

**THE DISCOVERY OF THE HOLOTYPE OF *LEDROMORPHA PLANIROSTRIS*
(DONOVAN) (CICADELLIDAE: LEDRINAE), WITH NOTES ON OTHER
AUSTRALIAN AUCHENORRHYNCHA SPECIES DESCRIBED
BY EDWARD DONOVAN**

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Summary

Evidence is presented to link a female specimen of *Ledromorpha planirostris* (Donovan) (Hemiptera: Cicadellidae: Ledrinae) held in the Macleay Museum, University of Sydney, to the original description of *Fulgora planirostris* by Donovan (1805) despite a difference in sex between the specimen and Donovan's illustration of the species. Supporting information presented includes evidence that Donovan's illustrations in other insect groups have been shown to have significant errors derived from Donovan's methods of study, evidence that in 1818 Alexander Macleay bought material from the collection of Edward Francillon in whose collection Donovan's type material was originally held and evidence derived from the physical attributes of the specimen itself. On the basis of this evidence, the female specimen of *L. planirostris* is recognised as the holotype of *Fulgora planirostris* Donovan. Recognition of the syntypes of *Cicada pustulata* Donovan and designation of a lectotype is also made. Implications of these discoveries for other Donovan species described from Australia are discussed.

Keywords: Hemiptera, Cicadellidae, Flatidae, Ricaniidae, Aphrophoridae, Nomenclature, Type Designation

INTRODUCTION

The whereabouts of the material used by Donovan (1805) to describe a number of species of Australian insects has long been a mystery to taxonomists. Of particular interest, among the species of Hemiptera illustrated in Donovan's Plate 1 and described in the accompanying text (on unnumbered pages), is the original description of one of the world's largest leafhoppers, *Ledromorpha planirostris* (Donovan), originally *Fulgora planirostris*.

This species is distributed in eastern Australia from Queensland to New South Wales and Victoria. Adults and the extremely flattened, paper-thin nymphs live under the loose bark of eucalypt trees. Despite being well represented in collections with adults and nymphs, all known specimens are females (Evans 1966, Day and Fletcher 1994). J.W. Evans spent many years studying the Cicadellidae of Australia and, during his lifetime, was able to visit collections holding Australian material in most parts of the world so his comment about the lack of males in collections (Evans 1966) is significant. The female is characterised by a prominent ovipositor which extends well beyond the apices of the folded tegmina. However, the illustration provided by Donovan (1805), which shows the insect with its wings spread in flying position, is clearly that of a male. For this reason, locating Donovan's original specimen was of particular interest.

Included on his single plate of Auchenorrhyncha, Donovan (1805) illustrated six species of Auchenorrhyncha described as new in the accompanying text. Donovan's plate is reproduced here as Figure 1. The specimens seen by Donovan were said to be collected in "New Holland" or "Botany Bay" and all were in the collection of a Mr Francillon. In addition to *F. planirostris*, Donovan described *Fulgora parva* (now in *Philagra*, Aphrophoridae), *Cicada hyalinata* (now in *Armacia*, Ricaniidae), *Cicada viridana* and *Cicada modesta* (now in *Poeciloflata*, Flatidae) and *Cicada pustulata* (now *Neomelicharia cruentata* (Fabricius), Flatidae). Donovan (*loc. cit.*) included figures of two colour forms of *C. pustulata*. Evans (1966) noted that the whereabouts of the holotype of *F. parva* is unknown. Fletcher (1988) noted that the location of Donovan's flatid specimens was also unknown.

Chalmers-Hunt (1976) lists the natural history auctions registered in the British Isles between 1700 and 1972. This work not only catalogues the sales but also provides further information about the material brought to sale. Chalmers-Hunt (*loc. cit.*: 5) states that the collection of John Francillon (1744-1816), a London doctor, was auctioned in 1818, not long after that of Edward Donovan himself. According to Chalmers-Hunt (*loc. cit.*), Francillon "had it is said the most magnificent cabinet of insects that has ever been brought to sale in this country. Be that as it may, its chief importance was that it contained many

Fabrician as well as numerous Donovan types described by that author in his *Epitome of the Insects of New Holland* and elsewhere". Most importantly, Chalmers-Hunt (*loc.cit.*) continues "Alexander Macleay bought many of the lots..." and continues that further parts reached the British Museum (Natural History) and the Hope Department, Oxford. There is therefore a reasonable probability that the material bought from the Francillon Collection by Alexander Macleay and placed in his collection included the "Australian" specimens used by Donovan for his production of his Auchenorrhyncha plate in Donovan (1805).

The Macleay papers held by the Macleay Museum include a copy of the original auction catalogue, identified as being that used by Alexander Macleay, and annotated by hand with prices paid for individual lots. Alexander Macleay (1767-1848) came to Australia in 1826 as Colonial Secretary and brought his extensive natural history collections with him. The collection eventually was passed to Sir William Macleay who donated it to the University of Sydney where it is now known as the Macleay Museum. The connection between Francillon and the Macleays raised the possibility that Donovan's material, in whole or part, is located in the Macleay Museum, University of Sydney.

Examination of the entomological collections of the Macleay Museum was carried out on several occasions, including examination of a portion of the collection now housed at Elizabeth Bay House, Sydney, William Macleay's former residence now restored as an historical museum. Alexander Macleay's Chippendale insect cabinets are exhibited in the study and house significant parts of the collection.

Specimens of a number of Donovan's species were located in the Macleay Collection, including four specimens (all female) of *L. planirostris*, five specimens of *N. cruentata* and six specimens of *P. parva*. No specimens of *P. modesta*, *P. viridana* or *A. hyalinata* were located.

Edward Donovan (1768-1837)

When Donovan produced his 1805 publication, few illustrations of Australian insects had been published. Donovan was said by Westwood (1872) to be "an excellent artist" and had already published on the British insects (1792 *et seq.*) and on the insects of India (1800-03).

Donovan was entranced by the Australian fauna, writing that "no extent of country in the world can

boast of a more copious or diversified assemblage of interesting objects... It bursts upon our view at the first glance like a new creation". He had a collection of his own, which included some Australian species "collected by Mr Bailey, the astronomer" and by others, but for many of the Australian and other foreign insects he visited the collections of others, making sketches and notes and completing the illustrations later. In doing so, he made numerous errors in detail, many of which were exposed by Westwood (1872) who described Donovan as "a careless person". Waterhouse (1938) compared Donovan's illustrations of butterflies with specimens of the species represented and the paintings ("Icones") by William Jones and commented "I was well acquainted with Westwood's account of the carelessness of Donovan but was scarcely prepared for what I found". He then outlined many of the errors made by Donovan and considered them far more than mere "carelessness". In fact, as Westwood demonstrated, Donovan actually "manufactured" a butterfly species using parts of several, even unrelated, specimens.

It is therefore probable that Donovan's decision to represent *L. planirostris* with its wings spread in flying position was made in the absence of the specimen on which his illustration was based. In light of the carelessness displayed by Donovan in his work with the Lepidoptera, it is likely that he added the abdomen of *L. planirostris* without checking the specimen and painted a male without realising the implications of this action. It is therefore likely that Donovan's type specimen was not a male as illustrated, but a female.

Of the four specimens of *L. planirostris* held in the Macleay Museum, three have data labels from South Australia and New South Wales while the fourth lacks any label. An examination of the pins on which the specimens are mounted has revealed that all four are far more recent than would be expected for a specimen dating from the 18th Century. However, the single unlabelled specimen has been remounted at least twice as evidenced by the presence of extra pin holes. In addition, Donovan's (1805) illustration shows a slight serration along the front margin of the head (Figure 1) which is correlated in this specimen as abrasion damage (Figure 2). The ovipositor of the specimen is also bent sideways in such a way as to indicate that this distortion was caused to the specimen when it was fresh, probably when it was first captured. This damage to both the ovipositor and the head is consistent with the specimen having been placed in a small container when fresh and stored

there for some time. The distortion of the ovipositor may also explain why the presence of such an obvious ovipositor was not noted by Donovan in his visit to the Francillon collection and not recalled when he needed to create an abdomen for his illustration.

In light of the evidence presented above, this specimen is here recognised as the holotype of *Fulgora planirostris* Donovan.

Abbreviations for collections: AM, Australian Museum, Sydney; ANIC, Australian National Insect Collection, Canberra; ASCU, NSW Agricultural Scientific Collections Unit, Orange; JWE, John Evans collection, property of AM; MAMU, Macleay Museum, University of Sydney, Sydney; MJF, Murray Fletcher collection, Orange.

Family Cicadellidae

Subfamily Ledrinae

Tribe Ledrini

Genus *Ledromorpha* Stål

Ledromorpha Stål 1864: 68

Type species: *Fulgora planirostris* Donovan, designated by Evans 1947: 130.

Ledromorpha planirostris (Donovan)

Fulgora planirostris Donovan 1805: pl. 1

Ledromorpha planirostris (Donovan), Stål 1864

Other synonymy is provided by Day and Fletcher 1994: 1142.

Holotype (examined, Figure 2): female, lacking data (MAMU); Other material examined: 1 female, no data (JWE); NEW SOUTH WALES: (all females), 2 specimens, "N.S. Wales" (MAMU), Auburn, 6.ii.1961, R. Dawes; Artarmon, 12.ii.1984, P. Brown; Mt Ku-ring-gai, 27.xii.1963, A. Simon; Wyoming, 25.x.1960, E.B., *Eucalyptus*; Lucknow, 6.ii.1951, A.W. Day; Avoca Beach, 19.iii.1984, J. Borchard; nr Glenbrook, Blue Mountains National Park, ii.1988, P. Reed; 5, Fairburn, nr Armidale, i.1993, A. Campbell & G.R. Brown, malaise trap; Brodies Plains, nr Inverell, 12.iii.1948 (all ASCU); North Ryde, 16.i.1970, P. Maguire (MJF); Connells Point, vi.1984, P. Clay; Bateau Bay, 8.iv.1989, L. Bushell, (both AM); Norton's Basin, Nepean River; Bowral, i.1964 (both JWE); Mossy Point, 13.i.1972, D.F. Waterhouse; Congo, 8km SE by E of Moruya, 35.58S 150.09E, 12.v.1984, M.S. Upton; 4.5km E of Wyndham, iii.1999, A. Scrymgeour (all ANIC). QUEENSLAND: (all females), Kinbombi Falls, nr Goomeri, 19.xii.1976, M.S. & B.J. Moulds (ASCU); Burleigh, xi.1942, M. Smales (JWE); Biggenden, Bluff Range, 10.i.1971, H. Frauca, on bottlebrush;

Passchendale State Forest, Amiens, 17.xii.1966, T.G. Campbell, J. & A. Harslett (all ANIC). SOUTH AUSTRALIA: 1 female, "S. Australia" (MAMU). TASMANIA: 1 female, no further data (JWE)

Notes: Despite the historical interest in the recognition of this holotype, the scientific implications are not of great significance. This is because *L. planirostris* is a distinctive species, easily recognisable and not necessarily needing a reference type specimen to establish its identity. However, there are implications concerning the other Australian species included in the same work by Donovan (1805).

Notes on other species: The lack of a data label on the type of *L. planirostris* suggests that other specimens from the Francillon collection may also lack data labels. This is supported by the statements by Donovan (1805) that Francillon's specimens of *C. hyalinata*, *C. pustulata*, *C. modesta* and *C. viridana* were all "received" by Francillon from Botany Bay. This indicates that the origins of these specimens were probably communicated to Donovan by Francillon himself rather than being derived from data labels attached to the specimens. This is particularly significant since all of these species are Indonesian and have not been recorded from eastern Australia except by Donovan (1805) and subsequent authors referring to the Australian record in that work (e.g. Schaum 1850, Walker 1851, Dohrn 1859, Melichar 1902, Metcalf 1957). Notes on these species are provided below.

Family Flatidae

Subfamily Flatinae

Genus *Neomelicharia*

Neomelicharia Kirkaldy 1903: 79

Type species: *Flata cruentata* Fabricius, by original designation.

Neomelicharia cruentata (Fabricius)

Flata cruentata Fabricius 1803: 46

Cicada pustulata Donovan 1805: Pl. 1., synonymised by Medler 1999: 49

Poeciloptera pustulata (Donovan), Guerin-Meneville 1834: 471

Poeciloptera pustulata (Donovan), Schaum 1850: 72

Colobesthes pustulata (Donovan), Walker 1851: 440

Phyllyphanta pustulata (Donovan), Dohrn 1859: 66

Atella pustulata (Donovan), Stål 1866: 394.

Nephesa amoena Walker 1870: 172, synonymised by Melichar 1902: 109

Colgar pustulata (Donovan), Melichar 1902: 109

Neomelicharia pustulata (Donovan), Kirkaldy 1909: 32

Type material examined: lectotype male (here designated), bearing a label "reportedly Australian (JWE)" (Figure 7). Paralectotypes: 1 male, 1 female, 1 unknown (abdomen missing) "Java"; 1 unknown (abdomen missing) "New Holland"; (all in MAMU). Known distribution: Indonesia (Morty, Sulu, Gilolo, Ceram, Amboina, Java)

Notes: Walker (1870) gave the distribution as Morty, Sulu, Gilolo and Ceram. Melichar (1902) listed all published locality records and added Amboina and Java. Subsequent authors listed only the Indonesian localities Amboina (Distant 1910, Melichar 1923) and Buru (Schmidt 1926). Walker (1870) described two varieties of *N. pustulata* also from localities in Indonesia.

Of the five specimens of *N. cruentata* (= *C. pustulata*) in the Macleay Museum collection, three paralectotypes bear data labels. These labels were probably attached to the specimens at the time they were remounted and the handwriting matches that of George Masters who was first curator of the Macleay Museum. It is probable that Masters identified the specimens (as *N. cruentata*) using Melichar (1902) which would have been recently available for this use. He may have added "Java" to the identification label as being the distribution of the species rather than the origin of the specimen. The other two labelled specimens are simply labelled "Java", also in George Masters' hand. No other label appears with these paralectotypes.

The other two specimens also lack original data labels. The fourth paralectotype bears a hand-written determination label, in an unknown hand, which reads "*Neomelicharia pustulata* Donovan / New Holland". The lectotype bears a hand-written label which reads "reportedly Australian (JWE)", indicating that this was a note provided by J.W. Evans.

Donovan (1805) illustrated two colour forms of this species, both of which are represented in the Macleay Museum material. The male paralectotype from "Java" matches Donovan's green form and the lectotype matches his other illustration. As with the holotype of *C. planirostris*, all these specimens have been repinned, they lack original data labels and are in a collection known to contain Donovan type material. Two of the specimens also match Donovan's original illustrations and the series all appear to have been available to Donovan when he visited Francillon's collection and are here regarded as Donovan's missing type series.

Medler (1999) designated a male from Java as the neotype for *C. pustulata* but this designation needs to be discarded with the discovery of Donovan's original type material. A lectotype designation is made here in order to provide a reference replacement for Medler's neotype.

Genus *Poeciloflata* Melichar

Poeciloflata Melichar 1901: 235

Type species: *Cicada modesta* Donovan, by original designation.

***Poeciloflata modesta* (Donovan)**

Cicada modesta Donovan 1805: pl. 1

Flata modesta (Donovan), Donovan 1820: 4

Poekilloptera modesta (Donovan), Guérin-Ménéville 1834: 471

Poeciloptera modesta (Donovan), Schaum 1850: 72

Poeciloptera combinata Walker 1858: 110,

synonymised by Stål 1862: 490

Poeciloflata modesta (Donovan), Melichar 1901: 236

Known distribution: Indonesia (Borneo, Celebes, Makian I.), Malaysia (Sabah)

Notes: As with *N. pustulata* a number of authors list Australia (or one of its components) as a locality record for this species although all are probably based on Donovan (1805). Walker's (1858) description of *P. combinata* was based on a specimen from Celebes and his subsequent description of the species (Walker 1870) listed Celebes and Makian as locality records. Material of the species in the Naturhistoriska Riksmuseet in Stockholm, identified by Melichar, are also from Celebes. Froggatt (1907) gave a brief description which appears to have been based on Donovan's (1805) figure of the species without indication of whether or not he had seen Australian specimens, which is unlikely as there are no specimens known from Australia. Melichar (1901, 1923) reviewed the world Flatidae and listed the species only from Celebes and Borneo. No specimen of this species was found in the Macleay Museum in the current investigation.

***Poeciloflata viridana* (Donovan)**

Cicada viridana Donovan 1805: pl. 1

Flata viridana (Donovan), Donovan 1820: 4

Poekilloptera viridana (Donovan), Guérin-Ménéville 1834: 471

Poeciloptera viridana (Donovan), Schaum 1850: 72

Poeciloptera helena Walker 1858: 110, synonymised by Stål 1862: 489

Poeciloflata viridana (Donovan), Melichar 1901: 235

Known distribution: Indonesia (Borneo, Celebes)



Figure 1. Reproduction of Donovan's (1805) Hemiptera plate.

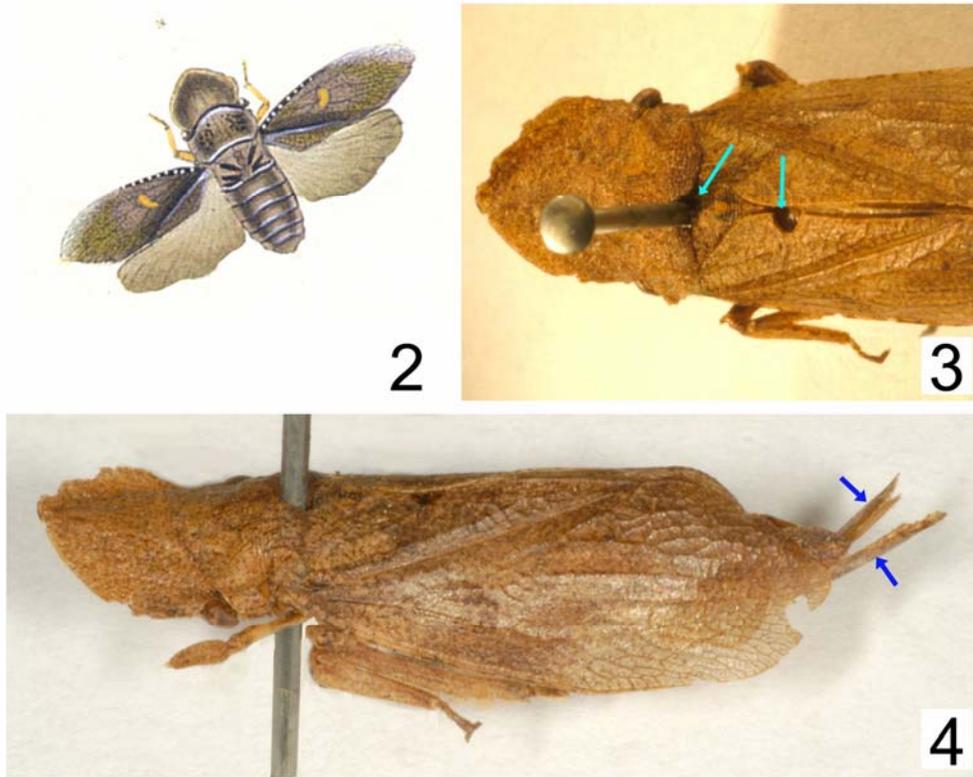


Figure 2. Donovan's (1805) illustration of *F. planirostris*.

Figure 3. Dorsal view of *L. planirostris* holotype showing other pin holes (arrowed) and damage to front of head.

Figure 4. Lateral view of *L. planirostris* holotype showing distorted ovipositor (arrowed).



Figure 5-6. Lectotype and paralectotype of *C. pustulata* as illustrated by Donovan.

Figure 7-8. Lectotype and paralectotype of *C. pustulata*.

Notes: As with *P. modesta* the localities given by authors followed the original reference to the species by Donovan (1805) until 1858 when Walker described his new species *P. helena* from Celebes. As with *P. modesta*, Melichar's (1901, 1923) reviews of the world Flatidae only list *P. helena* from Celebes and Borneo. No specimen of this species was found in the Macleay Museum in the current investigation.

Family Ricaniidae

Genus *Armacia* Stål

Armacia Stål 1862: 70

Type species: *Ricania clara* Stål, by original designation

Notes: *Armacia* is a genus of twelve species distributed primarily through Indonesia to Papua and the Solomon Islands. The most widespread species, *A. hyalinata* (Donovan), is recorded from India (Blanchard 1840), Africa (Walker 1851), the Solomon Islands (Melichar 1898) and Australia (Donovan 1805).

Armacia hyalinata (Donovan)

Cicada hyalinata Donovan 1805: Pl. 1

Ricania hyalinata (Donovan), Guerin-Meneville 1834: 466

Ricania donovanii Spinola 1839, *nom. nov.* for *Cicada hyalinata* Donovan, *invalid nom. nov.*

Armacia hyalinata (Donovan), Melichar 1898: 287

Known distribution: Africa, India, Indonesia (Molucca Islands, Ternate Is., Buru Is.), Papua New Guinea, Solomon Islands, Australia (Dorre Island, WA)

Notes: Melichar (1898) records the species from Dorre Island which is near Shark Bay on the west coast of Western Australia and this indicates that the species may occur on the Australian mainland. Donovan (1805) lists the species from "Botany Bay". Without a more detailed study of the Australian Ricaniidae, the Australian fauna remains largely unknown but the wide distribution of the species, from Africa and India in the west of its range to Papua and the Solomon Islands in the east, as well as the record from Western Australia, does not preclude its natural occurrence in eastern Australia. However, the doubtful provenance of other material from the Francillon collection means that the record from Botany Bay provided by Donovan (1805) cannot be accepted without confirmation through further Australian material of the species from eastern Australia. No specimen of this species was found in the Macleay Museum in the current investigation.

Family Aphrophoridae

Genus *Philagra* Stål

Chalepus Walker 1851: 731, preoccupied by *Chalepus* Thunberg 1805.

Philagra Stål 1863: 593, *gen. nov.*

Type species *C. douglasi* Stål, designated by Metcalf and Horton 1934: 399.

Notes: This genus is primarily Oriental with species in China and India as well as Indonesia and Australia. The Australian fauna includes four described species found primarily on *Casuarina* and *Acacia* (Liang and Fletcher 2003).

Philagra parva (Donovan)

Fulgora parva Donovan 1805: Pl. 1.

Philagra parva (Donovan), Stål 1866: 386.

Distribution: All States of Australia.

Notes: This is the most widespread Australian spittlebug (Family Aphrophoridae) and the spittle masses created by its nymphs are frequently seen on the smaller twigs of Casuarinaceae (sheoak trees). Evans (1966) noted that the location of the type was unknown but the Macleay Museum contains six specimens of this species and the presence of other Donovan (1805) type material in this institution suggests that one of them may be the Donovan type. However, none of the specimens appears to have been repinned and it is not possible to reliably link any of them with Donovan.

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