorum* sp. nov., holotype, ♂ (WAM). **A.** Habitus, dorsal view. **B.** Habitus, ventral view. **C.** Habitus, lateral view. **D.** Habitus, perpendicular view of frons. **E.** Habitus, anterolateral view. **F.** Metatibia and tarsus, ventral view. **G.** Head and thorax, dorsal view. **H.** Frons, perpendicular view. **I.** Head and thorax, lateral view.

2.3 times as wide as long in midline and slightly longer than pronotum, smooth with three hardly visible obsolete carinae prolongating pronotal ones. Tegulae absent.

TEGMINA (Fig. 8G, I). Brachypterous; tegmina slightly elongate in dorsal view, about 1.6 times as long as broad, sides broadly rounded in dorsal view, slightly broadening from base to apex, broadly, roundly truncate apically, convex, smooth; no trace of venation.

LEGS (Fig. 8A–F). Profemora elongate, moderately foliaceous, about 4.0 times as long as wide, with ventroapical strong tooth; protibiae elongate, foliaceous, about 2.5 times as long as wide; median legs elongate and slender, much shorter than anterior legs, with mesotibiae slightly more slender than mesofemora; posterior legs elongate and slender; metatibiae broadening towards apex, with two lateral spines, one near tibiofemoral joint and one in distal half of tibia, and six apical spines; first and second metatarsomeres with strong spine at each side and apical row of 12 platellae ventrally. Metatibiotarsal formula: (2) 6/2/2.

ABDOMEN (Fig. 8 A–E). Dorsoventrally flattened and smooth, largely visible in dorsal view.

#### Male terminalia (Fig. 9)

Pygofer (*Py* – Fig. 9A–E) moderately curved in lateral view, with anterior margin strongly bisinuate in lateral view and with strong process projecting posterad and weakly curved ventrad on posterior margin; pygofer suboval in posterior view. Gonostyli (*G* – Fig. 9A–E) moderately developed, elongate and tapering towards the posterior in ventral view; dorsal margin with strongly recurved lateral hook (*lh*) directed mesoventrad and pointed, curved dorsal process (*dpg*) directed cephalodorsad. Aedeagus (*ae* – Fig. 9F–K) moderately elongate, dorsoventrally flattened and rather wide in dorsal view, with strongly sinuate laterodorsal processes (*ldp*) of phallobase (*phb*) in lateral view; in dorsal view, laterodorsal processes roundly projecting laterocephalad in a strong lamina, with lateral margin strongly bisinuate towards the posterior; distal portion strongly tapering, twisted and curved posteroventrad but with dorsal margin weakly upcurved, with lateral margin slightly lamellate laterally and bearing numerous pointed teeth directed caudad; connective (*cv*) moderate, with well-developed, laterally flattened suboval tectiductus (*td*). Anal tube (*An* – Fig. 9A–E) massive, curved and widening towards the posterior in lateral view and with large, pointed, triangular lateroventral tooth (*alt*) in distal portion projecting ventrad; in lateral view, ventral margin sinuate in basal portion, and forming a nearly right angle at base of tooth; in dorsal view, about 1.02 times as long as broad in midline; broadest at  $\frac{2}{3}$  of length; lateral margins forming an angularly rounded lobe in basal half in dorsal view.

#### Biology

The species was recorded in the month of January and its biology remains unknown.

#### Distribution

Australia, SW Western Australia, York (Fig. 7A).

#### Additional unidentified Cleotychni

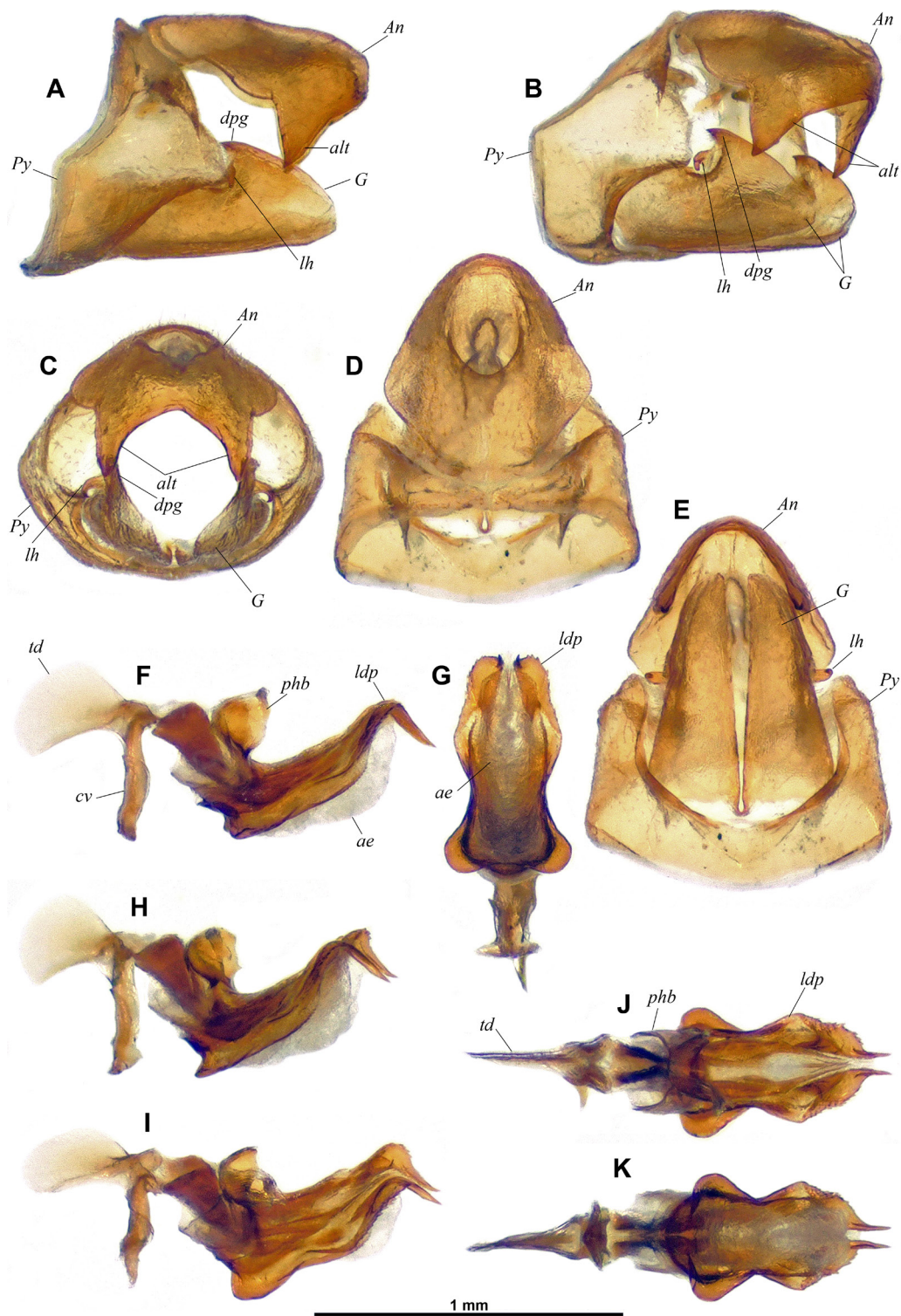
##### *Cleotychni* gen. ind.

Figs 7B, 10

This undescribed genus is known from two species from Western Australia. It clearly differs from the two genera currently included in the tribe Cleotychni by possessing slender, elongate forelegs (protibiae and profemora foliaceous in *Cleotyche* and *Femotyche* gen. nov.).

The two species, both recorded only from photographs, differ in the width of the white band on the tegmina (rather narrow in sp. 1; wide in sp. 2) and by the white markings on sides and in midline of abdomen, extending further cephalad in sp. 2.





**Fig. 9.** *Femotyche hortorum* sp. nov., terminalia of holotype, ♂ (WAM). A–E. Pygofer, anal tube and gonostyli. A. Left lateral view. B. Laterocaudal view. C. Caudal view. D. Dorsal view. E. Ventral view. F–K. Aedeagus. F. Left lateral view. G. Posteroventral view. H. Posterolateral view. I. Dorsolateral view. J. Dorsal view. K. Ventral view. Abbreviations: *ae* = aedeagus; *alt* = apicolateral tooth of anal tube; *An* = anal tube; *cv* = connective; *dpg* = dorsal process of gonostylus; *G* = gonostylus; *ldp* = laterodorsal process of phallobase; *lh* = lateral hook of gonostylus; *phb* = phallobase; *Py* = pygofer; *td* = tectiductus.

*Cleotychni* gen. ind. sp. 1  
Figs 7B, 10A–E

**Material examined from photographs**

AUSTRALIA • 1 specimen (Fig. 10A); Western Australia; Perth, Creyk Park; 32°07'55" S, 116°00'52" E; 21 May 2021; Kerry Stuart • 1 specimen (Fig. 10B–C); same data as for preceding; 26 Feb. 2018 • 1 specimen (Fig. 10D–E); Western Australia; Ashendon, Rutherglen Road; 32°13'12" S, 116°13'41" E; 5 Feb. 2010; Fred and Jean Hort.

**Note**

The specimen from Ashendon (Fig. 10D–E) was on low shrubs in an area of white sand in low heathland with very few grasses (Fred & Jean Hort, pers. com., Jan. 2020).

*Cleotychni* gen. ind. sp. 2  
Figs 7B, 10F

**Material examined from photographs**

AUSTRALIA • 1 specimen (Fig. 10F); Western Australia; Red Gully, Brand Highway; 31°07'18" S, 115°46'44" E; 1 Feb. 2020; Fred and Jean Hort.

**Note**

The specimen was on a grass stem in an area of white sand in low heathland with very few grasses (F. & J. Hort, pers. com., Jan. 2020).

**Discussion**

The new genus *Femotyche* gen. nov. is placed in the tribe Cleotychni as it matches the diagnostic characters as given in Constant *et al.* (2022), such as the habitus reminiscent of Caliscelidae (Hemiptera: Fulgoromorpha), with pyriform body shape and the anterior part of body slightly compressed, the head with well-delimited trigons (triangular area delimited by carinae at anterior angles of vertex), the frons subrectangular, parallel-sided, much longer than wide, the vertex subquadrate, longer than wide, the last segment of the labium half as long as the subapical one, the elongate pronotum (shorter than vertex along mid-line), dorsally tricarinate, with a single lateral keel on each side and posterior margin nearly straight, the smooth mesonotum, with weak carinae, the strongly reduced tegmina, without carina or defined clavus, the tegulae absent, the abdominal tergites without carinae, the procoxae with outer carina extended into triangular apical lobe, the profemora and protibiae flattened and dilated, foliate, the metatibiae with two lateral spines, one near tibiofemoral joint and one in distal half of tibia, the metatibiae with 6 apical teeth separated in two groups: two teeth on internal side and four on external side, the first and second segments of metatarsus with platellae instead of spines, except large lateral common teeth without setae, the arolium with one pair of chetoid sensilla, the claws with three setae, etc.

The Australian endemic tribe Cleotychni now counts two genera and seven species, representing more than 30% of the species diversity of the family Dictyopharidae in Australia, although the tribe and its first species were described very recently by Emeljanov (1997). Recent fieldwork in Queensland and collaboration with citizen-scientists allowed the discovery and description of four species (Constant *et al.* 2022; present work), while additional undescribed taxa have been documented from photographs.

The present work documents two new genera and four new species (with only one genus and two species formally described due to lack of collection specimens) from the direct suburb of Perth, confirming the





**Fig. 10.** Undescribed genus of Cleotychni from Western Australia. **A–C.** Cleotychni gen. ind. sp. 1, Perth, Creyk Park, © Kerry Stuart. **A.** 21 May 2021. **B–C.** 26 Feb. 2018. **D–E.** Cleotychni gen. ind. sp. 1, Ashendon, Rutherglen Road, 5 Feb. 2010, © Fred & Jean Hort. **F.** Cleotychni gen. ind. sp. 2, Red Gully, Brand Highway, 1 Feb. 2020, © Fred & Jean Hort.

statement by Moir & Fletcher (2012), that a number of Cleotychni species remain undescribed, and additionally illustrating another undescribed species from Western Australia.

For the new species *Femotyche kerryae* sp. nov. described in this work, some video footages exist, filmed by Mrs Kerry Stuart (K. Stuart, pers. com., Jan. 2021), showing the mimicry of the insect with jumping spiders (Araneae: Salticidae) in the way it moves in a peculiar jerky way, rapidly waving its forelegs in the way salticids move their prolegs and pedipalps.

The contributions of citizen-scientists were instrumental in discovering and documenting the taxa included in the present work, as well as in providing specimens of the new species, allowing their formal descriptions. Such collaboration can be very important to document species for faunistic studies or aspects of their natural history such as host plants, behaviour, interspecific relationships, etc. (e.g., Bourgoin *et al.* 2023; Constant 2018, 2023; Constant *et al.* 2016), and must be encouraged. However, when it comes to accurately documenting the biodiversity, proper, specimen-based taxonomic descriptions of the taxa are required and amateurs should be encouraged to help and contribute to the collections of natural history institutions. The limited taxonomic capacity in Australia currently impedes a fast progress in the documentation of a unique fauna (Taxonomy Decadal Plan Working Group 2018). Examples (although too few), prove that some investment into the study of specific groups can reveal an amazing diversity, such as in the family Cixiidae within the planthoppers (e.g., see <https://shorturl.at/HspaM>).

## Acknowledgements

We wish to thank Kerry Stuart (Perth, Western Australia, Australia), Fred and Jean Hort (Swan View, Western Australia, Australia), Paul Irvine (Perth, Western Australia, Australia) and Alexandra Miller (Mundaring, Western Australia, Australia) for all their help by generously sharing specimens, information and/or photographs; Dr Nikolai Tataric (WAM) for his advice and support and for his help during our visit to WAM collection; Dr Thierry Backeljau (RBINS) for his continued support; the two anonymous reviewers for their useful comments; Prof. Thierry Bourgoin (Muséum national d'Histoire naturelle, Paris, France) for verifying our interpretation of the female terminalia.

## References

- Bourgoin T. 1993. Female genitalia in Hemiptera Fulgoromorpha, morphological and phylogenetic data. *Annales de la Société entomologique de France (Nouvelle Série)* 29: 225–244.
- Bourgoin T. 2024. FLOW (Fulgoromorpha Lists On the Web): a world knowledge base dedicated to Fulgoromorpha. V.8, updated [I.2024]. Available from <http://hemiptera-databases.org/flow/> [accessed 6 Jan. 2024].
- Bourgoin T. & Huang J. 1990. Morphologie comparée des genitalia mâles des Trypetimorphini et remarques phylogénétiques (Hemiptera: Fulgoromorpha: Tropiduchidae). *Annales de la Société entomologique de France (Nouvelle Série)* 26 (4): 555–564.
- Bourgoin T., Gjonov I., Lapeva-Gjonova A., Roger S., Constant J., Kunz G. & Wilson M.R. 2023. When cockroaches replace ants in trophobiosis: A new major life-trait pattern of Hemiptera planthoppers behaviour disclosed when synthesizing photographic data. *Diversity* 15 (3): 356. <https://doi.org/10.3390/d15030356>
- Constant J. 2004. Révision des Eurybrachidae (I). Le genre *Amychodes* Karsch, 1895 (Homoptera: Fulgoromorpha: Eurybrachidae). *Bulletin de l'Institut royal des Sciences naturelles de Belgique* 74: 11–27.
- Constant J. 2018. Revision of the Eurybrachidae XIV. The Australian genera *Olonia* Stål, 1862 and *Stalobrachys* gen. nov. (Hemiptera: Fulgoromorpha). *European Journal of Taxonomy* 486: 1–97. <https://doi.org/10.5852/ejt.2018.486>



- Constant J. 2023. Revision of the Eurybrachidae (XVII). The new Australian genus *Kamabrachys* gen. nov. with ten new species (Hemiptera: Fulgoromorpha). *European Journal of Taxonomy* 895: 1–133. <https://doi.org/10.5852/ejt.2023.895.2289>
- Constant J., Phauk S. & Bourgoïn T. 2016. Updating lanternflies biodiversity knowledge in Cambodia (Hemiptera: Fulgoromorpha: Fulgoridae) by optimizing field work surveys with citizen science involvement through Facebook networking and data access in FLOW website. *Belgian Journal of Entomology* 37: 1–16.
- Constant J., Semeraro L. & Moir M.L. 2022. Australian Cleotychni planthoppers: review of the genus *Cleotyche* Emeljanov, 1997 with three new species (Hemiptera: Fulgoromorpha: Dictyopharidae). *European Journal of Taxonomy* 836: 66–95. <https://doi.org/10.5852/ejt.2022.836.1917>
- Emeljanov A.F. 1997. A new genus and species of the Dictyopharidae from Australia belonging to a new tribe (Homoptera, Cicadina). *Zoosystematica Rossica* 6 (1–2): 77–82.
- Emeljanov A.F. 2011. Improved tribal delimitation of the subfamily Dictyopharinae and description of new genera and new species (Homoptera, Fulgoroidea, Dictyopharidae) [in Russian]. *Entomologicheskoe Obozrenie* XC (2): 299–328. <https://doi.org/10.1134/S0013873811090053>
- Moir M. & Fletcher M.J. 2012. Copycats, or should that be ‘copybugs’? Bugs that mimic spiders. *Australasian Arachnology* 84: 6–7.
- O’Brien L.B. & Wilson S.W. 1985. Planthoppers systematics and external morphology. In: Nault L.R. & Rodriguez J.G. (eds) *The Leafhoppers and Planthoppers*: 61–102. John Wiley & Sons, New York.
- Shorthouse D.P. 2010. SimpleMappr, an online tool to produce publication-quality point maps. Available from <http://www.simplemappr.net> [accessed 6 Jan. 2024].
- Song Z.-S., Bartlett C.R., O’Brien L.B., Liang A.-P. & Bourgoïn T. 2018. Morphological phylogeny of Dictyopharidae (Hemiptera: Fulgoromorpha). *Systematic Entomology* 43: 637–658.
- Taxonomy Decadal Plan Working Group 2018. *Discovering Biodiversity: A Decadal Plan for Taxonomy and Biosystematics in Australia and New Zealand 2018–2027*. Australian Academy of Science and Royal Society Te Apārangi, Canberra and Wellington. Available from <https://shorturl.at/DUN2Q> [accessed 18 Jul. 2022].

*Manuscript received: 8 January 2024*

*Manuscript accepted: 1 August 2024*

*Published on: 31 October 2024*

*Topic editor: Tony Robillard*

*Section editor: Christopher Dietrich*

*Desk editor: Chris Le Coquet-Le Roux*

Printed versions of all papers are deposited in the libraries of four of the institutes that are members of the EJT consortium: Muséum national d’Histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium. The other members of the consortium are: Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum of the Czech Republic, Prague, Czech Republic; The Steinhardt Museum of Natural History, Tel Aviv, Israël.