LIVING WORLD

Journal of The Trinidad and Tobago Field Naturalists' Club

2023

THE TRINIDAD AND TOBAGO FIELD NATURALISTS' CLUB

The Trinidad and Tobago Field Naturalists' Club was founded on 10 July, 1891. Its name was incorporated by an Act of Parliament (Act 17 of 1991). The objects of the Club are to bring together persons interested in the study of natural history, the diffusion of knowledge thereof and the conservation of nature.
Monthly meetings are held at St. Mary's College on the second Thursday of every month except December.
Membership is open to all persons of at least fifteen years of age who subscribe to the objects of the Club.

Mission Statement
To foster education and knowledge of natural history and to encourage and promote activities that lead to the appreciation, preservation and conservation of our natural heritage.

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Editorial

The 2023 Living World is a bumper edition, with six research papers, ten nature notes and the regular Report of the Trinidad and Tobago Bird Status and Distribution Committee (TTBSDC).

We open the issue with Matthew Cock's comprehensive treatments of Trinidad and Tobago's elf moths and wasp moths respectively, the latter is coauthored by Michel Laguerre. These are followed by an update on new moth and butterfly records for Tobago. For this update Matthew teamed up with several TTFNC members and other citizen scientists to incorporate their observations and, importantly, include them in the process of publishing these records, which together add 67 species to Tobago's known list for Lepidoptera which now stands at 683.

We also have contributions on Zoantharia off Trinidad's north coast; author Stanton Belford applied genetic techniques alongside differences in morphological traits to better characterize the zoanthid biodiversity around Toco, confirming previous identifications while also revealing a species not previously known from the area. This represents the first genetics-focused paper published by the journal, and is unlikely to be the last. Using a more traditional yet equally insightful approach, Chris Starr and Ishmael Samad describe some compass-savvy termites from Kernahan along Trinidad's east coast. The final research paper is a biography-style piece celebrating the considerable contributions of the Jamaican Naturalist William Thomas March. Author Olivia Beavers details his life and describes some of the important specimens he collected, which are now held in museum collections across the world.

These research articles are complemented by a nice collection of nature notes. Three document chance observations of predation behaviour, adding to our knowledge of who eats what. Perhaps the most surprising are Matt Kelly's two instances of birds eating birds in Tobago, alongside two predation events by snakes from Shaquille George and Floyd Hayes, respectively. Two more notes document new records - a new orchid reported for Tobago by Matt Kelly, and a new anole lizard recorded for Trinidad by Shaquille George. Shaquille also teams up with Danniella Sherwood to document additional records for a rarely seen tarantula. The remaining three nature notes concern Lepidoptera-based observations: two from John Morrall on butterflies, and one led by Matthew Cock, once again bringing together multiple citizen science observations from iNaturalist to piece together the life history of a common yet little-known moth, *Napata terminalis*; a reminder of how much there is still to learn about the biodiversity seen in our backyards, and that all of us can contribute to shared scientific knowledge.

Finally we present the 2022 report of the TTBSDC, in which Martyn Kenefick reports on 103 records comprising 59 species. As a result of these observations two additional species were recorded for Tobago and two species were added to the official National List of birds, bringing it up to 494 species.

The Editorial Committee was saddened by the passing of Dr Elisha Tikasingh in August 2023. Elisha was the Editor of Living World between 1997 and 2013 and was well known to our regular contributors. In his pre-editor days Elisha lobbied for TTFNC members to write-up and publish their novel observations, and led the way in preparing the 1973 issue which reported on the Club expedition to Bush Bush. It was Elisha who instituted many of the initiatives to establish Living World as a peer reviewed Journal and maintain its function as a major repository of knowledge of the Natural History of T&T. Elisha remained a strong supporter and friend of the journal and the club even after he had officially stepped down as Editor, generously sharing his time and experience; he continued as an active member of the club well beyond his 90th birthday, and was a familiar face at club meetings on zoom during the pandemic, despite worsening health. A wider account of Elisha's work was published in Living World in 2014.

In line with Elisha's vision for the journal, Living World continues to encourage and support both professional biologists and amateur naturalists in publishing their observations. This has been made easier with the rise in popularity of platforms such as e-Bird and iNaturalist which not only offer opportunities for citizens to share their observations, but also allow experts to recognise observations of significance and to involve the observers in subsequent publications, where appropriate. We are grateful to regular

author Matthew Cock for setting an excellent example in this respect.

Alongside encouraging a broad range of authors to contribute, we are increasingly aware of our responsibility to ensure that our authors observe best practice with respect to animals or plants that need to be collected to conduct the studies or observations presented. While most nature notes tend to involve fortuitous observations, in cases where specimens need to be collected to confirm ID or to extract DNA, it is important that the necessary permissions are sought. In Trinidad this can be done via the Wildlife Section of the Forestry Division, and in Tobago via the Division of Food Security, Natural Resources, the Environment and Sustainable Development, at the Tobago House of Assembly. In cases where the national regulations are unclear, we nevertheless expect authors to contact the authorities and let them know of the work being conducted. Similarly, where a specimen is collected, the expected best practice would be for it to be deposited and accessioned within a recognised museum or herbarium collection, and the accession number included in the manuscript.

As always, your friendly editorial team are on hand to answer any queries, and guide prospective authors through the submission and editorial process. We are always happy to hear from anyone who has an idea for a contribution, and we hope this current issue, which is brim full of knowledge and insights from a wide range of authors from school-age naturalists to professional scientists, will inspire others to share their natural history observations through Living World.

A.E. Deacon and G. White

Cover Photograph

Our cover photograph shows a colony of *Zoanthus sociatus*, photographed by Stanton G. Belford at Saline "Salybia" Bay in May 2022. It was found at low tide at less than 0.3 metres depth on a clear day with low turbidity. Belford initially thought that it was *Zoanthus pulchellus* based on the colour, however mitochondrial COI and 16S revealed it to be *Z. sociatus*. This demonstrates the value of molecular analyses for species identification. See page 126 for a full account of this study.

Euchromiina wasp moths (Lepidoptera, Erebidae, Arctiinae, Arctiini) of Trinidad & Tobago

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ABSTRACT

An illustrated and annotated catalogue is presented of 28 genera and 61 species of Euchromiina (Erebidae, Arctiinae, Arctiini) confirmed to occur in Trinidad and seven species in Tobago. Of these, nine are new records for Trinidad. Images of 34 species of living adults are included. Very little has been recorded regarding food plants and early stages of Euchromiina in Trinidad, but what is known is reported. A supplementary appendix includes all records from Trinidad & Tobago, and figures showing details of the body and male genitalia for selected species.

Key words: food plants, distribution, checklist, inventory, new records, DNA barcodes, iNaturalist

INTRODUCTION

Trinidad and Tobago are two small islands off the north-east coast of South America with a combined land area of about 5100 km^2 and maximum elevation slightly below 1000 m. Together with some very small associated islands, they make up the country Trinidad & Tobago. As continental islands, they have a biota that is a subset of that of the nearby South American mainland. The fauna of Trinidad is by far the better known of the two, and Tobago being further from the South American mainland has a biota that is largely a subset of that of Trinidad (Starr 2009, Cock 2021).

We consider the term 'wasp moths' to cover two closely-related subtribes Euchromiina and Ctenuchina of the tribe Arctiini, subfamily Arctiinae, family Erebidae. In the last 20 years, regional lists of Euchromiina and Ctenuchina have started to appear (e.g. Piñas and Manzano 2003, Hernández-Baz and Grados 2004, Hernández-Baz and Bailey 2006, Hernández-Baz *et al.* 2013, Hernández-Baz *et al.* 2017), and it seems likely that these two subfamilies will be useful flagship groups for the assessment and monitoring of biodiversity. Wasp moths are small to medium sized moths (Figs. 1–2), often brightly coloured, and many having transparent areas on the wings. Most (but not all) have a general wasp-like appearance (Figs. 1–2), and may move and fly in a wasp-like way. Many species are thought to be distasteful and they mimic each other as well as stinging wasps, distasteful beetles, etc. Sexual dimorphism is usually, but not always, slight; some cases of strong sexual dimorphism have led to the two sexes being described as separate species, which may only recently have been detected. It is becoming apparent that some species are polymorphic – the different morphs often having been described as separate species. *Phoenicoprocta vacillans* below is a striking example of strong sexual dimorphism, combined with substantial continuous variability in the male and polymorphism in the female (Fleming 1957).

There is no recent catalogue of Euchromiina or Ctenuchina. The most recent comprehensive treatments were Hampson's (1898, 1914) review of the collection in the Natural History Museum, London (NHMUK) and Draudt's (1915–1917) treatment in Seitz' Macrolepidoptera of the World, both more than 100 years ago. In the introductory remarks to the family, Seitz (1915) indicated that more than 2000 species of Syntomidae (i.e. Syntomini, Euchromiina and Ctenuchina) were known, of which 1800 were American, all belonging to the Euchromiina and Ctenuchina. However, documentation and voucher material of these two tribes from Trinidad & Tobago are relatively rich. The subtribe has been documented alongside other Trinidad moths in a preliminary catalogue (Kaye 1901), a catalogue (Kaye and Lamont 1927) and additions (Lamont and Callan 1950), including 12, 39 and 42 Euchromiina respectively. Some of W.J. Kaye's material of Euchromiina was deposited in the NHMUK, but his collection was acquired by the Allyn Museum of Entomology, Sarasota, Florida, which is now integrated into the McGuire Center for Lepidoptera and Biodiversity, Gainesville (MGCL). Sir Norman Lamont's collection is divided between The National Museums of Scotland, Edinburgh (NMS) and the University of the West Indies Zoology Museum, St. Augustine, Trinidad & Tobago (UWIZM). Based on the locality and date information in Kaye and Lamont (1927) compared to actual specimens in these two collections, specimens of Lamont's material collected before 1915 were all collected at Palmiste but incorporated into his collection with no data labels.

In the 1950s, William Beebe and colleagues Henry Fleming and Rosemarie Kenedy worked inter alia on

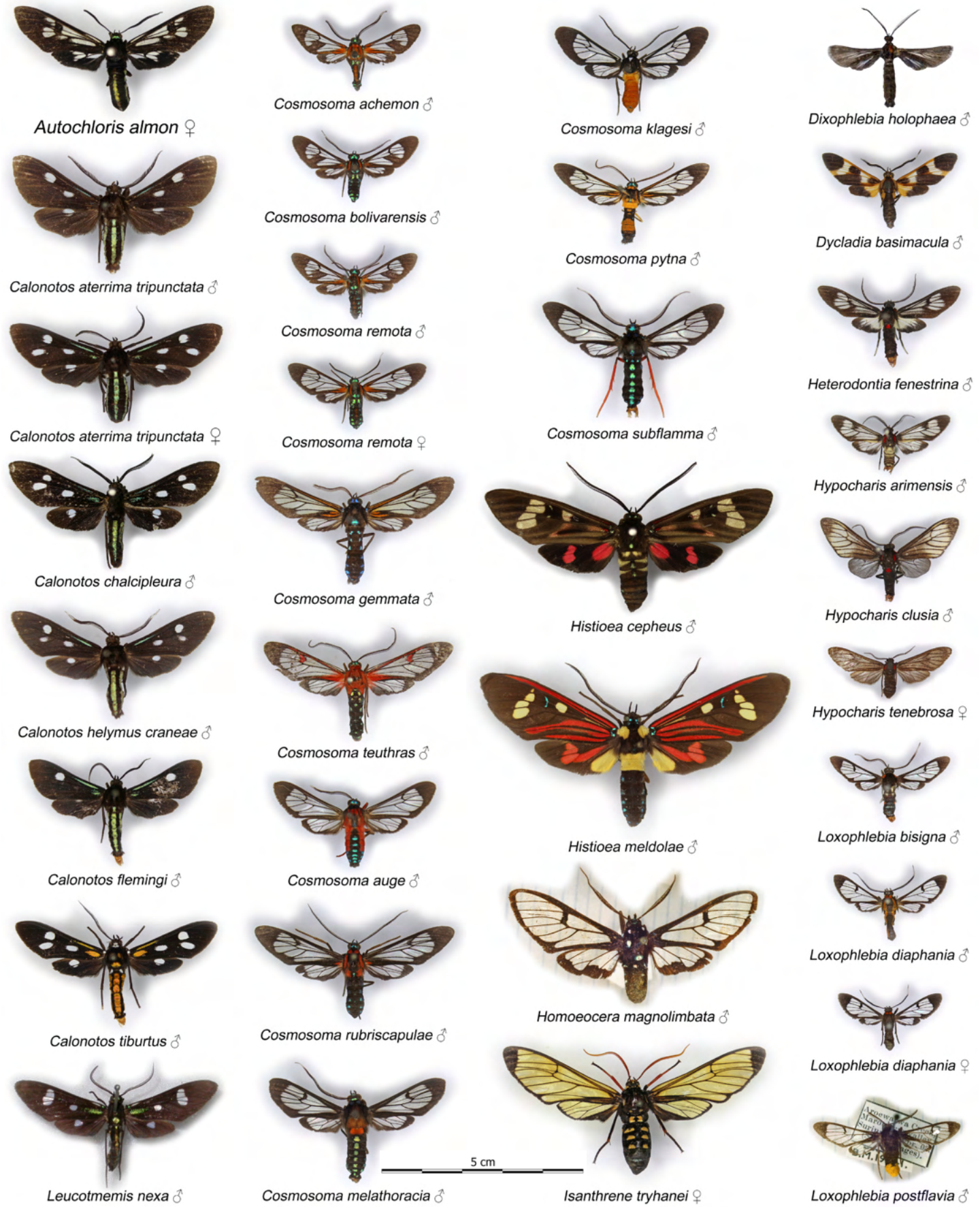

Fig. 1. Trinidad & Tobago Euchromiina 1, genera A–L. Life size; all images appear enlarged in the species accounts below, together with any photo credits. Note *Cosmosoma hypocheilus* (Fig. 27) is not included here.

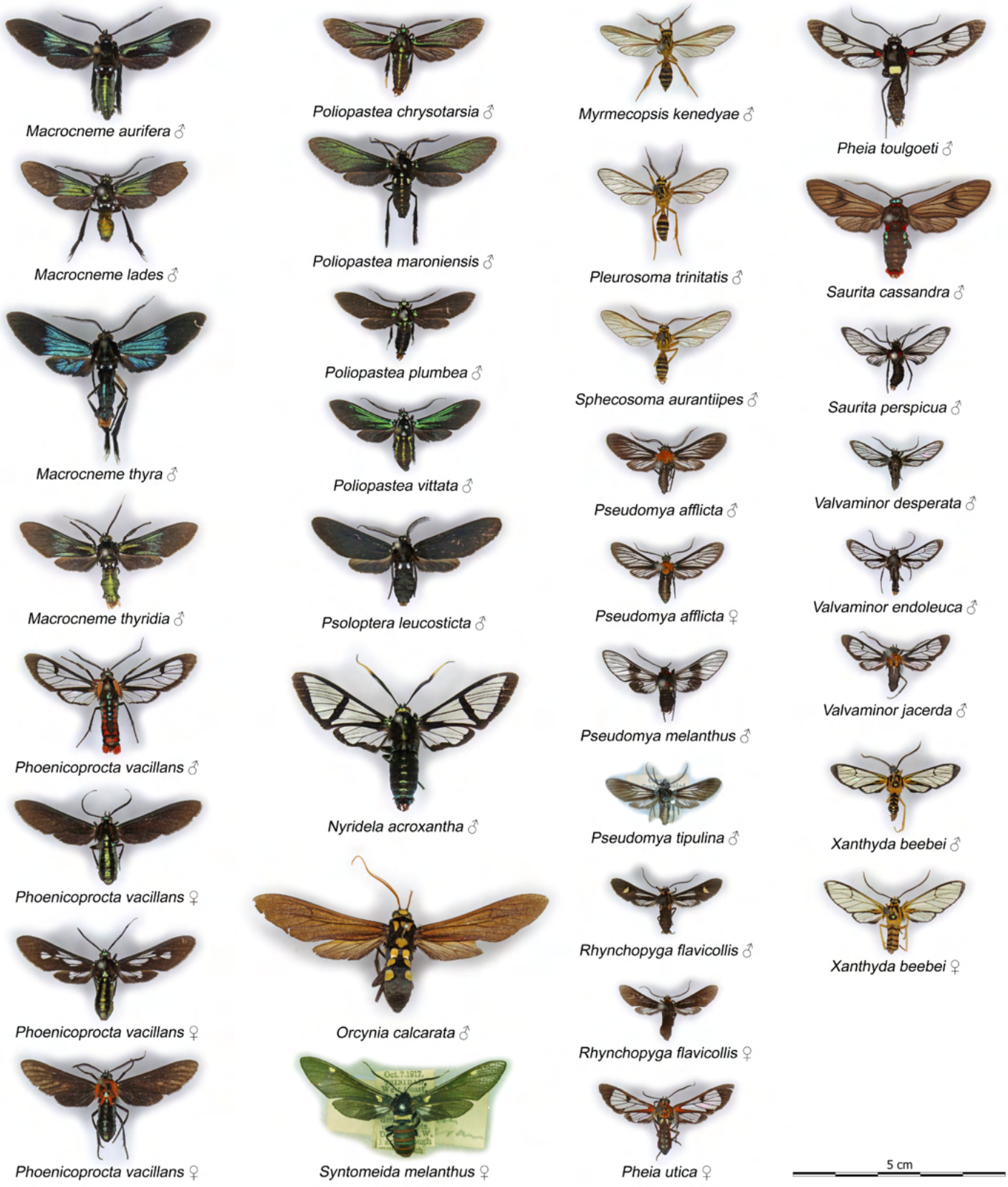

Fig. 2. Trinidad & Tobago Euchromiina 2, genera M–X. Life size; all images appear enlarged in the species accounts below, together with applicable photo credits.

Euchromiina and Ctenuchina at Simla, the tropical field station of the New York Zoological Society (NYZS) in the Arima Valley. Based on this, Fleming (1957, 1959) monographed the two subtribes for Trinidad, which provided a valuable start for our work, and included 52 species of Euchromiina. Fleming (1957, 1959) refers to their material deposited in the Department of Tropical Research, NYZC. Holotypes and some paratypes were deposited in The American Museum of Natural History, New York (AMNH), and some paratypes in NHMUK, but the remainder stayed with NYZC. The NYZS (now Wildlife Conservation Society) collections were subsequently transferred to AMNH, although some duplicates went to the National Museum of Natural History, Washington (USNM) (S. Miller pers. comm.). We have not examined Fleming's material, and in the following refer to Fleming's material from NYZS as in AMNH without allowing for some being in USNM.

This earlier work included several examples of sexually dimorphic or polymorphic species being counted more than once, although Fleming (1957) clarified most of these. Building on this earlier work, we now treat 61 species from Trinidad, and seven from Tobago. Of these, nine are newly recorded from Trinidad. This is based on examination of historical collections (NHMUK, USNM, NMS and UWIZM) and the collection of the first author (MJWC) (Cock 2003), which is divided between his collection (MJWC), UWIZM and NHMUK. At this time, three species of Trinidad Euchromiina are known from single records, and another three from just two records. Given a total of 61 species now known, this suggests that more species are yet to be recorded, although perhaps not a great many more.

Cock (2017) recorded six species of Euchromiina from Tobago, and Cock and Laguerre (2022) add one further species. Remarkably, two of the seven Tobago species, *Cosmosoma gemmata* (Butler, 1876) and *Pheia utica* (Druce, 1889), have not as yet been recorded from Trinidad (29%). In contrast, Cock (2017) noted that 17 out of 355 total moth species (4.7%) recorded from Tobago were species not known from Trinidad. These numbers are now 15 out of 466 (3.2%) (Cock *et al.* 2022, M.J.W. Cock unpublished data). Here we treat the subtribe Euchromiina from Trinidad & Tobago, and will address the Ctenuchina in a follow-on publication.

Classification

In the past, the two subtribes Euchromiina and Ctenuchina have been variously treated as part of the families Syntomidae (now Syntomini a separate and distantly related Old World tribe of Arctiinae), and as Euchromiidae or Ctenuchidae. The present arrangement follows Zahiri *et al.'s* (2011) phylogeny of the Erebidae, and is supported by the recent study by Dowdy *et al.* (2020), who consider Euchromiina and Ctenuchina as valid sister sub-tribes within Arctiini.

Although Hampson (1898) recognized that what we now refer to as Euchromiina and Ctenuchina were separated by their hindwing venation, Forbes (1939) seems to have been the first to separate them as named groups: Euchromiinae and Ctenuchinae, which he treated as subfamilies of Euchromiidae. He states that '*In the Euchromiinae M2 of the hind wing is rudimentary or absent, being represented by a faint vein or line of scales from the angle of the discocellular, and Cu1 and Cu2 are stalked or united; while in the Ctenuchinae M2 is fully developed and curved, arising from below the angle of the discocellulars, and Cu1 and Cu2 are widely separated except in the Horama group. A few aberrant genera also have M2 obsolescent from the angle but Cu2 well separated.*' Fleming (1957, 1959) treated the two subtribes as subfamilies, Euchromiinae and Ctenuchinae, of Ctenuchidae, stating '*The absence of vein Sc in the hindwing separates the Euchromiinae from other families of Trinidad moths. In this subfamily vein M2 of the hindwing is rudimentary or absent but often represented by a vein·like line of scales. Whereas in the subsequent subfamily, Ctenuchinae, vein M2 of the hindwing is present. Veins CUl and CU2 are stalked or united in the Euchromiinae, but in the Ctenuchinae. with the exception of the Horama and related genera, they are widely separated.*' (Fleming 1957).

Within the Trinidad fauna, the two subfamilies are confusingly similar. Some distinctive genera and habitus types (external appearance) are restricted to one or other, but others are not so easily allocated on sight. *Calonotos*, *Cosmosoma*, *Histioea*, and the polybiine wasp mimics are examples of distinctive Euchromiina genera, and *Agyrta*, *Aclytia*, *Episcepsis*, and *Eucereon* are examples of distinctive Ctenuchina genera. Other forms such as genera with transparent wing areas, species with all metallic or black wings, and yellow banded lycid beetle mimics occur in both subtribes. In practice, familiarity with both subtribes obviates the need to classify them by subtribe before identification to genus or species. Where it would be easy to confuse a Euchromiina species with a superficially similar Ctenuchina species, we have included diagnostic features to separate them.

Biology and collecting

Adult Euchromiina may fly by day or night, or both. Those that are in mimicry groups with wasps and other diurnal species, may be predominantly day-flying. Euchromiina have a functioning proboscis, and several species have been observed feeding at flowers such as eupatorium (*Chromolaena odorata* and *Austroeupatorium inulaefolium*)

and black sage (*Varronia curassavica*) by day. Adults probably also feed at flowers by night, but this has not been documented.

Many Euchromiina, along with many Ctenuchina, some Phaegopterini and Pericopini (Arctiinae) and the butterfly tribes Danaini and Ithomiini (Nymphalidae, Danainae) are attracted by pyrrolizidine alkaloids (PAs), which they imbibe and sequester for use as a chemical defence against predation and as precursors for synthesis of mating pheromones (Pliske 1975, Nishida 2002). Pyrrolizidine alkaloids are found in a wide variety of plants, including *Heliotropium* and some other Boraginaceae, Eupatoriae (Asteraceae), and several other families. Beebe (1955) described how *Heliotropium indicum* L. (Boraginaceae) can be hung up to dry and over ten days or so would attract these groups of butterflies and moths (e.g. Fig. 93). MJWC used this method widely in Trinidad to collect Euchromiina and Ctenuchina. Those species which fly by night are readily attracted to lights, particularly those with a strong ultra violet component which can be used for collecting (MVL – mercury vapour light and BLT – black light trap).

Beebe and Kenedy (1957) reported their behavioural observations on 13 species of 'Ctenuchidae' of which five are Euchromiina and eight Ctenuchina. Almost nothing has been recorded regarding the life histories and food plants of the Trinidad & Tobago species, and little elsewhere, so that the only substantive information source is the Janzen and Hallwachs (2022) database of Costa Rican rearing.

Effectively almost all collecting of Euchromiina (and Ctenuchina) in Trinidad has been based on one of these three attractants: light (especially UV light), PAs (particularly as drying *Heliotropium indicum*, referred to as heliotrope hereafter in the text) and flowers (particularly eupatorium and black sage). Any species that is not attracted to one of these three is likely to have been rarely collected; the large day-flying wasp mimic *Isanthrene tryhanei* may be such a case. The practice of night walks (Deo *et al*. 2021) is starting to generate records of Euchromiina, and it will be interesting to see if this leads to observations of newly recorded or rarely seen species.

Nomenclature

Noting that there is no recent catalogue of Euchromiina or Ctenuchina, for nomenclature we have depended on Cerda's (2008) work on the Euchromiina of French Guiana and LepIndex, the on-line database of the old NHMUK card index (Beccaloni *et al.* 2003). The later must be used with caution as on the one hand it is now out of date, and on the other it includes many unpublished new combinations used by the curators of the collection. Accordingly, we have made every effort not to use unpublished new combinations by checking back to Hampson (1898, 1914) and reviewing subsequent literature, e.g. Fleming (1957), to locate where name changes have been made.

Identification

When working with pinned specimens in good condition, almost all of the Trinidad species can be identified by careful examination and comparison with the images provided here, although some, in particular *Macrocneme* spp., may still require examination of the genitalia or DNA barcoding. Figs. 1–2 show all species life size for initial identification, but this should be followed up by comparison with the enlarged images under each species account. Diagnostic features are pointed out in the text which should help separate similar species. Many naturalists are now taking photographs rather than specimens in support of their observations. With experience, images of living moths can also be readily identified, and we have included such images as available to facilitate this. In the case of Euchromiina, the best diagnostic features are often on the dorsal surface of the forewing, but characters of the hindwing, body and legs are also often helpful. For some species, multiple views of the body and legs are included in a supplementary Appendix.

The terminalia comprise the genitalia and associated sternite and tergite of abdominal segment 8 (A8). They require dissection to see the full structure, but sometimes diagnostic features, particularly the apex of the valves can be examined by carefully brushing off the scales of the ventral abdomen tip. The male and female genitalia structures often provide good diagnostic features to distinguish species that otherwise have a similar external appearance (habitus). We include figures of 17 Euchromiina dissections in a supplementary Appendix, which demonstrate characters used to help define species treated. Ideally, such figures would have been compared with those of type specimens, but most Euchromiina types have not been dissected and for those that have, few good figures are currently available.

There is not a great deal of individual variation in most species of Euchromiina found in Trinidad, but examples have been illustrated in a few cases, e.g. *Autochloris almon* (Figs. 3–4), while a small number are polymorphic, e.g. *Phoenicoprocta vacillans* (Figs. 101–102). Sexual dimorphism may be restricted to the female being slightly larger, with less strongly pectinated antennae, but can be marked or extreme, e.g. *P. vacillans*.

DNA barcoding based on sequences of a defined section of the CO1 mitochondrial gene (Hebert *et al.* 2003) provides a tool that can be used to help clarify the status of different populations of taxa in the future, based on the increasing numbers of publicly available DNA barcodes in BOLD (Barcode of Life Database, http://www.boldsystems.org/) and GenBank (http://www.ncbi.nlm.nih.gov/genbank). Barcode Index Numbers (BINs) have been introduced

to provide a permanent numbering system for barcode clusters normally separated from others by at least 2% base pairs substituted, which in a high percentage of cases correspond to known taxonomic species and can also help flag species complexes or clusters needing taxonomic research (Ratnasingham and Hebert 2013, Miller *et al.* 2016). MJWC checked all Trinidad genera of Euchromiina against BOLD in January 2020 and constructed BOLD TaxonID Trees using public DNA barcodes in BOLD and the standard BOLD function for the genera thus far recognized from Trinidad. In most cases, there were very few DNA barcodes from South America, but often a large sample from Costa Rica based on the work of Dan Janzen and Winnie Hallwachs' inventory programme (Janzen and Hallwachs 2022). It was quite common to find that one phenotypic species in Costa Rica comprised more than one BIN in BOLD, and when DNA barcodes were available from South America, they did not necessarily match those from Costa Rica and appeared as different BINs. This is an indication of changes that are coming to our understanding of the Neotropical moths and the names which should be applied. However, a significant number of the Euchromiina recorded from Trinidad were described from the island, and others were described from the Guianas or Venezuela, both of which have a high affinity with the Trinidad Lepidoptera fauna (e.g. Cock and Robbins 2016), and so these names are likely to be reliable for Trinidad. On the other hand, many Euchromiina recorded from Trinidad, but described from further south, e.g. southern Brazil or from Central America could well prove to be part of a species complex, for which the current name will not be applied to the Trinidad population in the future. The BOLD database does not have adequate coverage yet to resolve these questions, so there would be value to building up a library of DNA barcodes for the Trinidad & Tobago fauna, which in due course can help solve some of these questions, resolve which species do occur in Trinidad & Tobago, and as the technology becomes more accessible, facilitate rapid identification. For the taxa that have been described from Trinidad, characterisation by their DNA barcodes will be an important contribution, to stabilise and define the use of these names. The following 23 taxa of Euchromiina have been described from Trinidad [with their current status]:

- *Antichloris trinitatis* Rothschild, 1912 [synonym of *Phoenicoprocta vacillans* (Walker, 1856)]
- *Calonotos craneae* Fleming, 1957 [valid subspecies *Calonotos helymus* (Cramer, 1775)
- *Calonotos flemingi* Cock and Laguerre, 2022 [valid species]
- *Calonotos tiburtus* form *trinidadensis* Strand, 1915 [synonym of *Calonotos aterrima* (Sepp, 1847) ssp. *tripunctata* Druce, 1898]
- *Calonotos tripunctata* Druce, 1898 [valid subspecies of *Calonotos aterrima* (Sepp, 1847)]
- *Cosmosoma klagesi* Rothschild, 1910 [valid species]
- *Cosmosoma melathoracia* Kaye, 1901 [valid species]
- *Cosmosoma pytna* Druce, 1906 [valid species]
- *Cosmosoma rubriscapulae* Kaye, 1901 [valid species]
- *Histiaea* [sic] *meldolae* Butler, 1876 [valid species]
- *Isanthrene tryhanei* Rothschild, 1911 [valid species]
- *Macrocneme nigritarsia* ab. *trinitatensis* Strand, 1917 [synonym of *Poliopastea vittata* (Walker, 1854)]
- *Macrocneme spinivalva* Fleming, 1957 [synonym of *Macrocneme aurifera* Hampson, 1914]
- *Macrocneme thyra intacta* Draudt, 1915 [synonym of *Macrocneme thyra* Möschler, 1883]
- *Mydropastea disparata* Kaye, 1920 [synonym of *Phoenicoprocta vacillans*]
- *Pheia beebei* Fleming, 1957 [valid species, now placed in *Xanthyda*]
- *Phoenicoprocta trinitatis* Strand, 1915 [synonym of *Phoenicoprocta vacillans*]
- *Phoenicoprocta vacillans ab. nigropeltata* Strand, 1915 [synonym of *Phoenicoprocta vacillans*]
- *Pseudosphex kenedyae* Fleming, 1957 [valid species, now placed in *Myrmecopsis*]
- *Saurita arimensis* Fleming, 1957 [valid species, now placed in *Hypocharis*]
- *Saurita perspicua* Schaus, 1905 [valid species temporarily retained in *Saurita*]
- *Sphecosoma trinitatis* Rothschild, 1911 [valid species now placed in *Pleurosoma*]
- *Valvaminor jacerda* Cock and Laguerre, 2022 [valid species]

Layout of species entries

In the treatment that follows, genera and species are presented in alphabetical order. This inevitably means that closely related genera may be widely separated, and this is partially addressed in the combined plates (Figs. 1–2), where similar genera and species are placed together to some extent. As for Cock's (2021) recent treatment of Trinidad & Tobago Notodontidae, under each species, the presentation follows a standardised sequence:

The **currently accepted name** for that species, and subspecies where used. The author and year of publication for each name are included, in parentheses where the species or subspecies were originally described in a different genus. This is followed by references to the figures illustrating the species in this paper, and where known, the BIN in BOLD. Immediately below this is the original description(s), preceded by '**OD**:'; author and year of publication for the species is repeated, followed by the original combination, and the type locality (TL). The original publications of

descriptions are not included in the references unless they are specifically referred to in the text; if needed, this information is available in Beccaloni *et al.* (2003). Below this, and preceded by '**TT**:', are entries for this and any other names or combinations for this species that have appeared in the literature and refer explicitly to its presence in Trinidad or Tobago, i.e. these do not include generalised statements, e.g. that a particular species occurs throughout the Caribbean, or throughout the Neotropical Region. We have listed taxonomic papers where Trinidad or Tobago are included in the material examined section; doubtless we have missed some of these but should have located and referred to all those papers dealing with Trinidad or Tobago specifically.

Historical notes. The key published records are presented, and in many cases, the location of specimens referred to in the original publications has been established, to confirm these early identifications. We also explain the basis of our identification and use of the name. In preparing this account, we have checked all species in the NHMUK collection, although MJWC did much of this last century and the curation has been further developed since then. We have also examined the main collection and type collection in USNM. In some cases, MJWC has dissected the male terminalia of specimens in MJWC to compare with Cerda (2008) and unpublished images of ML's dissections from French Guiana and elsewhere.

Taxonomic issues. Here, concerns regarding the identity of the species in Trinidad & Tobago are outlined, particularly where examination of DNA barcodes in BOLD (http://www.boldsystems.org/) suggests greater diversity than is evident in the described species, or recent work has revealed some of this complexity.

Identification. Notes and pointers are provided to facilitate the identification of each species in Trinidad (or Tobago), paying particular attention to the features visible in images of live moths in the resting position. These diagnostic features are not intended to be used for the richer continental fauna of South America, where in many cases they will not be adequate. Comments on polymorphism, variation, and sexual dimorphism are included here.

Biology in Trinidad. In this section, comments and illustrations regarding the life history and adult habits are restricted to observations from Trinidad & Tobago (unless specifically stated otherwise). Where nothing is known from Trinidad & Tobago, this section is omitted.

Status in Trinidad. This is a brief statement regarding the frequency with which each species has been encountered, where, and in what habitats, broadly categorized as forested or suburban.

Figures. The pinned specimens shown in the plates are shown life-size in Figs. 1–2, and enlarged to a standard column width elsewhere; the specimens were collected by MJWC and are held in his collection except where otherwise stated. Whenever possible a male and female in dorsal view and ventral view are shown, and additional specimens may be included to indicate morphs and variation. © in the figure legend refers to the photographer unless indicated otherwise.

Supplementary Appendix. The appendix, available at https://ttfnc.org/livingworld/index.php/lwj/article/view/cock_laguerre2023/appendix, includes a listing of all records compiled from the sources listed below, following a standard format: locality, means of capture, sex of specimen if known (a '?' indicates uncertainty, e.g. in a photograph, or the sex was not noted at the time of examination), date of capture, (collector/photographer), [collection holding the specimen (if any), and any comments regarding curation or identification from the time MJWC examined the collection]. 'MVL' is used to indicate captures made using a mercury vapour light and 'BLT' for black light trap – both having a strong ultra-violet component to attract the adults by night, whereas 'at light' normally refers to other lights, e.g. domestic lighting.

This includes a listing of all material from Trinidad & Tobago reported by Fleming (1957) or examined by one of the authors. In preparing this work, we consulted the following collections, either in person or from images shared by their staff (see acknowledgements):

MGCL	McGuire Center for Lepidoptera & Biodiversity, Gainesville FL, USA;
MJWC	the private research collection of M.J.W. Cock, UK (records from all specimens and unpublished notes compiled and collated);
MNB	Museum für Naturkunde Berlin, Germany;
NHMUK	Natural History Museum, London, UK, which contains much historical material collected by F. Birch, S.M. Klages, W.J. Kaye, and others (the main sequence was checked and records included, but accessions were not reviewed systematically);
NMS	National Museum of Scotland, Edinburgh, UK, which includes part of the collections of Sir Norman Lamont and D.J. Stradling (records from both compiled and collated);
OUMNH	Oxford University Museum of Natural History, which includes material collected by R.M. Farmborough, F. W. Jackson and others (records from many, but perhaps not all, specimens from both the main sequence and accessions compiled and collated);
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
USNM	National Museum of Natural History (formerly

United States National Museum), Washington DC, USA (type material examined, but only selected species in the main collection);

UWIZM University of the West Indies Zoology Museum, St. Augustine, Trinidad & Tobago, which includes part of the collections of Sir Norman Lamont and D.J. Stradling as well as the former CABI collection containing material collected by the author, F.D. Bennett, R.E. Cruttwell (now McFadyen), R. Brown and T. Cassie, M. Morais, and others (records from all specimens compiled and collated).

While MJWC was resident in Trinidad, he sent a large number of specimens to the NHMUK for identification by CABI and NHMUK staff and retention in the NHMUK collection. For each morphospecies sent, a duplicate specimen was retained, and these pairs of duplicates were numbered sequentially TL-001, TL-002, etc. Hence for each TL- number there will normally be one duplicate in NHMUK (many are held in the accessions) and the other in either MJWC or UWIZM; these specimens are indicated by the TL- number which is given together with the holding collection in square brackets. MJWC recorded the locality and date of capture of specimens sent to NHMUK, but not the sex. Hence, in compiling this data here, he has often not located his specimens in NHMUK, and so many are listed with '?' for the sex. In the case of Euchromiina, identifications were made at NHMUK by Alan Watson. We have revisited all these early identifications, and with the benefit of having examined types in the USNM have often improved on them; accordingly, we do not discuss Watson's early identifications in our treatment. MJWC has also examined and included images of live material from various contacts (see Appendix listings and acknowledgements) as well as reviewing the records on iNaturalist (https://www.inaturalist.org/).

EUCHROMIINA OF TRINIDAD & TOBAGO: SYSTEMATIC ACCOUNT

Abrochia Herrich-Schäffer, 1855 (see *Pseudosphex* Hübner, 1818) (Ctenuchina)

AUTOCHLORIS HÜBNER, [1819]

Type species: *Sphinx almon* Cramer, 1779, TL Suriname.

***Autochloris almon* (Cramer, 1779)**

Figs. 3–4. BIN BOLD:ACV3136

OD: Cramer 1779: *Sphinx Adscites almon*, TL Suriname.

Fig. 3. Male *Autochloris almon*. **Above**, Inniss Field, eupatorium flowers, in copulo, 2.x.1994; 37 mm. **Below**, Parrylands, eupatorium flowers, 29.ix.2019 (J. Morrall); 39 mm.

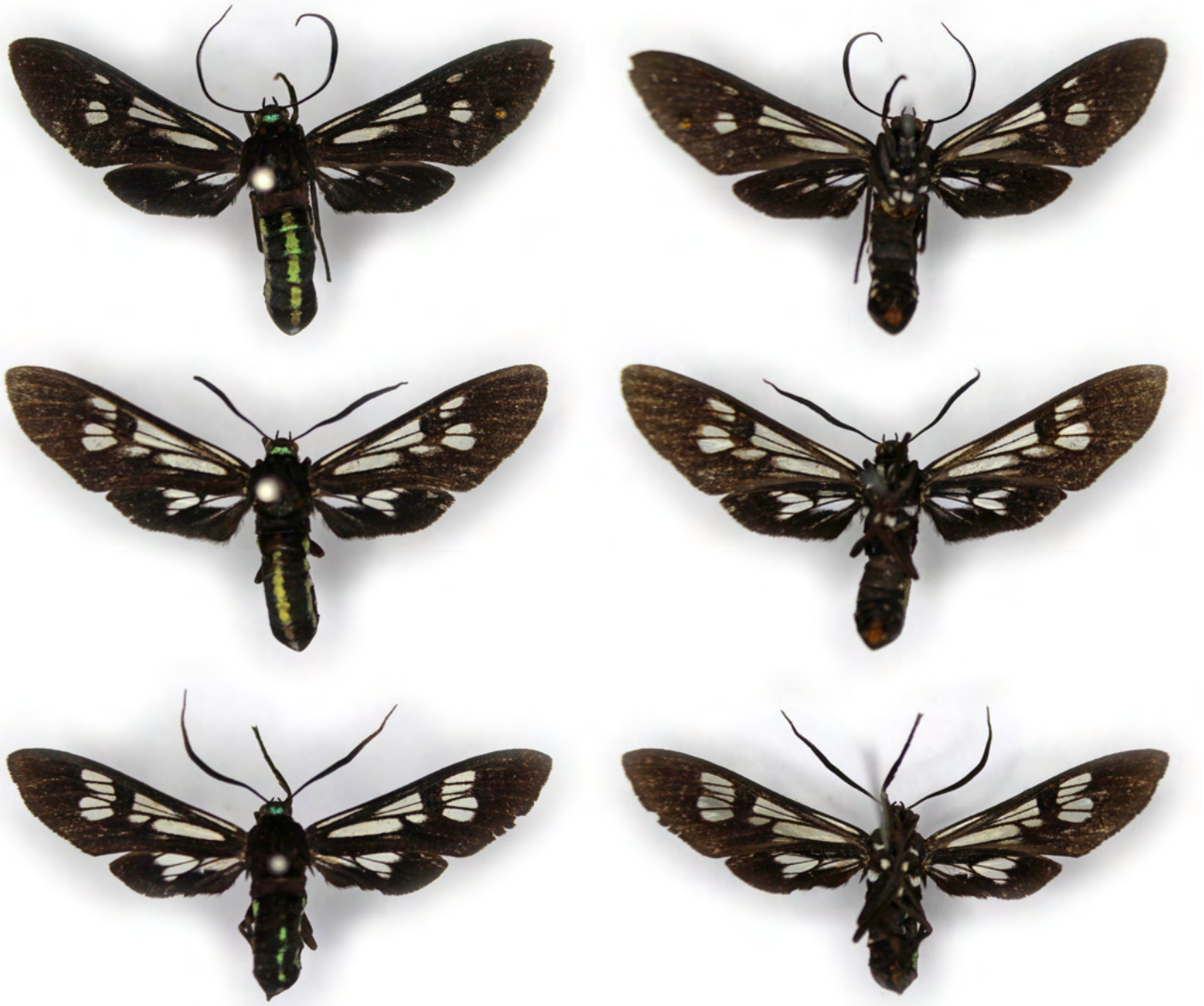

Fig. 4. Female *Autochloris almon*. **Above**, Cat's Hill, eupatorium flowers, 24.ix.2017 (John Morrall); 39 mm. **Middle**, Cat's Hill, eupatorium flowers, 24.ix.2017 (John Morrall); 39 mm. **Below**, Inniss Field, eupatorium flowers, in copulo 2.x.1994; 38 mm.

Historical notes. This species has not previously been recorded from Trinidad. Identified by comparison with the NHMUK series, most of which have extensive hyaline markings (Figs. 3–4), as does Cramer's (1777–1782, pl. 224F) image.

Taxonomic issues. Given that this species was described from Suriname, the use of this name should be correct. In NMS, there is a male of this species labelled as a cotype of *Mydropastea disparata* Kaye, 1920 (see under *Phoenicoprocta vacillans* below). DNA barcodes of Trinidad material form part of BIN BOLD:ACV3136 which includes material identified as *A. cincta* Schaus, 1905 (TL French Guiana) and *A. completa* Walker, 1854 (TL Brazil, Pará). It seems this may be a polymorphic species on the mainland, but *C. almon* should be the oldest name.

Identification. The black wings with transparent hyaline spots (Figs. 3–4) are quite distinctive in Trinidad, and might only be confused with the female *chrysonota* morph of *P. vacillans*. However, in that species the dorsal green line of the abdomen extends onto the posterior part of the thorax, whereas in *A. almon* it stops on abdominal segment 2. This species is variable in the extent of the transparent hyaline areas of both wings (Figs. 3–4). The antennae of males have longer pectinations, but otherwise the sexes are similar.

Biology in Trinidad. Adults fly by day, but have not been recorded attracted to heliotrope. Almost all records are of adults attracted to flowers of *Austroeupatorium inulaefolium*; both males and females are attracted, and one mating pair has been taken on these flowers.

Status in Trinidad. An uncommon species, thus far only

recorded from the south of the island.

***CALONOTOS* HÜBNER, [1819]**

Type species: *Sphinx phlegmon* Cramer, 1775, TL Surname. Incorrectly spelt as *Calonotus* in much of the literature (Watson *et al*. 1980), including that for Trinidad. The Trinidad *Calonotos* fauna includes five species with black wings and solid white spots on both wings, a feature only shared by *Leucotmemis nexa* in the Trinidad fauna. The latter species is readily separated by the post-medial white marking being a bar rather than a spot, and having four dark veins crossing it. *Calonotos tiburtus* has orange stripes on the abdomen rather than metallic green stripes of the other four species. *Calonotos flemingi* has no sub-medial white spot on the forewing, and typically just a white post medial spot. The male of *C. aterrima tripunctata* normally has just one post-medial white spot, while the female, *C. chalcipleura* and *C. helymus craneae* have two. In *C. aterrima tripunctata* and *C. flemingi* the dorsal green line on the abdomen extends across abdominal segment 1, but not in *C. chalcipleura* and *C. helymus craneae*. In *C. aterrima tripunctata* and *C. helymus craneae* there is a green streak on the basal costa, but in *C. chalcipleura* and *C. flemingi* there is a second basal green streak.

***Calonotos aterrima* (Sepp, 1847) ssp. *tripunctata* Druce, 1898**

Figs. 5–7. BIN: BOLD:AAK1644.

OD: Sepp 1847 (in Sepp 1843–1847): *Glaucopis aterrima*, TL Suriname.
Druce 1898: *Calonotos tripunctata*, TL Trinidad.

TT: *Calonotos tripunctata* Druce: Druce (1898), Kaye (1901), Kaye and Lamont (1927), Fleming (1957)
Calonotos tripunctatus [sic] Druce: Zerny (1912), Draudt (1915–1917), Fleming (1950)
Calonotos tiburtus trinidadensis Strand: Strand (1915) TL, Strand (1927), Fleming (1957) [synonym]
Calonotos tiburtus trinitatis [sic] Strand: Draudt (1915–1917) [synonym]
Calonotos aterrima tripunctata Druce: Cock and Laguerre (2022)

Historical notes. Sepp (1843–1848, pl. 97) illustrated the biology and adults when describing *C. aterrima*; the adult has a plain black forewing. As also reported below for *C. helymus*, the Trinidad population differs from those of the Guianas in that it has white spots on the forewing. Druce (1898) described *C. tripunctata* from Trinidad,

Fig. 5. Male *Calonotos aterrima tripunctata*, Cumaca Road, 4.6 miles, MVL, 21.x.1982; 40 mm.

Fig. 6. Female *Calonotos aterrima tripunctata*, Curepe, at light, 24.vi.1978; 42 mm.

Fig. 7. Male *Calonotos aterrima tripunctata*, St. Augustine, UWI, 11.ii.2021, nandani_bridglal (iNaturalist observation 69700815); ©, with permission.

based on a male with two white forewing spots (♂ type, NHMUK). This record was repeated in Kaye (1901). Kaye and Lamont (1927) listed four specimens from Palmiste 31.v.1917, 25.v.1917, 4.iv.1921, 30.iv.1921 (N. Lamont). The second of these is a correctly identified female now in NMS. The fourth is a male *C. helymus*, also in NMS, but the other two specimens have not been located. There are five other specimens in Lamont's collection in UWIZM as *C. tripunctata*, but they are a male *C. aterrima tripunctata* and four female *C. helymus craneae*. Clearly early collectors treated the two species as one.

Strand (1915) described form *trinidadensis* of *C. tiburtus* from Caparo, Trinidad. Cock and Laguerre (2022) examined images of the type series and found it comprised a female *C. aterrima tripunctata*, and a male and female *C. helymus craneae*. They designated the female *C. aterrima tripunctata* as lectotype, and hence *C. tiburtus trinidadensis* is a synonym of *C. aterrima tripunctata.*

Fleming (1957) recorded seven males and 14 females from Simla. MJWC initially identified this species as *C. tripunctata* by comparison with the type (NHMUK, ♂ with two forewing spots, Trinidad); at that time (1980s), the NHMUK series of *C. tripunctata* was a mixture of what MJWC considered *C. tripunctata* and *C. craneae*.

Taxonomic issues. Kaye and Lamont (1927) stated that *C. tripunctata* and *C. chalcipleura* 'merge into one another and they are clearly one species'. Fleming (1957), in contrast considered that *C. chalcipleura* 'appears to be a valid species', although he does not formally change its status. Specimens from the Kaye collection in MGCL and the Lamont collection in NMS are a mixture of *C. helymus craneae* and *C. aterrima tripunctata*.

DNA barcodes of two Trinidad specimens show that the Trinidad population is in fact the species treated as *C. aterrima* in French Guiana (BOLD:AAK1644), and we found that the male genitalia are also the same. However, the French Guiana population has the forewing plain black, whereas it always has white spots in Trinidad, and accordingly, Cock and Laguerre (2022) treated *C. tripunctata* as a subspecies of *C. aterrima*.

Identification. Separation from *C. helymus* is discussed under that species; see also under *Calonotos* above. The antennae of males are noticeably more strongly bipectinate than those of females. In the material examined, males have two white forewing spots, whereas females have three.

Biology in Trinidad. The early stages have not been reported from Trinidad. Sepp (1843–1847, pl. 97) illustrated the biology of what appears to be this species on 'caféyer' (i.e. caféier, the coffee tree, *Coffea* sp. Rubiaceae).

Status in Trinidad. A common and widespread species, more prevalent in lowland areas.

Calonotos chalcipleura Hampson, 1898

Figs. 8–9, Appendix Figs. 1, 25. BIN BOLD:AAG6310.

OD: Hampson 1898: *Calonotos chalcipleura*, TL Venezuela, Aroa

Historical notes. This species has not previously been recorded from Trinidad, although it may easily have been overlooked.

Taxonomic issues. Kaye and Lamont (1927) stated that

Fig. 8. Male *Calonotos chalcipleura*, Morne Bleu Ridge, Textel Road, ix.2021, S. Alston-Smith; 42 mm.

Fig. 9. Male *Calonotos chalcipleura*, Inniss Field, by night, 21.v.2022, R. Deo (iNaturalist observation 118264188); ©, with permission.

C. tripunctata and *C. chalcipleura* 'merge into one another and they are clearly one species'. Zerny (1931a, 1931b) probably overlooked Kaye and Lamont's (1927) statement when he maintained *C. chalcipleura* as a valid species. Fleming (1957) specifically stated that *C. chalcipleura* 'appears to be a valid species'. A Trinidad specimen was DNA barcoded and forms part of BIN BOLD:AAG6310, together with specimens from Colombia (2) and Peru (14).

Identification. This species could be mistaken for *C. helymus craneae*, as the diagnostic markings on the anterior abdomen are similar. However, *C. chalcipleura* has a green patch in space 1 (Cu_2–2A) at the base of the wing, which is not present in C. *helymus craneae*, and the white spot on the hindwing is present across two spaces, divided by the black nerve (like *C. aterrima tripunctata*), and not just in the upper space, and the ventral abdomen has a weak, partial white line rather than a solid one. The female resembles the male, but the antennae are not as broadly pectinate.

Biology in Trinidad. One Trinidad capture was at flowers and another was seen on a night walk. It is not clear from the specimen data that any have been caught at light in Trinidad.

Status in Trinidad. Several records from the Northern Range and around Port of Spain, as well as one in lowland forest of south Trinidad.

Calonotos flemingi Cock and Laguerre, 2022

Figs. 10–11. For figures of the details of body and male genitalia, see Cock and Laguerre (2022).

OD: Cock and Laguerre 2022: *Calonotos flemingi*, TL Trinidad.

TT: *Calonotos flemingi* Cock and Laguerre: Cock and Laguerre (2022) TL

Historical notes. This is a species recently described from Trinidad (Cock and Laguerre 2022). Although W.J. Kaye probably saw one or more specimens in OUMNH, he did not separate them from other Trinidad *Calonotos* species.

Identification. This seems to be the only Trinidad species of the genus consistently with a single white spot on the dorsal forewing. Heavily marked females may have traces of small extra spots in spaces 2 and 3 (Cu_1-Cu_2 and M_3-Cu_1)

Fig. 10. Female *Calonotos flemingi*. **Above**, Trinidad, iv-v.1902 (E. Bourke) [OUMNH]. **Below**, Fondes Amandes, 200 ft., 19.iii.1922 (F.W. Jackson) [OUMNH]

Fig. 11. Male *Calonotos flemingi*, Curepe, MVL, 15-22.iv.1982; 34 mm.

(Fig. 11 below), but the pair of small spots in outer space 3 (M_3-Cu_1) is not seen in any other Trinidad species.

Status in Trinidad. An uncommon species from lowland areas.

***Calonotos helymus* (Cramer, 1775) ssp. *craneae* Fleming, 1957**

Figs. 12–15. BIN: BOLD:AAK1636.

OD: Cramer 1775: *Sphinx Adscita helymus*, TL Suriname. Fleming 1957: *Calonotos craneae*, TL Trinidad.

TT: *Calonotos craneae* Fleming: Fleming (1957), Beebe and Kenedy (1957), Blest (1964), Cock (2003) *Calonotos helymus craneae* Fleming: Cock and Laguerre (2022)

Historical notes. Cramer (1775–1782) described this species from Suriname, illustrating dorsal and ventral views. This form with plain black forewings has not been seen from Trinidad, where all material has three, or sometimes two, white forewing spots.

Kaye and Lamont (1927) recorded *C. helymus* from Trinidad on the basis of an undated Lamont specimen from Palmiste; this specimen is in NMS, and is a female of *Phoenicoprocta vacillans* (Walker, 1856) form *trinitatis* Strand, with plain dark forewings (and is treated under that species).

Fleming (1957) described *C. craneae* from Trinidad, based on a type series of 30 males and 24 females. MJWC identified Trinidad material as this species by comparison with the paratypes (♂, ♀ Trinidad) in NHMUK, and from Fleming (1957). An image of the holotype is available on-line (AMNH 2022).

Taxonomic issues. Although the plain black forewing form is not found in Trinidad, and the white spotted form is not found in French Guiana, DNA barcodes and the male genitalia of Trinidad material show that *C. craneae* is the same as *C. helymus* as found in French Guiana (Cerda 2008). Accordingly, Cock and Laguerre (2022) placed *C. craneae* as a subspecies of *C. helymus*.

Identification. In Trinidad, *C. helymus craneae*, *C. chalcipleura* and *C. aterrima tripunctata* (below) can be easily confused. However, as Fleming (1957) pointed out, *C. aterrima tripunctata* can be separated from the other two by the green markings on the dorsal abdomen. The dorsal green band starts on the anterior margin of A1 in *C. aterrima*, but on the anterior margin of A2 in *C. chalcipleura and C. helymus*; further *C. helymus* has a white spot on either side of this line on A1, not present in *C. aterrima*. The separation of *C. chalcipleura and C. helymus craneae* is discussed under the former species.

Males have longer pectinations on the antennae than

Fig. 12. Male *Calonotos helymus craneae* with two forewing spots, above Mt. St Benedict's, MVL, 26.v.1981; 42 mm.

Fig. 13. Male *Calonotos helymus craneae* with three forewing spots, Curepe, MVL, 5.i.1980; 40 mm.

Fig. 14. Female *Calonotos helymus craneae*, Cat's Hill, on flowers of *Austroeupatorium inulaefolium*, 24.ix.2019 (J. Morrall); 40 mm.

Fig. 15. Male *Calonotos helymus craneae*, Port of Spain, Lady Chancellor Road, 8.ii.2010, M. Gibson (iNaturalist observation 38419929); ©, with permission.

do females, but this is not easy to interpret in photographs. Based on the material examined, females typically have three forewing spots, whereas the spot in space 3 (M_3-Cu_1) is typically reduced or sometimes absent in males.

Biology in Trinidad. The early stages have not been reported from Trinidad. Sepp (1843–1848, pl. 59) illustrated the biology of what appears to be this species on an unidentified ?Apocynaceae. Adults are distasteful (Beebe and Kenedy 1957). They occasionally fly by day (females have been found feeding at flowers of *Austroeupatorium inulaefolium*), and by night when both sexes are attracted to light (Beebe and Kenedy 1957, author's observations).

Status in Trinidad. This is a widespread and common species, most frequently found in disturbed and suburban areas.

***Calonotos tiburtus* (Cramer, 1780)**

Figs. 16–18, Appendix Fig. 2.

OD: Cramer 1780: *Sphinx tiburtus*, TL Suriname.

TT: *Calonotos tiburtus* (Cramer): Kaye and Lamont (1927), Fleming (1957)
Calonotos tiburtus trinidadensis Strand: Strand (1915) TL, Strand (1927), Fleming (1957) [misidentification]
Calonotos tiburtus trinitatis [sic] Strand: Draudt (1915–1917) [misidentification]

Historical notes. Kaye and Lamont (1927) listed this species from Trinidad without comment. This could have been based on the specimen in the Admiral Bourke collection in OUMNH, which W.J. Kaye examined. Identified by comparison with the NHMUK series.

Taxonomic issues. This species is not covered by Cerda (2008), and the externally visible genitalia of a Trinidad specimen do not match any of the species from French Guiana that he treated. Hampson (1898) treated this species from Costa Rica, Panama, Guyana and Suriname; he indicates that the spot in space 2 (Cu_1-Cu_2) is only present in the female, but it is present in all Trinidad specimens examined.

As noted under *C. aterrima tripunctata,* Strand (1915)

Fig. 16. Male *Calonotos tiburtus*, Morne Bleu, Textel Installation, at light, 10.vii.1978; 39 mm.

Fig. 17. Female *Calonotos tiburtus*, Curepe, MVL, (F.D. Bennett); 38 mm.

Fig. 18. Male(?) *Calonotos tiburtus*, Bush Bush Island, 8.iv.2022, R. Deo (iNaturalist observation 110744526); ©, with permission.

described specimens of *C. aterrima tripunctata* and *C. helymus craneae* as form *trinidadensis* of *C. tiburtus*. Cock and Laguerre (2022) designated a lectotype, making *C. tiburtus trinidadensis* a synonym of *C. aterrima tripunctata*.

Identification. This is the only Trinidad species of this appearance with golden orange stripes on the abdomen. The sexes are similar.

Biology in Trinidad. Most captures have been at light.

Status in Trinidad. Fleming (1957) recorded two specimens from Simla and notes that it is quite common in Nariva Swamp. This is a widespread but uncommon species recorded from both forest and suburban habitats. There have been a few observations by day, but most records are of moths attracted to light by night.

Chrostosoma guianensis Kaye (see *Saurita perspicua*)
Chrostosoma viridipunctatum Rothschild (see *Heterodontia fenestrina*).

COSMOSOMA HÜBNER, [1823]

Type species *Cosmosoma omphale* Hübner, 1823, TL not stated, a junior subjective synonym of *Sphinx auge* Linnaeus, 1767. The genus is known to be polyphyletic (Simmons *et al*. 2012, Laguerre 2014). *Cosmosoma* spp. all have transparent wings, with a sharply defined black border of variable width, sometimes a dark bar across the end of the forewing cell, and the head, thorax and abdomen variably marked in bright colours. This is also true of *Loxophlebia* spp., *Pheia toulgoeti*, male *Phoenicoprocta vacillans*, *Valvaminor jacerda* and *Xanthyda beebei* (Euchromiina), as well as *Aethria*, *Dinia*, *Diptilon*, *Trichura* and *Urolasia*

(Ctenuchina).

***Cosmosoma achemon* (Fabricius, 1781)**

Figs. 19–20.

OD: Fabricius 1781: *Zygaena achemon*, TL Jamaica

TT: *Cosmosoma achemon* (Fabricius): Fleming (1957)

Historical notes. Fleming (1957) recorded a male from St. Augustine. Identified by comparison with the NHMUK series.

Taxonomic issues. Some males in the NHMUK series have red marking on the bar of cell of the dorsal forewing. Cerda's (2008) figure of the male is more extensively red than that shown here from Trinidad (Fig. 19), whereas that of the female (not seen from Trinidad) has red confined to the shoulders. *Cosmosoma achemon* is represented in BOLD by BIN BOLD:ACF3243 (Paraguay (1), Peru (1), Costa Rica (37), Guatemala (1), Jamaica (1), Dominican Republic (1)) as a sequence from the type locality, Jamaica is included. The females have no forewing bar, and match Trinidad material in habitus.

Identification. This is one of four relatively small *Cosmosoma* spp., the other three being *C. bolivarensis*, *C. hypocheilus* and *C. remota*. *Cosmosoma achemon* has more extensive red markings on the dorsal forewing, extending nearly the length of the dorsum, the dorsal thorax is mostly red, and a solid red dorsal line on the abdomen; *C. bolivarensis* has minimal or no red markings on the dorsal forewing, only a red line each side of the dorsal thorax, and no red dorsal line on the abdomen; *C. hypocheilus* has extensive red markings on the base and costa of the dorsal forewing, red dorsal thorax and a brown-red stripe on the dorsal abdomen, narrowed at each end; *C. remota* has intermediate red markings on the dorsal forewing, just a red line on each side of the dorsal thorax, and the red dorsal line of the abdomen reduced or fragmented. The male of *C. remota*, and both sexes of *C. bolivarensis* and *C. remota* have a black bar on the forewing from the tornus to the cell, although more material may show this character

Fig. 20. Female *Cosmosoma achemon*, Penal, 4.iii.2014, K. Sookdeo; ©, with permission.

to be more variable than this. *Cosmosoma hypocheilus* has this bar in the male, but not in the individual we identify below as female (Fig. 27); both sexes have a dark bar from the costa across the end of the cell.

Biology in Trinidad. Males have been attracted to light.

Status in Trinidad. Rare; records restricted to Curepe, St. Augustine and Penal suggest this is not a forest species.

***Cosmosoma auge* Linnaeus, 1767**

Figs. 21–22.

OD: Linnaeus 1767: *Sphinx auge*, TL 'America'.

Historical notes. This species has not been reported from Trinidad before. Although there are two identified specimens from the 1940s in Sir Norman Lamont's collection in UWIZM, Lamont and Callan (1950) did not include this species. Identified from Cerda (2008).

Taxonomic issues. *Cosmosoma auge* is included in BOLD as BOLD:AAE4005 (Argentina (6), Paraguay (1), Brazil: Parana (1), Jamaica (2), Puerto Rico (1), Dominican Republic (1), Florida (3, as *C. myrodora*), Costa Rica (10)) and ABZ2089 (Brazil: Parana). Linnaeus (1767,

Fig. 19. Male *Cosmosoma achemon*, Curepe, BLT, 26.v-11.vi.1981 (F.D. Bennett); 25 mm.

Fig. 21. Male *Cosmosoma auge*, Morne Bleu, Textel Installation, at light, 29.ix.1978; 32 mm.

Fig. 22. Male *Cosmosoma auge*, Penal, at light, 3.iii.2014 (K. Sookdeo); ©, with permission.

p.807) gave the type locality as 'America' and one or more specimens in the collection of Lorenze Spengler. There is what appears to be a type specimen in The Linnean Collections (2022), which although in poor condition, is compatible with the species we treat here. Hence, it seems appropriate to treat BOLD:AAE4005 as *C. auge* and apply this name to Trinidad material.

Identification. The predominantly red thorax, broad dorsolateral red stripes on the abdomen, and dorsal row of blue iridescent spots on the abdomen should serve to distinguish this species. The sexes are similar.

Biology in Trinidad. Most specimens were captured at light.

Status in Trinidad. An uncommon species, mostly from forested areas.

***Cosmosoma bolivarensis* Klages, 1906**

Figs. 23–25. For figures of the details of body and male genitalia, see Cock and Laguerre (2022).

OD: Klages 1906: *Cosmosoma achemon* var. *bolivarensis*, TL Venezuela, Cuidad Bolivar

TT: *Cosmosoma anoxanthia* (Druce): Kaye and Lamont (1927), Fleming (1957) [misidentification]
Cosmosoma bolivarensis Klages: Cock and Laguerre (2022)

Historical notes. Druce (1905) described *Cosmosoma anoxanthia* from the Caura Valley, Venezuela, and Hampson (1914, pl. 8.25) provides an illustration. Kaye and Lamont (1927) recorded a capture of *C. anoxanthia* at Palmiste by Sir Norman Lamont. There is a Lamont specimen with no data label in NMS, which is considered to represent this specimen. Fleming (1957) recorded six males and three females from Simla. Cock and Laguerre (2022) explained that the species treated as *C. anoxanthia* in Trinidad is actually *C. bolivarensis*, which they raised to species status from being a synonym of *C. anoxanthia*.

Taxonomic issues. Klages (1906) and Fleming (1957) stated that the female lacks the tornal bar of the forewing found in the male, but this seems not to be consistently the case in Trinidad (Fig. 24), so we consider this character variable.

Identification. This species may be compared with the other two relatively small *Cosmosoma* spp: *C. achemon* and *C. remota*, as discussed above under the first of these. The sexes are similar.

Biology in Trinidad. Males of this species have been occasionally attracted to *Heliotropium*. Both sexes have been attracted to light.

Status in Trinidad. An occasional and widespread species.

***Cosmosoma gemmata* (Butler, 1876)**

Fig. 26.

OD: Butler 1876: *Pheia gemmata*, TL Santa Marta, Colombia.

TT: *Cosmosoma gemmata* (Butler): Cock (2017)

Historical notes. Cock (2017) recorded this species from Tobago, but it is not known from Trinidad.

Taxonomic issues. Identified by comparison with the type (NHMUK, ♀ Colombia, St Marta) and NHMUK series. Cerda (2008) treated *C. gemmata* and its morph *xanthocera* Hampson, 1898, which has extensive orange

Fig. 23. Male *Cosmosoma bolivarensis*. **Above**, Curepe, to *Heliotropium*, 7-13.xi.1980; 25 mm. **Below**, Curepe, MVL, 30.viii.1978; 24 mm.

Fig. 24. Female *Cosmosoma bolivarensis*, Curepe, MVL, 14.ix.1979; 27 mm.

Fig. 25. Male *Cosmosoma bolivarensis*, Penal, 19.iv.2014, K. Sookdeo; ©, with permission.

areas on the forewing costa and base, and parts of the dorsal body. The form *xanthocera* is the only one that occurs in French Guiana, and although both forms occur in Venezuela (Klages 1906), the *xanthocera* morph has not been seen from Trinidad or Tobago. There are no DNA barcodes available to help understand this better. A specimen labelled as *C. xanthocera* in Lamont's collection in UWIZM is actually *C. pytna* Druce (below).

Identification. This species can be recognized by the red streaks on the basal forewing, the absence of red markings on the body, and the dorso-lateral row of blue metallic spots on the abdomen. It is closest in appearance to *C. rubriscapulae*, but that species has minimal red markings at the base of the dorsal forewing, and is extensively red on the dorsal thorax. The female has not been recorded from

Fig. 26. Male, *Cosmosoma gemmata*, Tobago, nr. Speyside, MVL, 14-17.v.1982; 38 mm.

Tobago, but is similar to the male.

Biology in Trinidad and Tobago. The only known Tobago adult was attracted to MV light.

Status in Trinidad. No Trinidad records; only one record from Tobago, in disturbed forest above Speyside (Cock 2017).

Cosmosoma hypocheilus Hampson, 1898

Fig. 27.

OD: Hampson 1898: *Cosmosoma hypocheilus*, TL St. Vincent.

Historical notes. This is a new record for Trinidad based on a photograph only (Fig. 27). It was identified from Hampson (1898), and is almost an exact match to Hampson's figure, except for the absence of a dark bar from the end of the cell to the tornus, which is a male character.

Taxonomic issues. Not in BOLD.

Identification. This is a relatively small species, comparable to *C. achemon*. It can be recognized by the extensive red markings at the base of the dorsal forewing and extending along most of the costa, the red dorsal thorax, the red dorsal line on the abdomen, narrowing at each end, and the black bar across the end of the cell of the forewing. Hampson (1898) notes that in the female, the dark bar from the end of the cell to the tornus is very much reduced or absent, as is the case in Fig. 27.

Fig. 27. Female *Cosmosoma hypocheilus*, South Oropouche, Mon Desir, on flowers of *Austroeupatorium inulaefolium*, 28.ix.2020, T.P. Maharaj; ©, with permission.

Biology in Trinidad. The only record was photographed feeding at flowers of *Austroeupatorium inulaefolium*.

Status in Trinidad. Just one record from South Oropouche. It is expected to occur in Tobago, given that it was described from St. Vincent.

Cosmosoma klagesi Rothschild, 1910

Figs. 28–30, Appendix Figs. 3, 26. BIN BOLD:ABZ0274.

OD: Rothschild 1910: *Cosmosoma klagesi*, TL Trinidad.

TT: *Cosmosoma klagesi* Rothschild: Rothschild (1910), Zerny (1912), Rothschild (1913), Draudt (1915–1917), Kaye and Lamont (1927), Zerny (1931a), Fleming (1957), Blest (1964), Cerda (2008)

Historical notes. Rothschild (1910) described and illustrated (Rothschild 1913) this species from Trinidad, based on what he reported as a female from Caparo, Trinidad, November 1905 (S.M. Klages). This specimen in NHMUK is actually a male.

Kaye and Lamont (1927) noted that this species was described from a Trinidad specimen, and added records from Guaico, 18.iv.1915 (N. Lamont), and Manzanilla, 1922 (F.W. Jackson); both these specimens have been examined in NMS. Fleming (1957) recorded 51 males and 20 females from Simla. Identified by comparison with the type (NHMUK, ♂ Trinidad).

Taxonomic issues. In BOLD, material identified as *C. stilbosticta* (Butler, 1876), *C. klagesi*, *C. braconoides* (Walker, 1854) and *C. thiacia* Hampson are grouped in BIN BOLD:ABZ0274 from Costa Rica, Guatemala, Ecuador, Brazil (Parana), French Guiana, Colombia and Peru. At present, we consider this a group of closely related species with a common BIN, and retain the name *C. klagesi* here as it was described from Trinidad. The male genitalia of a Trinidad specimen are shown in Appendix Fig. 26, and match those shown by Cerda (2008) from French Guiana.

Identification. A very distinctive species in Trinidad as it is the only one that is black with a plain orange abdomen.

Fig. 28. Male *Cosmosoma klagesi* ♂, Cumaca Road, 4.6 miles, MVL, 21.x.1982; 30 mm.

Fig. 29. Female *Cosmosoma klagesi*, Sangre Grande, Sans Souci Estate, MVL, 8.viii.1982; 31 mm.

Fig. 30. Female *Cosmosoma klagesi*, Arima Valley, Asa Wright Nature Centre, 7.xii.2019, S.L. Williamson (iNaturalist observation 36484831); © with permission.

The sexes are similar.

Biology in Trinidad. All records which record the method of capture were of specimens attracted to light. The adults show some resemblance to the night-flying social wasps of the genus *Apoica*, which have a nasty sting (speaking from personal experience).

Status in Trinidad. An occasional and widespread species.

Cosmosoma melathoracia Kaye, 1901

Figs. 31–34, Appendix Figs. 4, 27.

OD: Kaye 1901: *Cosmosoma melathoracia*, TL Trinidad.

TT: *Cosmosoma melathoracia* Kaye*:* Kaye (1901), Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1957)
Cosmosoma melathoracea [sic] Kaye*:* Kaye and Lamont (1927)
Cosmosoma melathoracium [sic] Kaye: Zerny (1912), Zerny (1931a)

Historical notes. Kaye (1901) described and illustrated this species from a specimen captured in May 1898 at Tabaquite, Trinidad; the female holotype is in NHMUK. Kaye and Lamont (1927) noted an additional specimen from Palmiste,

8.ix.1917 (N. Lamont); this specimen, a female, is in NMS. Fleming (1957) recorded six males from Simla. Identified by comparison with the type and NHMUK series.

Taxonomic issues. Not in BOLD, but DNA barcodes would be useful to assess the affinities of this species. We include figures of the body details (Appendix Fig. 4) and male genitalia (Appendix Fig. 27) for this species described from Trinidad.

Identification. The distinctive brown dorsal thorax is variable in colour and intensity (Figs. 31–34). When this brown area is not evident, the red spot or pair of spots dorsally on abdominal segment one and the row of metallic green dorsal spots on the abdomen will characterize this

Fig. 31. Male *Cosmosoma melathoracia*, Sangre Grande, Sans Souci Estate, MVL, 8.viii.1982; 34 mm.

Fig. 32. Male *Cosmosoma melathoracia* (orange dorsal thorax), Rio Claro-Guayaguayare Road, milestone 6.5, MVL, 30.ix.1978; 33 mm

Fig. 33. Female *Cosmosoma melathoracia*, Cumaca Road, 4.6 miles, MVL, 18.vii.1981; 37 mm.

Fig. 34. Male *Cosmosoma melathoracia*, Arima Valley, Asa Wright Nature Centre, 23.iii.2015, S. Nanz; ©, with permission.

species. The sexes are similar.

Biology in Trinidad. Most specimens with the method of capture recorded were taken at light, but it has also been attracted to heliotrope at night.

Status in Trinidad. An occasional species, found in forested areas.

***Cosmosoma pytna* Druce, 1906**

Fig. 35, Appendix Fig. 5.

OD: Druce 1906: *Cosmosoma pytna*, TL Trinidad.

TT: *Cosmosoma pytna* Druce: Druce (1906), Zerny (1912), Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1957)

Historical notes. This species was described from Trinidad (Druce 1906) and the male holotype is in NHMUK. There do not seem to have been any further published records since the original description (Kaye and Lamont 1927, Fleming 1957), but Lamont captured a female at Palmiste in 1947 and MJWC caught two males on the Rio Claro-Guayaguayare Road in 1978. Identified by comparison with the holotype.

Taxonomic issues. There are no sequences identified as *C. pytna* in BOLD. Sequences from the type locality Trinidad would be valuable to help characterize this name.

Identification. This is a distinctive species in Trinidad, due to the orange streaks on the base of the dorsal forewing, orange patagia, yellow-orange abdominal segment 1 and brown-orange abdominal segments 5–6. The sexes are similar.

Biology in Trinidad. The two recent captures were at MV light.

Status in Trinidad. A rare species, with no records from the North of Trinidad.

***Cosmosoma remota* (Walker, 1854)**

Figs. 36–38.

OD: Walker 1854: *Glaucopis remota*, TL Venezuela, Brazil, Pernambuco.

TT: *Cosmosoma remota* (Walker): Kaye and Lamont

Fig. 35. Male *Cosmosoma pytna*, Rio Claro-Guayaguayare Road, milestone 6.5, MVL, 30.ix.1978; 30 mm.

(1927), Fleming (1957), Cock (2017b)

Historical notes. Kaye and Lamont (1927) noted a record from Tobago, but do not explicitly mention this species as occurring in Trinidad. Fleming (1957) stated that there are Trinidad males in Kaye's collection. MJWC examined a male from Trinidad and a pair from Tobago from Kaye's collection, now in MGCL (see Appendix). Identified by comparison with the type (♀ with discal bar on forewing, Venezuela) and NHMUK series (including ♀ specimens with no discal bar).

Taxonomic issues. BIN BOLD:ACF3637 of specimens from Panama and Colombia identified as *C. remota*, is likely to represent this species, but sequences from Trinidad and the type localities would be needed to confirm this association. The specimen from Venezuela in NHMUK labelled as type is a female with a dark discal bar from the tornus to the cell; this bar is absent thus far in females examined from Trinidad and Tobago.

Fig. 36. Male *Cosmosoma remota*, Curepe, MVL, 22.viii.1978; 24 mm.

Fig. 37. Female *Cosmosoma remota*, Curepe, MVL, 26.viii.1978; 27 mm.

Fig. 38. *Cosmosoma remota*. **Left**, male, Port of Spain, Hololo Mountain Road, 18.xi.2018, bushmountainTT (iNaturalist observation 18483478); ©, under CC-BY-NC. **Centre**, female, Penal, at light, 7.xi.2013, K. Sookdeo; ©, with permission. **Right**, female, Tobago, south of Black Rock, 31.vii.2020, figtree (iNaturalist observation 60005380); ©, under CC-BY-NC.

Identification. This species has red streaks on the dorsal forewing, just a red line on each side of the dorsal thorax, and the red dorsal line of the abdomen reduced or fragmented. The differences to separate this species from the other relatively small *Cosmosoma* spp., *C. achemon*, *C. hypocheilus* and *C. bolivarensis* are discussed under *C. achemon* above. Based on material to hand, the female of *C. remota* lacks the black bar on the forewing from the tornus to the cell, unlike the male, *C. achemon* and *C. bolivarensis*.
Biology in Trinidad. Adults may be attracted to heliotrope, but the majority have been collected at light.
Status in Trinidad and Tobago. A common species, mainly found in suburban areas.

***Cosmosoma rubriscapulae* Kaye, 1901**
Figs. 39–41, Appendix Figs. 6, 28.
OD: Kaye 1901: *Cosmosoma rubriscapulae*, TL Trinidad.
TT: *Cosmosoma rubriscapulae* Kaye: Kaye (1901), Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1957)

Fig. 39. Male *Cosmosoma rubriscapulae*, Curepe, MVL, 16.viii.1978; 39 mm.

Fig. 40. Female *Cosmosoma rubriscapulae*, Morne Bleu, Textel Installation, at light, 29.iii.1979; 40 mm.

Fig. 41. *Cosmosoma rubriscapulae*, Morne Catherine, at light, 5.v.2022, R. Deo (iNaturalist observation 115722850); ©, with permission.

Cosmosoma rubriscapulum [sic] Kaye: Zerny (1912)
Historical notes. Kaye (1901) described and illustrated this species based on a specimen 'flying gently by day in Morrison Valley, beginning of July 1898 (W.J. Kaye)', and the same information is repeated in Kaye and Lamont (1927). This female holotype, labelled Trinidad but without further location, is in NHMUK. Fleming (1957) recorded three males and three females from Simla. Identified by comparison with the type (NHMUK, ♀ Trinidad) and NHMUK series.
Taxonomic issues. Not in BOLD. We include figures of the body details (Appendix Fig. 6) and male genitalia (Appendix Fig. 28) for this species described from Trinidad.
Identification. This species has short red streaks on the base of the dorsal forewing, is extensively red on the thorax and dorso-laterally on abdominal segment 1, and dorso-lateral rows of metallic blue spots on the abdomen. The

sexes are similar.

Biology in Trinidad. Life history unknown. Most specimens were captured attracted to light.

Status in Trinidad. An occasional species in both forested and suburban habitats.

***Cosmosoma subflamma* (Walker, 1854)**

Figs. 42–43, Appendix Figs. 7, 29.

OD: Walker 1854: *Glaucopis subflamma*, TL Brazil.

TT: *Cosmosoma subflamma subflamma* (Walker): Kaye and Lamont (1927), Fleming (1957)

Historical notes. Kaye and Lamont (1927) listed this species based on specimens from Verdant Vale, x.1918, at light (F.W. Urich) and Palmiste, 28.v.1921 (N.L.). The latter has been examined in NMS. The former has not been located, although it may well be the damaged female from Kaye's collection in MGCL. Fleming (1957) recorded a male from Simla. Identified by comparison with the NHMUK series and Cerda (2008).

Taxonomic issues. We have examined an image of the holotype of *C. subflamma* (NHMUK, ♀ Brazil); it is dark, with the blue metallic spots of the dorsal abdomen hardly apparent, and the hind legs appear to be dark. Walker (1854) stated that the 'femora towards the base and coxae [are] red; hind tibiae and hind tarsi red above'. Hampson (1898) only knew the holotype and described the legs as 'black, the femora and hind tibiae and tarsi striped with scarlet'.

Herrich-Schäffer [1854] (in Herrich-Schäffer 1850–[1858]) named *Laemocharis panopes* from Venezuela based upon an illustration – his fig. 243, which resembles *C. subflamma* except that the hind legs (the only ones shown) are uniformly pale orange. However, the holotype (MNB, ♀ Venezuela) appears to have dark hind legs. Zerny (1931b) treated *L. panopes* a synonym of *C. subflamma*.

Schaus (1896) described *C. lucia* from St. Lucia and stated that the legs are red. Hampson (1898) examined the type and described the 'mid and hind femora, tibiae and tarsi' as black (in error for red), 'the hind femora and at

Fig. 42. Male *Cosmosoma subflamma*, Curepe, to *Heliotropium* by night, 29.viii.1981; 35 mm.

Fig. 43. Male *Cosmosoma subflamma*, Penal, 24.ix.2014, K. Sookdeo; ©, with permission.

extremity and tibiae at base black'. Hampson (1898) and Draudt (1915–1917) treated *C. lucia* as a subspecies of *C. subflamma*, while Zerny (1912) considered it a variety of *C. subflamma*, based on which Cerda (2008) treated it as a synonym of *C. subflamma*.

Compared to material from Trinidad in MJWC (Fig. 42), Cerda's (2008) figure has the iridescent blue of the dorsal abdomen reduced and the legs more yellow, but the genitalia (Appendix Fig. 29) appear the same. At this stage, we are uncertain as to the status of the three names. Material from Trinidad is closest in appearance to *lucia*, but whether *lucia* is a separate valid species is not clear. Unfortunately, the holotypes of *subflamma* and *panopes* are both female, and the type localities (Brazil and Venezuela) are vague, so resolving this will not be straightforward. Accordingly, we refer to this species from Trinidad as *C. subflamma*, in line

with the treatment of Cerda (2008).
Identification. The bright red hind legs and basal parts of the other legs are distinctive, but note also the dorsal row of iridescent blue spots on the abdomen, posterior margin of thorax and head. The sexes are similar.
Biology in Trinidad. One male was attracted to heliotrope by night, but most records have been of individuals attracted to light. The sexes are similar.
Status in Trinidad. An uncommon species in Trinidad, mostly recorded from forested areas.

***Cosmosoma teuthras* Walker, 1854**
Fig. 44.
OD: Walker 1854: *Glaucopis teuthras*, TL Venezuela (and Brazil).
Historical notes. A new record for Trinidad, identified by comparison with the type (NHMUK, ♂ Venezuela) and NHMUK series.
Taxonomic issues. This species appears in BOLD as BOLD:AAA1312, incorporating several distinct separately named subclusters. The largest of these includes material from Central America south to Paraguay is mostly identified as *C. teuthras*; and given the Venezuela type locality is probably correctly associated with this name, which can be applied to the Trinidad population.
Identification. This species is extensively red on the dorsal head, thorax and dorsal forewing, including a bar across the end of the cell, which is not seen in any other Trinidad species. The female has not been documented from Trinidad, but the sexes are similar.
Biology in Trinidad. The only Trinidad male was attracted to MV light.
Status in Trinidad. Just one record from the forest of Inniss Field.

***DIXOPHLEBIA* BUTLER, 1876**
Type species: *Pseudomya quadristrigata* Walker, 1865, TL Brazil, Ega.

***Dixophlebia holophaea* Hampson, 1909**
Fig. 45.
OD: Hampson 1909: *Dixophlebia holophaea*, TL Guyana.
TT: *Dixophlebia holophaea* Hampson: Fleming (1957)
Historical notes. Fleming (1957) recorded two males from Simla. Identified by comparison with the type (NHMUK, ♂ Guyana, photo) and NHMUK series (none from Trinidad).
Taxonomic issues. There are no public sequences in BOLD.
Identification. This species has a disproportionately heavy and long abdomen compared to other Euchromiina and Ctenuchina, although this habitus may initially suggest this species belongs to some other family. We are not familiar with the female.
Biology in Trinidad. One record at light.
Status in Trinidad. A rare species recorded from the forested Northern Range.

***DYCLADIA* FELDER 1874**
Type species: *Dycladia correbioides* Felder, 1874, TL

Fig. 45. Male *Dixophlebia holophaea*, Grand Tacarib, at light, 29 August 2015, K. Sookdeo; ©, with permission.

Fig. 44. Male *Cosmosoma teuthras*, Inniss Field, MVL, 17.v.1999; 37 mm.

Colombia, Bogota.

***Dycladia basimacula* Schaus, 1924**

Figs. 46–48.

OD: Schaus 1924: *Dycladia basimacula*, TL Caura Valley, Venezuela (also from Trinidad).

TT: *Dycladia correbioides* Felder: Kaye and Lamont (1927) [misidentification]
Dycladia basimacula Schaus: Schaus (1924), Fleming (1957)

Historical notes. Kaye and Lamont (1927) recorded *Dycladia correbioides* from Trinidad, based on specimens from Palmiste, collected 7.i.1921 and 25.iv.1921 by Sir Norman Lamont. We have not located these specimens, but there are two specimens of *D. basimacula* from the Lamont collection in RSM, which he had identified as *D. correbioides.* We therefore agree with Fleming (1957) who suggested Kaye and Lamont (1927) had misidentified this species, and that *D. correbioides* (described from Central America, Colombia) is not a Trinidad species. Five specimens in Lamont's collection in UWIZM are curated as *D. correbioides*, but these all are *Lycomorphodes tortricina* Rothschild (Arctiinae, Lithosiini). Fleming (1957) reported four male *D. basimacula* from Simla. MJWC identified this species from the type (USNM, ♂ Venezuela) and Fleming (1957).

Taxonomic issues. The type has a yellow lateral stripe on the abdomen that is not always present on Trinidad specimens. No sequences in BOLD.

Identification. This species shares its colouring and general pattern with three species of Ctenuchina (*Correbidia assimilis* (Rothschild), *Pionia lycoides* (Walker) and an unnamed species of *Pionea*) and two of Lithosiini (*Lycomorphodes bipartita* (Walker) and *L. tortricina*), and all are involved in a mimicry ring with *Calopteron* spp. (Lycidae) beetles. *Dycladia basimacula* rests with its wings held at an angle rather than with the costa of each forewing parallel, or nearly so. Furthermore, the distal yellow band of the forewing of *D. basimacula* is angled, turning to meet the termen in the middle rather than continuing to the dorsum as in the other mentioned species. The sexes are similar.

Biology in Trinidad. All captures that include details were taken at light.

Status in Trinidad. An uncommon species found in both

Fig. 46. Male *Dycladia basimacula*, Curepe, MVL, 19–25.x.1981; 26 mm.

Fig. 47. Female *Dycladia basimacula*, Curepe, MVL, 21–31.i.1982; 27 mm.

Fig. 48. *Dycladia basimacula*, Mt. Hope, 5.v.2021, bellbird20 (iNaturalist observation 77557912); ©, with permission.

forested and suburban areas.

Dycladia correbioides Felder (see *D. basimacula* Schaus)

HETERODONTIA FELDER, 1874

Type species: *Heterodontia tricolor* Felder, 1874, TL Brazil, Amazon River. Kirby (1892) listed this as a valid genus, with just the one species, but Hampson (1898) placed *Heterodontia* as a synonym of *Chrostosoma* Hübner, 1821 (type species *Sphinx echemus* Stoll, 1781). Subsequent authors followed Hampson, until Grados (1999) reintroduced *Heterodontia* as a separate genus without comment, making several new combinations in the process. Cerda (2008) accepted Grados' action as re-establishing the genus and perpetuated the situation. The available sequences in BOLD do not offer much support for this split.

***Heterodontia fenestrina* (Butler, 1876)**

Figs. 49–52.

OD: Butler 1876: *Pseudomya fenestrina*, TL Brazil, Pará, Rio Trombetas.

TT: *Chrostosoma viridipunctatum* Rothschild: Fleming (1957) [misidentification]
Heterodontia fenestrina (Butler): Cerda (2008)

Historical notes. Fleming (1957) recorded 5♂ and 4♀ from Simla, Arima Valley as *C. viridipunctatum*. MJWC initially identified this species as *C. viridipunctatum* by comparison with the type (NHMUK, ♀ Bolivia) and NHMUK series, but noted that it might prove to be *C. fenestrina* Butler (type, NHMUK, ♂ Brazil). Cerda (2008) transferred *C. fenestrina* from *Chrostosoma* to *Heterodontia*, listed a record of *H. fenestrina* from Arima (May) and suggested that Fleming's (1957) records of *C. viridipunctatum* are misidentifications for this species. We follow this treatment here.

Taxonomic issues. It is anticipated that this species will fall within BOLD:AAJ5313 (*H. fenestrina* from French Guiana). One female in NHMUK has metallic green spots on the dorsolateral abdomen (Fig. 51), but does not otherwise appear to differ.

Identification. This species has translucent rather than transparent areas on the wings, which extend nearly three-quarters of the length of the forewing, and are interrupted by a dark bar from the tornus to the end of the cell. These features, in combination with a red spot at the anterior base of each forewing and a dorsal red spot on abdominal segment 1 should serve to recognize this species. The sexes are similar, except the female has less pointed wings, and the form with green spots on the abdomen has only been observed in a female.

Biology in Trinidad. Adults are attracted to light.

Status in Trinidad. An occasional species in forested areas

Fig. 49. Male *Heterodontia fenestrina*, Cumaca Road, 4.6 miles, MVL, 18.vii.1981; 28 mm.

Fig. 50. Female *Heterodontia fenestrina*, Morne Bleu, Textel Installation, at light, 3.vii.1978; 30 mm.

Fig. 51. Female *Heterodontia fenestrina* (green metallic markings dorso-laterally on abdomen), Tabaquite [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/

Fig. 52. Male *Heterodontia fenestrina*, Inniss Field, by night, 18.vii.2021, R. Deo (iNaturalist observation 87936944); ©, with permission.

HISTIOEA WALKER, 1854

Type species: *Euchromia proserpina* Hübner, 1823, TL Brazil. This genus has been misspelt as *Histiaea* (Watson *et al*. 1980).

Histioea cepheus (Cramer, 1780)

Figs. 53–56. BIN: BOLD:ABZ8247.

OD: Cramer 1780: *Sphinx cepheus*, TL Suriname.

TT: *Histiaea* [sic] *cepheus* (Cramer): Hampson (1898), Zerny (1912), Draudt (1915–1917), Beebe and Kenedy (1957), Dunning (1968)
Histiaea [sic] *cephus* [sic] (Cramer): Fleming (1950)
Histioea cepheus (Cramer): Kaye (1901), Cerda (2008)
Histaea [sic] *cepheus* (Cramer): Blest (1964)

Historical notes. A specimen captured by W.E. Broadway at the Botanic Gardens, Port of Spain, is referred to by Hampson (1898), Kaye (1901) and Kaye and Lamont (1927). This specimen is in NHMUK, although the data label does not mention the Botanic Gardens. Kaye and Lamont (1927) also listed a specimen from the edge of the Queen's Park Savannah, Port of Spain, 21.xi.1920 (W.J. Kaye); this specimen is in MGCL from the W.J. Kaye collection. Fleming (1957) recorded 46 males and 17 females from Simla. Identified by comparison with the NHMUK series.

Taxonomic issues. Cramer (1777–1782, plate 197E) shows the dorsal forewing of this species with the basal streak, postdiscal line in space 1 (Cu_2-2A) and the spot at the end of the cell all pink, and two distinct blue spots beyond the end of the cell. Gernaat *et al*. (2018) designated a lectotype from Suriname for *H. cepheus* It differs from Cramer's figure in that the forewing blue spots are smaller, the pink medial streak in space 1 (Cu_2-2A) is more diffuse, and there are diffuse pink streaks in space 1 (Cu_2-2A) from near the base to the distal end of the medial streak, and in the cell against the cubitus from near the base to the basal end of the

Fig. 53. Male *Histioea cepheus* (BIN BOLD:ABZ8247), Arima Valley, Simla, xii.2020 (S. Alston-Smith) [DNA MJWC-499]; 56 mm.

Fig. 54. Female *Histioea cepheus*(?) (BIN BOLD:AAF0772, i.e. *H. proserpina*), Arima Valley, Simla, at light, xii.2020 (S. Alston-Smith) [DNA MJWC-498]; 65 mm.

Fig. 55. Female *Histioea cepheus* (no DNA barcode), Arima Valley, Simla, at light, xii.2020 (S. Alston-Smith); 66 mm.

Fig. 56. Male *Histioea cepheus* (no DNA barcode), Arima Valley, Asa Wright, 7.xi.2016, P. Sullivan (iNaturalist observation 19677104); ©, under CC-BY-NC.

medial streak; the dorsal hindwing markings are pink rather than red, but this may reflect that the lectotype has faded; the distal spots of the ventral hindwing of the lectotype are pinkish yellow. Trinidad specimens (Figs. 53, 55) resemble this lectotype. Sequences in BOLD as *H. cepheus* from Venezuela and French Guiana appear in BOLD:ABZ8247. These specimens from French Guiana differ from Trinidad material in that (1) on the dorsal forewing, the basal streak, postdiscal spot in space 1 (Cu_2-2A) and the spot at the end of the cell are more clearly delineated and red not pink, and (2) the distal spot on the ventral hindwing is red rather than yellow. One specimen from Venezuela in BOLD:ABZ8247 is identified as *H. monticola* Klages and resembles the Trinidad material. *Histioea monticola* was described from the Suapure Mountains, Venezuela (Klages 1906) and

the type is in the USNM (examined), but this taxon has been treated as a synonym of *H. cepheus* since Hampson (1914). Given that BOLD:ABZ8247 occurs East and West of the Suriname type locality, we suggest that the French Guiana population represents a geographically separated, phenotypically distinct form of *H. cepheus*.

Three DNA barcodes were obtained from Trinidad material. Two (MJWC-493 and MJWC-499) formed part of BIN BOLD:ABZ8247 from French Guiana and Venezuela, i.e. *H. cepheus*, but a third (MJWC-498) formed part of BIN BOLD:AAF0772, i.e. *H. proserpina* (Hübner, 1827) (TL Brazil), which has a very different habitus and is known from the Amazon. We have no immediate explanation for this anomaly; there may have been some hybridization in the past, which has persisted genetically in the female mitochondria of *H. cepheus*, or perhaps *C. proserpina* has a *cepheus* morph which occurs sympatrically with *H. cepheus*.

Identification. The large size, sullied white forewing spots and diffuse pinkish markings on the forewing should make this species easy to recognise. The sexes are similar, although the female is a little larger.

Biology in Trinidad. R. Kenedy reared this species, but unfortunately provided no information on the food plant or early stages (Beebe and Kenedy 1957). Gernaat *et al*. (2018) found eggs of *H. cepheus* on *Olyra latifolia* (Poaceae), but the neonate caterpillars would not accept this food plant, although they were successfully reared on a non-flowering *Mikania* sp. comparable to *M. micrantha* (Asteraceae), one of eight plant species growing nearby which were offered. For three years, Cock (1981, 1982) studied the herbivorous insects associated with *M. micrantha* in Trinidad and the Neotropics, but did not encounter this caterpillar, indicating that *M. micrantha* is unlikely to be a normal food plant in the wild.

The moths are nocturnal; they are not attracted to heliotrope, and most records are at light, where males make up about two-thirds of the records (Beebe and Kenedy 1957, author's observations). Beebe and Kenedy (1957) considered the moths to be unpalatable, and note that '*when a specimen is immobilized suddenly, ... it has been seen in many cases to exude droplets of thick yellow fluid from the thorax. Sometimes the droplets are bubbly and almost completely cover the dorsal thorax. This seems to serve as an effective defense against at least some predators.*'

Status in Trinidad. A common species in forested areas but uncommon in suburban areas. It is the most commonly photographed species of Euchromiina at the Asa Wright Nature Centre. Hence, Beebe and Kenedy (1957), Blest (1964) and Dunning (1968) used them in their behavioural studies.

Histioea meldolae meldolae **Butler, 1876**

Figs. 57–58.

OD: Butler 1876: *Histiaea* [sic] *meldolae*, TL Trinidad, Venezuela.

TT: *Histiaea [sic] meldolae* Butler: Butler (1876), Hampson (1898), Zerny (1912), Draudt (1915–1917), Fleming (1950), Fleming (1957)
Histioea meldolae Butler: Waterhouse (1881), Druce (1881–1900), Kirby (1892), Kaye (1901), Kaye and Lamont (1927)

Historical notes. Kaye (1901) included this species based on the original description. Kaye and Lamont (1927) listed five specimens from Palmiste, collected by Sir Norman Lamont (iii.1915, viii.1915, 11.xii.1916, 22.x.1918, 22.i.1922), several of which are listed in the Appendix. Identified by comparison with the type (NHMUK, ?♀ Trinidad) and NHMUK series.

Taxonomic issues. Walker (1854) described *H. bellatrix* (as *Euchromia bellatrix*) referring to 'an abbreviated yellow band beyond, the blue dots in the disk' and two un-named varieties, one (implicitly var. β) with the yellow band comprising four yellow spots and the other (var. γ) with three yellow spots. It is not clear how the five specimens listed from Venezuela (three from Mr. Dyson's collection and two from M. Becker's collection) relate to the three different forms. Butler (1876) described *H. meldolae*

Fig. 57. Male *Histioea meldolae meldolae*, Hollis Reservoir, 2.ix.1978; 60 mm.

Fig. 58. Female *Histioea meldolae meldolae*, Parrylands Oilfield, MVL, 25.vii.1981; 60 mm.

referring to Walker's var. with three yellow spots (i.e. var. γ), and based on specimens from Trinidad (coll. Meldola) and Venezuela (colls. Dyson & Becker). By implication the specimens from the Dyson and Becker collections are some of the five to which Walker referred. Raphael Meldola (1849–1915) was a chemist and biologist who wrote on mimicry and evolution, but we have found no information to suggest he ever visited Trinidad himself (Marchant 1916), although four collections that included Meldola Trinidad Lepidoptera were donated to OUMNH in 1897 and 1901 (OUMNH 2022). Given that Butler named the species after Meldola, whose specimen(s) were from Trinidad, this should be taken as the primary type locality, and Hampson (1898) explicitly referred to the type being from Trinidad, effectively designating the Trinidad specimen curated as type in NHMUK to be the lectotype. Lesieur and Lévêque (2017) described *H. meldolae hoyaensis* Lesieur from Panama, and so the trinomial is used for the Trinidad population.

Identification. The large size, yellow-white spots and long red streaks on the forewing make this species unmistakeable. The sexes are similar.

Biology in Trinidad. Not attracted to drying heliotrope. Where recorded, adults were captured at light.

Status in Trinidad. An occasional species, mostly from forested areas.

HOMOEOCERA FELDER, 1874

Type species: *Homoeocera crassa* Felder, 1874, TL Colombia, Bogota. Laguerre (2014) treated some parts of this paraphyletic genus.

Homoeocera magnolimbata Dognin, 1911

Fig. 59.

OD: Dognin 1911: *Homoeocera magnolimbata*, TL French Guiana

TT: *Homoeocera magnolimbata* Dognin: Kaye and Lamont (1927), Fleming (1957)

Historical notes. First recorded from Trinidad by Kaye and Lamont (1927), referring to a specimen from St. Ann's, 21.x.1899, collected by F.W. Urich. This male specimen was in W.J. Kaye's collection, and is now in MGCBL. Identified by comparison with the type (USNM, ♀ French Guyana) and NHMUK series.

Taxonomic issues. No sequences in BOLD. Cerda (2008) was uncertain about the identity of Trinidad records of this species. Figures of Trinidad specimens (Figs. 59) are a good match to Cerda's (2008, Fig. 016) and to the type, so there seems no reason to question this identification.

Identification. This is a large species, with transparent wings and a mostly even narrow black margin, and a dark bar at the end of the forewing cell. It is comparable to

Fig. 59. *Homoeocera magnolimbata*. **Left**, male, Trinidad, 1909 [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/. **Right**, female, Moreau, 2.iii.1938 [N. Lamont] [NMS]; 40 mm; photo V. Blagoderov; © NMS, with permission.

Nyridela acroxantha, but in that species the dark bar across the end of the forewing cell runs across the wing to the tornus. The sexes are similar.

Biology in Trinidad. Nothing reported. Sir Norman Lamont captured a specimen at Moreau in March (location uncertain, but a forested area in the South of Trinidad where Lamont collected butterflies) and R.W. Farmborough collected one at forest roadside in the Rock-Penal Moruga area in September, which suggests this is a day-flying species captured feeding at flowers such as eupatorium.

Status in Trinidad. A rare species from forested areas, and no records since 1938.

HYPOCHARIS HAMPSON, 1898

Type species: *Laemocharis clusia* Druce, 1897, TL Brazil, Amazon River. Cerda (2008) moved several species from *Saurita* into *Hypocharis*, taking into consideration similarities in the male genitalia.

Hypocharis arimensis (Fleming, 1957)

Figs. 60–62, Appendix Figs. 8, 30.

OD: Fleming 1957: *Saurita arimensis*, TL Trinidad.

TT: *Saurita lacteata* (Butler): Kaye (1901), Zerny (1912), Draudt (1915–1917), Kaye and Lamont (1927) [misidentification]
Saurita arimensis Fleming: Fleming (1957)
Hypocharis arimensis (Fleming): Cerda (2008)

Historical notes. Fleming (1957) described *Hypocharis arimensis* (as *Saurita arimensis*) based on seven males from the Arima Valley, Trinidad, pointing out that it is not the same as *H. lacteata* Butler, 1877 (TL Amazons). Earlier authors had reported this species from Trinidad as *lacteata* (Kaye 1901, Kaye and Lamont 1927). Identified by comparison with a paratype (NHMUK, ♂ Trinidad) and from Fleming (1957).

Taxonomic issues. No public sequences in BOLD. An image of the holotype is available online (AMNH 2022). Cerda (2008) transferred this species from *Saurita* to *Hypocharis*. Dissection of a Trinidad male (Appendix Fig. 30) confirmed that this is the species that Cerda (2008) treated and illustrated under this name.

Identification. This species has translucent areas on both wings; the forewing with the apex, a patch at the end of the cell and a rectangle at the tornus black. When combined with the red lines on the tegulae and the white patch on the basal dorsal abdomen, it is distinctive.

Biology in Trinidad. This species seems to fly by night only, when it is attracted to light.

Status in Trinidad. A fairly common, widespread species, mainly in forested areas.

Fig. 60. Male *Hypocharis arimensis*, Inniss Field, MVL, 17.v.1999; 23 mm.

Fig. 61. Female *Hypocharis arimensis*, Rio Claro-Guayaguayare Road, milestone 6.5, MVL, 30.ix.1978; 27 mm.

Fig. 62. Male *Hypocharis arimensis*, Penal, at light, 24.i.2014, K. Sookdeo; ©, with permission.

***Hypocharis clusia* (Druce, 1897)**

Figs. 63–65.

OD: Druce 1897: *Laemocharis clusia*, TL Amazons, Maranham [Maranhão]

TT: *Hypocharis clusia* (Druce): Kaye and Lamont (1927) *Saurita clusia* (Druce): Beebe and Kenedy (1957), Fleming (1957), Blest (1964)

Historical notes. Kaye and Lamont (1927) recorded this species from Sangre Grande (25.viii.1917, Turner), St. Ann's (i.1922), Manzanilla (22.iii.1922, F.W. Jackson) and Palmiste (23.iii.1922, N. Lamont). MJWC examined all except the last of these in OUMNH and MGCL (ex. W.J. Kaye collection) as listed in the Appendix. Identified by comparison with the type (NHMUK, ♂) and NHMUK series.

Taxonomic issues. Fleming (1957) considered *Hypocharis* to be a synonym of *Saurita*. Betz (1972) either ignored this or reverted to *Hypocharis* without a formal taxonomic act, and this has been followed by subsequent authors (Cerda 2008). Fleming (1957) discussed the identity of this species in relation to material of a smaller species from Panama that Forbes (1939) identified as *H. clusia*. Cerda (2008) concludes that Forbes' material was misidentified. In BOLD, there are sequences of material that appears to be *H. clusia* from Costa Rica and Guatemala in BOLD:AAX2185, from French Guiana in BOLD:ADZ2339, and from Peru in BOLD:AAG6272. Provisionally we anticipate that BOLD:AAX2185 is the species that Forbes treated from Panama, and that Trinidad sequences when available will form part of BOLD:ADZ2339, which may be the BIN for which the name *H. clusia* is appropriate.

Fig. 63. Male *Hypocharis clusia*, Brigand Hill, MVL, 28.iii.2003; 27 mm.

Fig. 64. Female *Hypocharis clusia*, Valencia Forest, MVL, 5.viii.1981; 32 mm.

Fig. 65. Male *Hypocharis clusia*, Arima Valley, Asa Wright Nature Centre, 5.iii.2018, G. Barrett (iNaturalist observation 107614385); ©, under CC-BY-NC.

Identification. A large part of the distal forewing is slightly translucent, almost opaque, sullied white with dark veins, although less extensive in the female. This combined with red lines on the tegulae and red spots at the anterior base of the forewings and dorsally on abdominal segment 1 should serve to recognize this species.
Biology in Trinidad. The moths are nocturnal; they are not attracted to heliotrope and almost all captures are at light, the great majority being males (Beebe and Kenedy 1957, author's observations).
Status in Trinidad. Kaye and Lamont (1927) considered this species 'apparently widely spread but never common'. The records available suggest it occurs in diverse disturbed habitats.

***Hypocharis tenebrosa* Cerda, 2017**
Figs. 66–67.
OD: Cerda 2017: *Hypocharis tenebrosa*, TL French Guiana.
Historical notes. This is a new record for Trinidad.
Taxonomic issues. What appears to be this species appears in the USNM main collection as *Psilopleura sanguipuncta* Hampson but the wings look smokier than that species (type examined, NHMUK ♂, Brazil, Rio Grande do Sul). It may also be in NHMUK, where an all-male series from the Guianas is over a blank label. Visually, it is a good match to *H. tenebrosa*, which Cerda (2017) recently described from French Guiana, based on males only. The male is unknown from Trinidad, but the male type material of *H. tenebrosa* from French Guiana is very similar to the Trinidad female (Fig. 66). Males from Trinidad need to be obtained, dissected and compared with the figures in Cerda (2017), to test this provisional identification.
Identification. This is a small species with uniformly smoky wings, a red spot at the anterior base of the forewing and a red line on each tegula.
Biology in Trinidad. One capture at Simla at light and a photographic record from Brasso Seco.
Status in Trinidad. A rare species, but it could be easily overlooked.

***ISANTHRENE* HÜBNER, [1819]**
Type species: *Glaucopis incendiaria* Hübner, 1809, TL not stated.

Fig. 67. Female *Hypocharis tenebrosa*, Brasso Seco, 16.iv.2022, A. Deacon (iNaturalist observation 111996965); ©, under CC-BY-NC.

Fig. 66. Female *Hypocharis tenebrosa*, Arima Valley, Simla, MVL, 6.viii.1982; 24 mm.

***Isanthrene tryhanei* Rothschild, 1911**

Figs. 68–69.

OD: Rothschild 1911: *Isanthrene tryhanei*, TL Trinidad, St Ann's, ♀.

TT: *Isanthrene tryhanei* Rothschild: Rothschild (1911), Zerny (1912), Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927)
Isanthrene tryphanei [sic] Rothschild: Rothschild (1913)

Historical notes. This species was described and illustrated from a female from St. Ann's, Port of Spain (Rothschild 1911, 1913) and the holotype is the only specimen in NHMUK. Identified by comparison with the type (NHMUK, ♀ Trinidad).

Taxonomic issues. No public sequences in BOLD. The male is unknown. Only the first pair of sub-dorsal yellow abdominal spots are clear on the type, compared to three in the specimen in MJWC (Fig. 68). In this regard, the MJWC specimen resembles the species treated as *I. melas* (Cramer) by Cerda (2008, Fig. 017), although the thorax of *I. melas* is more extensively marked in yellow, and the hindwings of *I. melas* are almost colourless, unlike those of *I. tryhanei* which are yellow, matching the forewings. It seems possible that if genitalia and/or DNA barcodes were compared, *I. tryhanei* would be found to be a synonym of *I. melas*.

Identification. This large wasp mimic is the only Trinidad species with transparent yellow wings. Only two female specimens are known. The dorso-lateral yellow marks on abdominal segments 3 and 4 are minimal in the holotype.

Biology in Trinidad. MJWC's specimen was captured on a sunny day on Lalaja Ridge using a net; it was in flight, resembling a large wasp, but fortunately he caught it 'just to make sure'. Bryan Ramdeen photographed an adult moth trapped in a web of the golden silk orb-weaver spider, *Trichonephila clavipes* (Linnaeus) (Araneidae) in Tucker Valley (Fig. 69).

Status in Trinidad. A very rarely seen species, probably associated with forest areas.

Fig. 69. *Isanthrene tryhanei*, caught by *Trichonephila clavipes* spider, Tucker Valley, 20 August 2022, B. Ramdeen (iNaturalist observation 131662148); ©, with permission.

Fig. 68. Female *Isanthrene tryhanei*. **Above**, holotype, St. Ann's (F.E. Tryhane) [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/ **Below**, Lalaja Ridge, 5.iii.1979; 51 mm.

LEUCOTMEMIS BUTLER, 1876

Type species: *Glaucopis latilinea* Walker, 1854, TL Brazil.

Leucotmemis nexa (Herrich-Schäffer, 1854)

Fig. 70.

OD: Herrich-Schäffer 1854, p. 73: *Glaucopis nexa*, TL Brazil, Santarem.

TT: *Leucotmemis nexa* (Herrich-Schäffer): Kaye and Lamont (1927)

Historical notes. Kaye and Lamont (1927) listed records from St. Ann's, 18.ix.1899 (F.W. Urich); Palmiste, 9.ix.1917 (N. Lamont); Rock-Penal Road 1.i.1918 (N. Lamont), 14.i.1921 (W.J. Kaye). Of these, MJWC located the two Lamont specimens (in NMS), and the last, which is in MGCL (ex W.J. Kaye coll.). *Leucotmemis nexa* was identified by comparison with the NHMUK series.

Taxonomic issues. Herrich-Schäffer (1850–1858, fig. 254, p. 73), referred to this species as *Glaucopis nexa*, but treated it as a synonym of *G. phlegmon* Cramer, 1775 (although Herrich-Schäffer incorrectly refers to Walker as the author of *phlegmon*). The species Herrich-Schäffer illustrated as *nexa* is not the same as Cramer's *phlegmon*, but at this point, the name was not validly published (ICZN Article 11.6: A name which when first published in an available work was treated as a junior synonym of a name then used as valid is not thereby made available). However, Kirby (1892) treated both names as separate valid species making the name available with the original authorship (ICZN Article 11.6.1: However, if such a name published as a junior synonym had been treated before 1961 as an available name and either adopted as the name of a taxon or treated as a senior homonym, it is made available thereby but dates from its first publication as a synonym.). Fleming (1957) suggested this species is probably misplaced in *Leucotmemis*. Many sequences in BOLD from Costa Rica form BIN BOLD:AAA1328, and a small number of additional sequences from Mexico, Peru and Bolivia are grouped in the same BIN, suggesting this will prove to be a single, widespread Neotropical species.

Identification. This species superficially resembles the *Calonotos* spp. with green metallic stripes on the abdomen. However, rather than a single post-medial white spot it has an extended bar, crossed by four dark veins.

Biology in Trinidad. Nothing known from Trinidad.

Status in Trinidad. A rare species in Trinidad, with only four records from more than 100 years ago in forested areas of the south.

LOXOPHLEBIA BUTLER, 1876

Type species: *Poecilosoma vesparis* Butler, TL Peru.

Loxophlebia bisigna (Kaye, 1911)

Figs. 71–73.

OD: Kaye 1911: *Pheia bisigna*, TL Guyana.

TT: *Loxophlebia bisigna* (Kaye): Kaye and Lamont (1927), Fleming (1957)
Loxophlebia klagesi Rothschild: Rothschild (1911), Zerny (1912), Draudt (1915–1917) [?synonym]
Loxophlebia clagesi [sic] Rothschild: Hampson (1914) [?synonym]

Historical notes. Kaye and Lamont (1927) included *L. bisigna* from Trinidad based only on Rothschild's (1911) type series of *L. klagesi*, which they treat as a synonym. Fleming (1957) mentioned three specimens from Simla. MJWC examined the NHMUK series of *L. bisigna* and type of *L. klagesi* (NHMUK ♂ Suriname); see comments in next section.

Taxonomic issues. Kaye (1911) described *L. bisigna* from British Guiana (type in MGCL, ex coll. W.J. Kaye, not examined). Two months later, Rothschild (1911) described *L. klagesi* from Suriname (TL), Venezuela and Trinidad (♂ 'Caporo', i.e. Caparo). Rothschild (1911) noted that the Trinidad male has a scarlet lateral dot on A4, and two Venezuelan males have subdorsal scarlet patches on A3–A4, which are absent in the Suriname material, and in *L. bisigna*.

Fig. 70. *Leucotmemis nexa* ♂. Left, male, Penal-Rock Road, 14.i.1921 (W.J. Kaye) [MGCL, ex coll. Kaye]. Right, female, Siparia, Palo Seco, mostly cacao, 14.i.1917 (R.W. Farmborough) [OUMNH]

Draudt (1915–1917, pp. 61, 63) suggested that *L. klagesi* may be a synonym of *L. bisigna*, but in the corrections (p. 199) seems to have decided otherwise. Nevertheless, Draudt's original suggestion has been accepted by subsequent authors (Kaye and Lamont 1927, Fleming 1957, Cerda 2008). *Loxophlebia bisigna* has red markings at the base of the dorsal forewing which are absent in the NHMUK series of *L. klagesi*, and *L. klagesi* has red spots on the abdomen as stated by Rothschild (1911), but absent in *L. bisigna*. *Loxophlebia crusmatica* Dognin (type USNM, ♂ French Guiana) appears identical but does have red spots on the abdomen; Cerda (2008) made it a synonym of *L. bisigna*.

Fleming's three Trinidad specimens as well as those that we have examined from Trinidad consistently have a red lateral dot on A4, as noted by Rothschild (1911). MJWC compared the externally visible genitalia of two Trinidad males with those illustrated by Cerda (2008) from French Guiana, and could see no difference. We conclude that the red spots lateral on A4 represent a local form of *L. bisigna*. Sequences in BOLD from French Guiana form BIN BOLD:ACF1201, but see comments under *L. postflavia* below.

Identification. This species superficially resembles some *Cosmosoma* spp. and other genera with transparent wings. It is the only Trinidad species with white subdorsal markings on the posterior margin of the thorax and abdominal segments 1 and 2. It is perhaps most similar to *Pheia utica*, but that species (currently known from Tobago, but not Trinidad) has the white subdorsal markings restricted to abdominal segment 1, red streaks on the base of the dorsal forewing and small metallic blue subdorsal spots on the abdomen.

Biology in Trinidad. Adults of this species are attracted to heliotrope by day, and light by night.

Status in Trinidad. An uncommon species mainly from forested areas.

***Loxophlebia diaphana* (Sepp, 1848)**

Figs. 74–76.

OD: Sepp 1848: *Glaucopis diaphana*, TL Suriname.

TT: *Loxophlebia diaphana* (Sepp): Kaye and Lamont (1927), Fleming (1957), Cock (2017)
Mesothen aurantegula Jones: Kaye and Lamont (1927), Fleming (1957) [misidentification]

Fig. 71. Male *Loxophlebia bisigna*, Parrylands Oilfield, to *Heliotropium*, 7.xi.1980; 23 mm.

Fig. 72. Female *Loxophlebia bisigna*, Parrylands Oilfield, MVL, 25.vii.1981; 26 mm.

Fig. 73. Male *Loxophlebia bisigna*, Penal, at light, 18.iv.2014, K. Sookdeo; ©, with permission.

Historical notes. Kaye and Lamont (1927) listed a specimen of *L. diaphana* from Palmiste, 12.i.1921 (N. Lamont); this specimen is a male, now in NMS. Kaye and Lamont (1927) also listed a specimen of *Mesothen aurantegula* Jones from Palmiste, 17.i.1922 (N. Lamont). This specimen is a female *L. diaphana* in NMS, labelled as *M. aurantegula* by Sir Norman Lamont. *Mesothen aurantegula*, identified by comparison with the type (NHMUK, ♀ Brazil, São Paulo) and NHMUK series, resembles the female of *L. diaphana* and does not occur in Trinidad. Curiously, there are four male and three female *Valvaminor jacerda* which Kaye identified as *L. diaphana*, and are now in MGCL from Kaye's collection (see Appendix listings under *V. jacerda*). Fleming (1957) did not record *L. diaphana* (or *M. aurantegula*) from Simla. Identified by comparison with the type of *discifera* Walker (NHMUK, ♂ Para), a synonym, and NHMUK series.

Taxonomic issues. The NHMUK series comprises males only. The orange lateral stripes on most of this material is wider than in Trinidad specimens, and the spots on the patagia are less red. Cerda (2008) associated males and females, when he made the female *L. geminata* Schaus (TL French Guiana) a synonym of *L. diaphana*. It is possible that *M. aurantegula* is also the female of *L. diaphana*, the

Fig. 74. Male *Loxophlebia diaphana*, Maracas Bay, to *Heliotropium* by day, 29.iii.2003, 22 mm.

Fig. 75. Female *Loxophlebia diaphana*, Parrylands Oilfield, to *Heliotropium*, 7.xi.1980, 20 mm.

Fig. 76. Male *Loxophlebia diaphana*, Carapachaima, at light, 6.ix.2020, R. Deo (iNaturalist observation 58837939); ©, with permission.

range of which extends to Paraguay according to Cerda (2008). However, this does not need to be resolved here as the name *L. diaphana* is senior and can be used for Trinidad material. A specimen from Suriname is in BIN BOLD:AAX6550, along with two others identified as *L. imitata* from Panama.

Identification. This small Euchromiina shows strong sexual dimorphism. The male has an unusual orange line from the red patagia across the thorax and laterally on the abdomen, not seen in any other Trinidad species. The female has the patagia red, but no orange line. It superficially resembles *Valvaminor* species but none have red patagia.

Biology in Trinidad. Kaye and Lamont (1927) included a brief description of the caterpillar on *Serjania* sp. or *Paullinia* sp. (Sapindaceae), but this is not based on observations in Trinidad, but rather is copied from Hampson (1898), which was probably based on Sepp (1843–1848). This is a day-flying species, mostly captured when attracted to heliotrope.

Status in Trinidad and Tobago. An uncommon but widespread species.

Loxophlebia postflavia Druce, 1898

Fig. 77.

OD: Druce 1898: *Loxophlebia postflavia*, TL French Guyana [OUMNH].

Historical notes. The only records of this species from Trinidad are two specimens reported by Fleming (1957). Fleming refers to the NHMUK collection containing material from the Guianas, one of which is illustrated here (Fig. 77).

Taxonomic issues. Sequences from French Guiana (the type locality) form part of BOLD:ACF1201, along with

Fig. 77. Male *Loxophlebia postflavia*, Suriname, S.M. Klages [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/.

sequences for *L. bisigna* (above), suggesting that the two could be forms of the same species. If that is confirmed, *L. postflavia* would be the older name and have precedence.

Identification. This distinctive species is the only one from Trinidad that is black with mostly transparent wings and the apex of the abdomen yellow-orange. Cerda (2008) saw 28 specimens from French Guiana, and since he does not mention sexual dimorphism, we assume there is none. Alternatively, if *L. postflavia* and *L. bisigna* are forms of the same species, *postflavia* may be restricted to the male.

Biology in Trinidad. Nothing known.

Status in Trinidad. Although Fleming (1957) did not state this, by implication, his two specimens were collected at Simla.

MACROCNEME HÜBNER 1818

Type species: *Zygaena maja* Fabricius, 1787, TL 'America'. Our treatment is based on the revision of the genus by Dietz (1994). As Dietz (1994) stated: 'The phenotype is essentially the same for every species. The ground colour is brownish black, the hind legs are long and plumose, the wings are variously patterned with blue and/or green iridescence. All species possess white spots on the tips of the antennae, on the frons, at the base of the labial palpi, at the base of the wings (above and below), on the abdominal venter and pleura, and on the first abdominal tergite.'

As noted by Kaye (1913), members of the genus *Macrocneme* seem to be excellent mimics of fossorial or pompilid wasps, especially the genera *Salius* and *Pepsis*. *Macrocneme thyra* is wasp-like both in facies and in behaviour. The wings and abdomen possess a metallic blue-green sheen; the long hindlegs, more heavily scaled than is usual in ctenuchids, are extended downward and backward in flight. Kaye also noted that they wave their antennae and vibrate their wings rapidly when alighted, and that they

settle usually, like fossorial wasps, on ground, bank or leaf.

Kaye and Lamont (1927) recognized three species of *Macrocneme* from Trinidad: *M. lades* (Cramer), *M. thyra* Möschler and *M. eacus* (Stoll) (an unavailable name, see under *Poliopastea errans*). However, it is clear that they were mixing species up, and none of their records can be accepted at face value except by examination of voucher material. Fleming (1957) recognized two species of *Macrocneme*: *M. thyra*, and *M. spinivalva* Fleming and three species which he placed in *Macrocneme*, which are now placed in *Poliopastea*. Dietz (1994) revised the genus and recognized *M. aurifera* Hampson (= *M. spinivalva*), *M. lades* (= *M. aurata*), *M. thyra* (= *M. thyra intacta*) and *M. thyridia* Hampson from Trinidad. Cerda (2008) only examined Trinidad material of *M. thyra*. The treatment here follows that of Dietz (1994). It should be noted that the following are recorded from nearby in Venezuela or Guyana by Dietz (1994): *M. adonis* Druce, *M. semiviridis* Druce, *M. coerulescens* Dognin, *M. durcata* Dietz, and *M. orichalcea* Dietz, and could occur in Trinidad.

Macrocneme thyra is the most common *Macrocneme* species in Trinidad, *M. lades* is also frequent, but *M. thyridia* and *M. aurifera* are at best occasional. The first two are regularly found at flowers by day and attracted to lights at night, and probably the same is true for the other two, although there are not enough records with details to assess this.

Identification. This is a challenging genus, and dissection of the genitalia is necessary to confirm identifications. At this time, we are uncertain as to how the DNA barcodes will reflect our treatment, so more sequences, particularly of the less common species would help. We worked from the material in MJWC, comprising males of all four species confirmed by examination of the genitalia, three females of *M. thyra* confirmed by DNA barcodes (Fig. 79), and additional females provisionally associated with three of the four species. The following comments are considered robust for *M. thyra* and *M. lades* in Trinidad (but not elsewhere) but less so for *M. thyridia* and *M. aurifera*.

There is little sexual dimorphism in the four Trinidad species, mostly the ventral surface of the abdomen being more extensively white in males. The sexes cannot be reliably separated in images of living moths, although the pectinations of the female antennae are slightly shorter.

Both sexes of *M. lades* have a uniform green-bronze dorsal and lateral abdomen, the ground colour of the wings is browner than in the other species, and the metallic markings on the wings are consistently green-bronze. *Macrocneme thyridia* has a uniformly blue-bronze dorsal and lateral abdomen, and the metallic wing markings are blue-green. *Macrocneme thyra* and *M. aurifera* both have the abdomen black with contrasting blue-bronze dorsal and lateral lines, and the wing markings metallic blue or green. The ventral abdomen is extensively white in male *M. thyra* making them relatively easy to recognise. However, this is reduced to a narrow ventral line in female *M. thyra* and male *M. aurifera* – as it is in *M. thyridia* and *M. lades*. We have not identified any females from Trinidad as *M. aurifera*, so hesitate to suggest how the females of *M. thyra* and *M. aurifera* may be separated, but it may be that they cannot be separated on habitus. We are not confident that our treatment represents the final word on this challenging genus in Trinidad, so user beware!

Macrocneme albitarsia Hampson (see *Poliopastea plumbea*)

***Macrocneme aurifera* Hampson, 1914**

Fig. 78, 80, Appendix Fig. 9.

OD: Hampson 1914: *Macrocneme aurifera*, TL Peru.

TT: *Macrocneme spinivalva* Fleming: Fleming (1957) [synonym]

Macrocneme aurifera Hampson: Dietz (1994)

Historical notes. Fleming (1957) described *M. spinivalva* from Trinidad, but Dietz (1994) synonymized it with *M. aurifera* Hampson (type NMHUK, ♀ Peru), although he used the name *spinivalva* to label material in NHMUK. Dietz (1994) listed *M. aurifera* material from Arima Valley (USNM), Ariapite Valley (NHMUK, USNM); Hololo Mt. Road (Carnegie Museum); Maracas Valley, 150 ft (NHMUK); Mt. Tucuche, 2-3000 ft (NHMUK); St. Ann's Valley (NHMUK); Tabaquite (NHMUK); and Trinidad (NHMUK) (NHMUK material is included in the Appendix listing). W.J. Kaye must have seen specimens of this species as it is represented with contemporary material in NHMUK, but they would have been understandably misidentified. MJWC's material was identified from Dietz (1994).

Taxonomic issues. Fleming (1957) described *M. spinivalva* from Trinidad based on six males and 14 females; he indicates that the holotype and paratype are in AMNH, and three male and nine female paratypes were returned to NHMUK. When Dietz (1994) synonymized *M. spinivalva* with *M. aurifera*, no males of *M. aurifera* from Peru were available to him, but he was able to associate the sexes based on a mating pair in Fleming's type series. Dietz (1994) also noted that the females in Fleming's type series were a mixed series: the allotype appears to be *M. lades*, three others are either *M. thyra* or *M. thyridia* (listed separately in Annex).

Identification. See under *Macrocneme* above.

Biology in Trinidad. It is expected that this species will be found to fly both by day and by night, when more information is available.

Status in Trinidad. An occasional species, with no records as yet from the south of the island.

***Macrocneme lades* (Cramer, 1776)**

Figs. 78, 79, 81–84, Appendix Figs. 10, 31.

OD: Cramer 1776: *Sphinx lades*, TL Suriname.
Walker 1854: *Euchromia aurata*, TL ? [synonym according to Dietz (1994)]

TT: *Macrocneme lades* (Cramer): Kaye (1901) [misidentification], Kaye and Lamont (1927) [mixed species], Dietz (1994)

Historical notes. Kaye (1901) recorded this species based on specimens in NHMUK taken by C.W. Ellacombe; the only *Macrocneme* sp. in NHMUK taken by C.W. Ellacombe is *M. thyra*. Kaye and Lamont (1927) listed several specimens and considered this 'a most variable species', but their material is a mixture of species including *M. lades* (e.g. four specimens in coll. Lamont, UWIZM, as this species appear to be a mixture of species). Fleming (1957) did not recognize *M. lades*, but it seems likely that it was present amongst his material of other species. Dietz (1994) listed material from Manzanilla, Caparo, Ariapite, Port of Spain, and Cedros. MJWC's material (genitalia, Appendix Fig. 31) was identified from Dietz (1994).

Taxonomic issues. Dietz (1994) found that a distinctive 'brown' phenotype occurs in eastern Venezuela and the Guianas, and by implication in Trinidad. He added 'In this brown phenotype, the apex of wings is slightly pallescent. Iridescence is usually bronze or sometimes green, but

Fig. 78. Male abdomens of the Trinidad *Macrocneme* spp., above in dorso-lateral view, below in ventral view; from left to right *M. lades*, *M. thyra*, *M. aurifera*, *M. thyridia*. For other views and specimen details see Appendix Figs. 9–13.

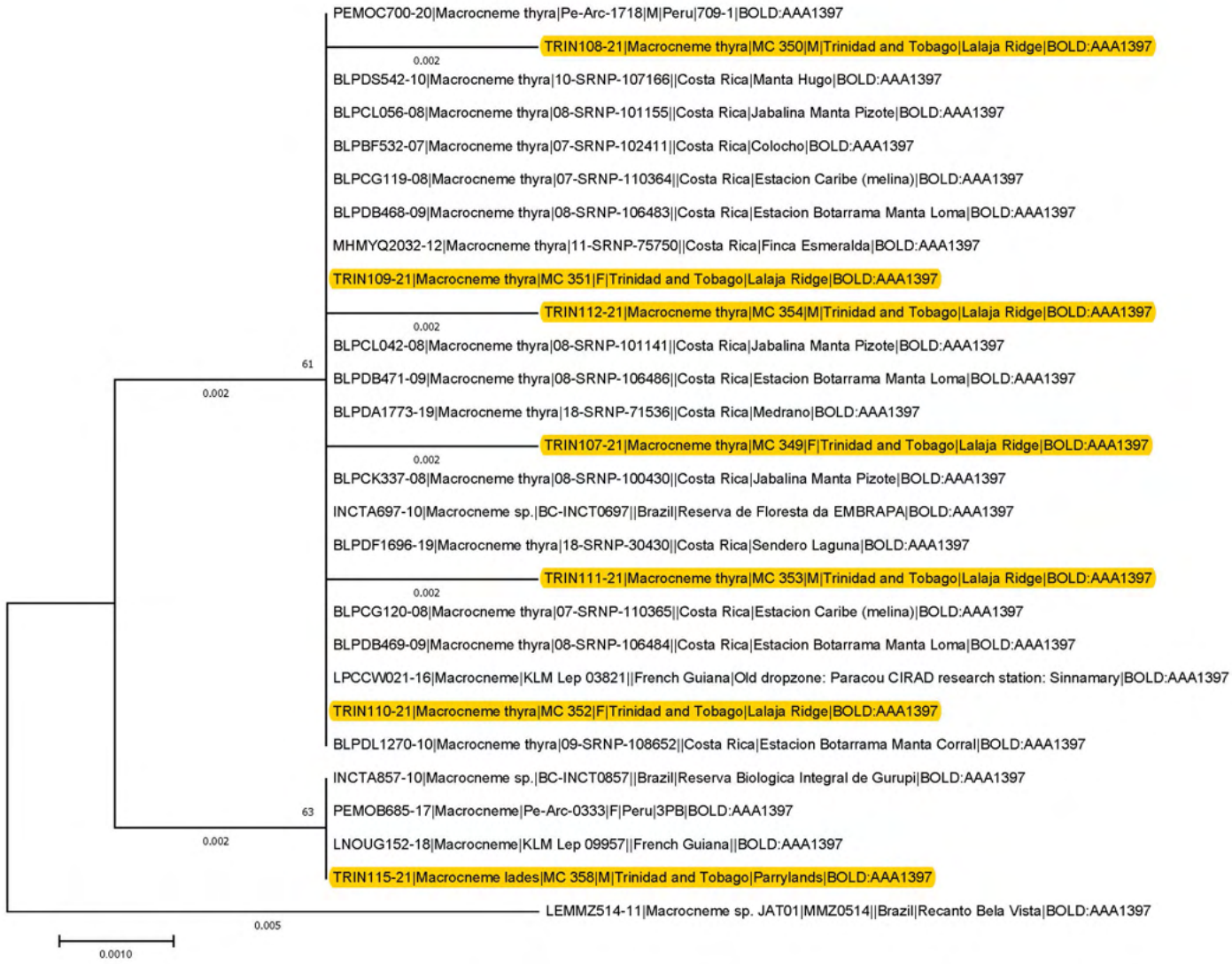

Fig. 79. Similarity tree for BOLD:AAA1397, including all available Trinidad sequences (highlighted). The main cluster, including TRIN108-21 to TRIN112-21 and probably TRIN107-21, is considered to represent *T. thyra* and the smaller cluster at the bottom including TRIN115-21 is considered to represent *T. lades*. The tree was inferred using the Neighbor-Joining method (Saitou and Nei 1987). The optimal tree is shown. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (500 replicates) are shown next to the branches (Felsenstein 1985). The tree is drawn to scale, with branch lengths (next to the branches) in the same units as those of the evolutionary distances used to infer the phylogenetic tree. The evolutionary distances were computed using the Maximum Composite Likelihood method (Tamura et al. 2004) and are in the units of the number of base substitutions per site. This analysis involved 28 nucleotide sequences. Codon positions included were 1st+2nd+3rd+Noncoding. All positions containing gaps and missing data were eliminated (complete deletion option). There was a total of 545 positions in the final dataset. Evolutionary analyses were conducted in MEGA X (Kumar *et al.* 2018).

Fig. 80. Male *Macrocneme aurifera*, Port of Spain, Upper Lady Chancellor Road, by day, 28.i.1979; 38 mm.

seldom blue. There is a large range in reduction of wing iridescence, with transverse median fascia sometimes completely absent.' This brown phenotype had been named *M. aurata* Walker, but Dietz (1994) concluded that this is a synonym of *M. lades*, although he did use the name *M. aurata* for material he labelled in British collections. Although Dietz (1994) was not explicit, our treatment is based on all Trinidad material of *M. lades* being of this brown phenotype, with the dorsal and lateral abdomen a distinctive uniform green-bronze. This assumption should be tested based on dissections and DNA barcodes from additional material.

One Trinidad male was sequenced (MJWC-358) and is included in the same BIN as Trinidad specimens of *M. thyra*

Fig. 81. Male *Macrocneme lades*, Curepe, MVL, 1.x.1979; 32 mm.

Fig. 82. Female *Macrocneme lades* (assumed), Parrylands Oilfield, MVL, eupatorium flowers, 16.x.1980; 33 mm.

Fig. 83. Male *Macrocneme lades* (assumed), Penal, at light, 13.xii.2014, K. Sookdeo; ©, with permission.

Fig. 84. Mating *Macrocneme lades* (assumed), female above, Blanchisseuse, 20.xi.2021, G. White; ©, with permission.

(BOLD:AAA1397) but in a separate cluster within the BIN (Fig. 79. This subcluster includes material from Argentina, Brazil (Sao Paulo and Maranhão), Peru, Venezuela and French Guiana, i.e. most of South America.

Identification. See under *Macrocneme* above.

Biology in Trinidad. Adults are attracted to flowers by day and to light by night. Mating has been observed by day (Fig. 84).

Status in Trinidad. An occasional species in forested and suburban habitats.

Macrocneme eacus (Stoll) (see *Poliopastea plumbea*)
Macrocneme plumbea Hampson (see *Poliopastea plumbea*)
Macrocneme spinivalva Fleming (see *Macrocneme aurifera*)

***Macrocneme thyra* Möschler, 1883**

Figs. 78, 79, 85–87, Appendix Figs. 11, 32.

OD: Möschler 1883: *Macrocneme thyra*, TL Suriname
Draudt 1915: *Macrocneme thyra intacta*, TL Trinidad [synonym]

TT: *Macrocneme thyra* Möschler: Kaye (1901), Zerny (1912), Blest (1964), Dietz (1994), Cerda (2008), Cock (2017)
Macrocneme thyra Möschler subsp. 1: Hampson (1898)
Macrocneme guyanensis Dognin: Hampson (1914) [misidentification]
Macrocneme thyra intacta Draudt: Draudt (1915–1917), Beebe and Kenedy (1957) [synonym]

Historical notes. Hampson (1898) treated *M. thyra* as having subspecies: subsp. 1 was noted to have the forewing with the blue-green at base entire, and very little white on inner area of fore wing below or on base of hind wing, and was based on a male in NHMUK from Trinidad collected by [H.] Caracciolo, and another from Colombia. Kaye (1901) referred to Hampson (1898) and mentioned 'specimens' (in error for one male) in NHMUK collected by Caracciolo. There is only one specimen of *Macrocneme* collected by Caracciolo in NHMUK, and it is a male *M. thyra*. Draudt (1915–1917) introduced the name *intacta* as a form of *M. thyra*, based on Hampson's (1898) *M. thyra* subsp. 1, and hence, Cariacciolo's specimen from Trinidad in NHMUK is the type of this subspecies name.

Kaye and Lamont (1927) repeated the information in Kaye (1901), added a record from Guaico (18.iv.1915, N. Lamont) and noted that there are specimens in Kaye's collection. The Guaico specimen is in NMS and appears to be a male *M. thyra*. The Kaye material may be the two males in NHMUK mentioned in the last paragraph, or the six males and six females in MGCL from his collection.

Fleming (1957) recognized one male from Tabaquite in NHMUK as *M. thyra thyra,* and 137 males and seven females from Simla as *M. thyra intacta*, although he is clear that he could see no difference in the male genitalia between the two subspecies. Fleming (1957) referred to an additional six male and three females in NHMUK from Port of Spain, Guaico, Ariapite Valley, and St. Ann's (see Appendix listing). Dietz (1994) made *M. thyra intacta* a synonym of *M. thyra*, noting that it was within the range of variation of this species and the male genitalia are essentially identical. He listed material from Guaico; Ariapite Valley; Simla; Upper Arima Valley; Carenage; Heights of Aripo; Guanapo Road; Hololo Mountain Road; Maraval; Mt Tucuche; Port of Spain; St Ann's; St Ann's Valley; St Augustine, and Tobago. MJWC's material was identified from Dietz (1994).

Hampson (1914) recorded *M. guyanensis* Dognin from Trinidad, listing two males in NHMUK collected by [W.J.] Kaye. These two males were identified by Dietz as *M. thyra*, although *M. guyanensis* itself was made a synonym of *M. thyridia* (Dietz 1994).

Taxonomic issues. Six DNA barcodes from Trinidad and identified as *M. thyra* are part of BOLD:AAA1397, a wide-ranging BIN. The BIN has several clusters within it (see *M. lades* above and Fig. 79). We consider the large cluster within BOLD:AAA1397 to be *M. thyra*; in addition to the six Trinidad sequences, it includes material mostly identified as *M. thyra* from Costa Rica (15), Colombia (1), French Guiana (1), Peru (1), and Brazil, Pará (1).

Identification. See under *Macrocneme* above. Dietz (1994) wrote '*The colour of the wing iridescence is usually consistent within a population, but may vary between populations from golden-green, to green, to blue-green,*

Fig. 85. Male *Macrocneme thyra*; **top**, Cumaca Road, 4.6 miles, MVL, 18.vii.1981, 37 mm; **middle**, Lalaja, on eupatorium flowers, 28.ix.2019 (J. Morrall) [DNA MJWC-350], 37 mm; **bottom**, as middle [DNA MJWC-353], 38 mm.

Fig. 86. Female *Macrocneme thyra*; **top**, Lalaja, on eupatorium flowers, 28.ix.2019 (J. Morrall) [DNA MJWC-349], 37 mm; **middle**, as top [DNA MJWC-351], 37 mm; **bottom**, as top [DNA MJWC-352], 37 mm.

to deep blue. Sometimes, within a single population, combinations of colours occur, as in three specimens with similar data from Simla, Arima Valley, Trinidad. In one both wings are green, in a second they are blue, and in the third the forewing is green and the hindwing blue. Most examples of thyra have a patch of metallic scales in the discal area of the hindwings, but in specimens from the Guianas and eastern Venezuela this iridescence is absent, or occasionally present only as a few scattered scales. The dorsum [of the abdomen] can be either iridescent green or have the metallic scales restricted to three longitudinal striae. There are two sublateral lines extending the length of the abdomen which are broader than the thin mid-dorsal line that may obsolesce beyond the middle. In the females the abdominal iridescence is often duller and darker than in males, making the striae appear faint or absent. These striae are particularly notable

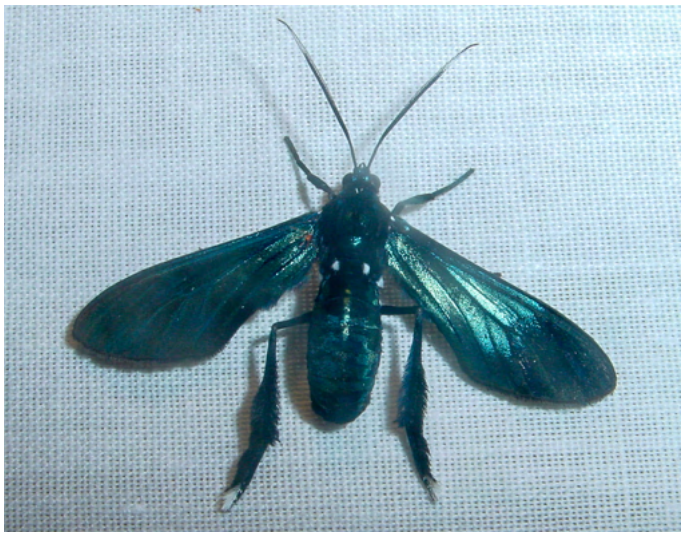

Fig. 87. Female *Macrocneme thyra* (assumed), Arima Valley, Asa Wright Nature Centre, at light, 6.iii.2007, S. Daniel (iNaturalist observation 69962122); ©, with permission.

in the Trinidad populations (=intacta) and in individuals from the Guianas and Venezuela. Where thyra occurs sympatrically with lades, the two species share similar patterns in variation. Both are browner in ground color in the Orinoco and Guiana drainages than in other parts of their range. In the Guianas and eastern Venezuela, where thyra is heavily white on the underside, lades has the white on the venter attenuating caudally.'

Fig. 85 shows three males from Trinidad (confirmed by genitalia or DNA barcode) and Fig. 86 shows three females (confirmed by DNA barcode). The sequenced specimens all fall within the cluster of BOLD:AAA1397 referred to under 'Taxonomic issues' above. It is clear that the metallic colouring can be blue or green, and the extent and degree of interruption on both wings is variable. However, although Dietz wrote 'Where *thyra* occurs sympatrically with *lades*, the two species share similar patterns in variation' we have separated *M. thyra* and *M. lades* on habitus, as described under the heading *Macrocneme* above, and supported by limited male dissections. This treatment certainly merits further investigation based on genitalia and DNA barcodes, and voucher specimens should be kept for all observations.

Biology in Trinidad. This species flies both by day and by night (Beebe and Kenedy 1957, author's observations). By night, males are readily attracted to light, particularly in the early evening before 22.00 h, but females are more frequently seen by day than by night (Beebe and Kenedy 1957, author's observations).

Status in Trinidad. A common and widespread species.

***Macrocneme thyridia* Hampson, 1898**

Figs. 78, 88–89, Appendix Fig. 12.

OD: Hampson 1898: *Macrocneme thyridia*, TL Suriname [♀ NHMUK]

TT: *Macrocneme thyridia* Hampson: Dietz (1994)

Historical notes. This species was first recorded from Trinidad when Dietz (1994) listed material from Ariapite Valley [NHMUK]; Fondes Amandes [NHMUK]; Port of Spain, Emperor Valley [OUMNH]; St Ann's Valley [NHMUK, USNM]; Trinidad (Kaye) [NHMUK]. MJWC did not locate this material in NHMUK, and although he did locate the OUMNH specimen, Dietz had not labelled it. Earlier authors would have seen some of this material which would have been lumped with *M. thyra* or another of the species treated above. MJWC's material was identified from Dietz (1994).

Taxonomic issues. According to Dietz (1994), this species may be easily confused with *M. lades* and *M. thyra*. They occur sympatrically and are similarly variable in colour and pattern of the wing iridescence. Usually the forewing in *M. thyridia* has a concentration of green scales (sometimes blue) at the base of the wing accompanied by a similar concentration on the inner margin. The only dependable method to diagnose *M. thyridia* is to examine the genitalia. More material and DNA barcodes from Trinidad are needed to better understand this species, and whether there are

Fig. 88. Male *Macrocneme thyridia*, Curepe, MVL, 2.xi.1979; 33 mm.

Fig. 89. Female *Macrocneme thyridia* (assumed), Arima Valley, Simla, MVL, 28.ix.1981; 37 mm.

useful diagnostic features.
Identification. See under *Macrocneme* above.
Biology in Trinidad. It is anticipated that this species flies by day and night, like other members of the genus.
Status in Trinidad. An uncommon species, with most records from the the north-west of the island.

Macrocneme vittata (Walker) (see *Poliopastea vittata*)
Mesothen aurantegula Jones (see *Loxophlebia diaphana*)
Metaloba nona Druce (see *Calonotos aterrima tripunctata* and *C. helymus craneae*)
Mydropastea chrysonota Hampson (see *Phoenicoprocta vacillans* ♀)

***Myrmecopsis* Newman, 1850**
Type species: *Myrmecopsis eumenides* Newman, 1850 (TL Brazil, Amazon, Ega) by monotypy. *Myrmecopsis eumenides* is a junior subjective synonym of *Pseudosphex polistes* Hübner, 1818 (Kirby 1892, Watson *et al*. 1980). Cerda (2008) treats *M. eumenides* from French Guiana and illustrates the male genitalia.

***Myrmecopsis kenedyae* (Fleming, 1957)**
Figs. 90–93. For figures of the details of body and male genitalia, see Cock and Laguerre (2022).
OD: Fleming 1957: *Pseudosphex kenedyae* Fleming, TL Trinidad.
TT: *Pseudosphex kenedyae* Fleming: Fleming (1957), Beebe and Kenedy (1957)
Myrmecopsis kenedyae (Fleming): Cock and Laguerre (2022).
Historical notes. Fleming (1957) described this species

Fig. 90. Dorsal view of male Euchromiina that mimic *Agelaia* spp. wasps (Polybiinae); **left**, *Myrmecopsis kenedyae*; **centre**, *Pleurosoma trinitatis*; **right**, *Sphecosoma aurantiipes*.

Fig. 91. Male *Myrmecopsis kenedyae*, Arima Blanchisseuse Road, milestone 9.75, Textel Road, eupatorium flowers, 11.x.1979; 25 mm.

Fig. 92. Female *Myrmecopsis kenedyae*, Lalaja Ridge, to *Heliotropium*, 6.v.1995; 25 mm.

Fig. 93. *Myrmecopsis kenedyae*, Lalaja Ridge, to *Heliotropium*, 6.v.1995, M.J.W. Cock.

from Trinidad, and the holotype can be seen at AMNH (2022). Identified by comparison with the two paratypes (♂ Trinidad) in NHMUK.

Taxonomic issues. No public sequences in BOLD. Cock and Laguerre (2022) transferred this species from *Pseudosphex* (Ctenuchina) to *Myrmecopsis*.

Identification. This is one of three yellow-brown and black mimics of *Agelaia* polybiine wasps in Trinidad, the other two being *Pleurosoma trinitatis* and *Sphecosoma aurantiipes* (Fig. 90). *Myrmecopsis kenedyae* is the only one of the three with the end of the forewing cell and cells distal to this with a strong dusky tint (Figs. 91–92). Sexes almost identical.

Biology in Trinidad. The type series of 15 males and one female was collected at heliotrope at Simla, mainly in the dry season: January (4), February (6), April (3), June (1), and December (2), and an image of the holotype is available online (AMNH 2022). The individuals attracted

to heliotrope are almost entirely male, flying from 0600h to 1815h (Beebe and Kenedy 1957). MJWC has also captured one male at eupatorium flowers. This distasteful moth is a Müllerian mimic of the stinging Polybiinae social wasp '*Stelopolybia pallipes* var. *anceps* (Saussure)' according to Beebe and Kenedy (1957), who detailed morphological and behavioural similarities. *Angelaia pallipes* (Olivier) and *A. multipicta* (Haliday) (= *anceps* Saussure) are two different wasp species, but probably they were referring to the latter.
Status in Trinidad. A fairly common and widespread species in forested areas, but normally only seen when attracted to heliotrope.

NYRIDELA LUCAS 1857

Type species *Isanthrene chalciope* Hübner, 1831, TL Cuba.

Nyridela acroxantha (Perty, 1833)

Fig. 94.
OD: Perty 1833: *Glaucopis acroxantha*, TL Tropical Brazil.
TT: *Nyridela chalciope* (Hübner): Kaye and Lamont (1927), Fleming (1957) [misidentification]
Historical notes. Kaye and Lamont (1927) recorded a specimen as *N. chalciope* from St. Ann's Valley, which MJWC examined in MGCL. Fleming (1957) had no additional records. Identified by comparison with the NHMUK series.
Taxonomic issues. *Nyridela acroxantha* (Perty, 1833) was described from tropical Brazil, *N. chalciope* (Hübner, [1831]) from Cuba, and *N. xanthocera* (Walker, 1856) from Brazil. *Nyridela acroxantha* is described as having black antennae, although Hampson (1898) described them as yellow distally, while the other two have yellow antennae. Druce (1881–1890) pointed out that the type in OUMNH has no locality data, and treats it as the Central American species. Hampson (1898) treated *N. acroxantha* as a synonym of *N. chalciope*, apparently overlooking the difference in antennae colour, but Zerny (1931a) and more recently Cerda (2008) treated both as valid. Kaye and Lamont (1927) and Fleming (1957) followed Hampson (1898) regarding this synonymy.

Cerda (2008) was unable to distinguish the three species based on the male genitalia. Public sequences in BOLD are predominantly from Costa Rica and cluster in two BINs. BOLD:AAA1414 has yellow antennae and includes a specimen from Jamaica, and so should be representative of *N. chalciope.* BOLD:ABY8418 has brown antennae, yellow distally and includes a specimen from French Guiana with black antennae, yellow distally, suggesting this BIN could be treated as *N. acroxantha*, leaving the status of *N. xanthocera* unresolved, but probably a synonym of *N. chalciope*, given that they both have yellow antennae. We therefore follow Cerda (2008) and treat the species in Trinidad as *N. acroxantha*. However, ML notes two DNA barcode species in French Guiana, 1.9% apart, so the situation can be expected to change again.
Identification. This is a large species with transparent wings with back margins. There is a distinctive black bar running from the costa across the end of the cell to the tornus. The sexes are similar.
Biology in Trinidad. MJWC's only specimen was attracted to heliotrope.
Status in Trinidad. A rare species in Trinidad, with two records from the Northern Range. There is a further specimen in UWIZM, but details are not to hand.

ORCYNIA WALKER 1854

Type species: *Euchromia calcarata* Walker, 1854, TL Brazil, Santarem.

Fig. 94. Male *Nyridela acroxantha*, Morne Bleu, Textel Installation, to *Heliotropium*, 9.x.1980; 42 mm.

***Orcynia calcarata* (Walker, 1854)**
Figs. 95–97.
OD: Walker 1854: *Euchromia calcarata*, TL Brazil, Santarem.
Historical notes. A new record for Trinidad. Identified by comparison with the type (NHMUK, Brazil, Santarem) and NHMUK series.
Taxonomic issues. Sequences from French Guiana and Peru form BOLD:AAU7938.
Identification. No sexual dimorphism. This large species appears to be a wasp mimic, like no other Trinidad species, with uniformly brown wings and large yellow spots on the body.
Biology in Trinidad. Julius Boos gave MJWC two males that he caught at lights in Parrylands, and Tarran Maharaj photographed an active individual by day, noting the resemblance to a Jack Spaniard wasp (*Polistes* spp., Vespidae) (Fig. 97).
Status in Trinidad. A rare species in Trinidad, with three records from Parrylands Oilfield, and one from South Oropouche.

Fig. 95. Male *Orcynia calcarata,* Parrylands Oilfield, at light, ii.1980 (J.O. Boos); 55 mm.

Fig. 96. Female *Orcynia calcarata,* Parrylands Oilfield, 13.ix.1980; 54 mm.

Fig. 97. *Orcynia calcarata,* South Oropouche, Mon Desir, 28.vii.2021, T.P. Maharaj (iNaturalist observation 88958328); ©, under CC-BY-NC.

***PHEIA* WALKER 1854**
Type species: *Glaucopis albisigna* Walker, 1854, TL Honduras.

Pheia beebei Fleming (see *Xanthyda beebei*)

***Pheia toulgoeti* Cerda, 2008**
Fig. 98.
OD: Cerda 2008: *Pheia toulgoeti*, TL French Guiana.
Historical notes. A new record for Trinidad. MJWC initially identified this species as *P. albisigna* (Walker, 1854) by comparison with the type (Honduras) and NHMUK series. However, although *P. toulgoeti* is very similar, it has the ventral abdominal segment 1 black with a white border, whereas in *P. albisigna* this area is pure white (Cerda 2008). On this basis, all Trinidad material is *P. toulgoeti*.

Fig. 98. Male *Pheia toulgoeti*, Parrylands Oilfield, MVL, 25.vii.1981; 33 mm.

Taxonomic issues. A sequence from French Guiana in BOLD indicates this species should be BIN ACN8935.
Identification. This species has transparent wings with broad black forewing margins and bar at the end of the cell. The conspicuous red spot at the base of the dorsal forewing, the white rectangle on the posterior margin of the thorax and the wasp-like constriction of the abdomen at segments 2–4, accentuated by a white ventro-lateral spot, will facilitate recognition of this species.
Biology in Trinidad. All four Trinidad specimens were attracted to light.
Status in Trinidad. A rare species with records from forested areas in the north (Cumaca Road) and south (Parrylands Oilfield).

***Pheia utica* (Druce, 1889)**
Figs. 99–100.
OD: Druce 1889: *Dycladia utica*, TL Guerro, Mexico.
Pheia utica (Druce): Cock (2017)
Historical notes. There are two Tobago specimens from W.J. Kaye's collection in MGCL, but Kaye and Lamont (1927) did not record this species from Trinidad. Cock (2017) recorded this species from Tobago. There are still no Trinidad records. Identified by comparison with the type (NHMUK, ♂ Mexico) and NHMUK series.
Taxonomic issues. Cerda (2008) treated this species as occurring south to the Amazon. His figure of the female has orange colouring, where MJWC's Tobago specimen (Fig. 100) has red colouring. In both sexes the subdorsal metallic blue markings are paler / more developed in the Tobago examples. There is only one available DNA barcode sequence identified as *P. utica*, MILA 2078 from Brazil, Maranhão, BIN BOLD:ACV3367, so DNA barcodes cannot be used to address this yet. The closest species

Fig. 99. Male *Pheia utica*, Tobago, 16.viii.1924 (C.L. Withycombe) [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/

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is *P. daphaena* Hampson (TL Dominica, St. Lucia), from Martinique (3.8% different), BOLD:ACV3242.
Identification. Of the Trinidad fauna, this species comes closest to *Loxophlebia bisigna*, but differs from that species in that the bar at the end of the forewing cell is wider, there are obvious red basal markings on the dorsal forewing, the paired white subdorsal marks are restricted to the first abdominal segment, and there is a row of subdorsal metallic blue spots in line with these.
Biology in Trinidad. MJWC's only specimen was taken at mercury vapour light.
Status in Trinidad. None of the Tobago specimens are clearly associated with forest, suggesting this species may be associated with suburban or disturbed areas

***PHOENICOPROCTA* DRUCE, 1898**
Type species *Phoenicoprocta metachrysea* Druce, 1898, TL French Guiana, by monotypy. Dyar (1915) made *P. metachrysea* a synonym of *P. vacillans*, based on 'a

Fig. 100. Female *Pheia utica*, Tobago, Scarborough, Marden House, MVL, 9.i.1982; 25 mm.

remarkably variable series bred from larvae by Mr. H.W.B. Moore in British Guiana'. Unfortunately, no details of the life history were recorded. This genus has also been referred to as *Phoenicoprocta* Hampson, 1898 but Druce used Hampson's name prematurely, and so has precedence (Watson *et al*. 1980).

***Phoenicoprocta vacillans* (Walker, 1856)**

Figs. 101–103.

OD: Walker 1856: *Eunonia vacillans*, TL Valley of the Amazon.
Rothschild 1912: *Antichloris trinitatis*, TL Trinidad [synonym]
Strand 1915: *Phoenicoprocta trinitatis*, TL Trinidad [synonym]
Strand 1915: *Phoenicoprocta vacillans ab. nigropeltata*, TL Trinidad [synonym]
Kaye 1920: *Mydropastea disparata*, TL Trinidad [synonym]

TT: *Antichloris trinitatis* Rothschild: Rothschild (1912) TL, Draudt (1915–1917 pp. 136, 197), Kaye and Lamont (1927) [synonym]
Autochloris trinitatis (Rothschild): Hampson (1914) [synonym]
Phoenicoprocta trinitatis Strand: Strand (1915) TL, Draudt (1915–1917), Strand (1927), Kaye and Lamont (1927) [homonym and synonym]
Phoenicoprocta vacillans ab. nigropeltata Strand: Strand (1915) TL, Strand (1927) [synonym]
Phoenicoprocta vacillans nigropeltata Strand: Draudt (1915–1917) [synonym]
Mydropastea disparata Kaye: Kaye (1920), Bland (2010) [synonym]
Mydropastea chrysonota Hampson: Kaye and Lamont (1927) [synonym]
Phoenicoprocta rubiventer Hampson: Kaye and Lamont (1927) [misidentification / possible synonym]
Calonotos helymus (Cramer): Kaye and Lamont (1927), Laurence (2000) [misidentification]
Phoenicoprocta vacillans (Walker): Kaye and Lamont (1927), Fleming (1957), Blest (1964), Bland (2010)

Historical notes. This is a sexually dimorphic and variable species (Figs. 101–102), which has caused considerable confusion in the literature, until Fleming (1957) recognized the problems and created several synonyms, some of which are used here to refer to sex-specific forms. Males (Figs. 101) have hyaline wings with a black border and black bar at the end of the cell; the patagia are usually orange or orange and red, but sometimes black; the dorsal abdomen has metallic blue spots on the dorsum, while the remainder varies from all red to all black with just the anal tuft red; the ventral valve is usually a shade of red, but can be black, and always has a pale margin. Females (Figs. 102) are black with dorsal and lateral metallic green stripes on the abdomen reminiscent of *Calonotos helymus* and *C. aterrima*; the thorax is normally black, but can be extensively red; the wings are black or variably endowed with transparent areas.

Rothschild (1912) described ***Antichloris trinitatis* Rothschild** from a female collected at Caparo in January 1906 by S.M. Klages. The type is now in NHMUK. Kaye and Lamont (1927) repeated this information. Fleming (1957) recognized this species as a female form of *P. vacillans* (his form 1).

Strand (1915) described ***P. trinitatis* Strand** from a Caparo male and ***P. vacillans ab. nigropeltata* Strand** from two Caparo males. Kaye and Lamont (1927) repeated this information. Once it became clear that Rothschild's *trinitatis* was a *Phoenicoprocta*, Strand's *trinitatis* became an unavailable homonym, and in any case, the two are both synonyms of *P. vacillans* (Fleming 1957). The original description of *nigropeltata* was as an aberration, so it was not an available name until Draudt (1915–1917) used it as a form (equivalent to subspecies in that work) that it became an available name. Nevertheless, it too is synonymous with *P. vacillans* (Fleming 1957). Fleming (1957) treated Trinidad males with extensive red on the abdomen as form *trinitatis*

Strand, and those without as form *nigropeltata* Strand.

Kaye (1920) described ***Mydropastea disparata* Kaye** based on a male and two females from Trinidad: Rock 1.i.1918 and Palmiste 9.ix.1917. The specimen from Rock is labelled type in NMS and treated as the holotype by Bland (2010). It is a female *P. vacillans* form *chrysonota* (Fig. 102 B–D). A further female *P. vacillans* form *chrysonota* in NMS is labelled as co-type. A male with no data label from the Lamont collection labelled as cotype in NMS is a male *Autochloris almon* (see above). Based on the information in Kaye and Lamont (1927), specimens of Lamont's material collected before 1915 were all collected at Palmiste but incorporated into his collection with no data labels. Bland (2010) stated that Kaye and Lamont (1927) synonymized *M. disparata* with *M. chrysonota*, but this was not done explicitly, although that was presumably their intention as the data of the type series of *M. disparata* was included under *M. chrysonota*. In any case, Bland (2010) listed *M. disparata* as a junior subjective synonym of *P. vacillans* form *chrysonota* based on MJWC's identification. Hampson (1898) described and illustrated ***Paramya chrysonota*** from the Amazon (Itaituba); he referred to the type in NHMUK as a male, but it is a female. Fleming (1957) recognized *chrysonota* as a female form of *P. vacillans* and made it a junior synonym.

In all, Kaye and Lamont (1927) recorded this species from Trinidad under no less than six different names. Their inclusion of ***P. vacillans*** itself was based on specimens from Palmiste (7.x.1918, 12.ii.1921, N. Lamont) and San Fernando (i.1922, N. Lamont). The first of these is a male in NMS, the second has not been located and the third is a male in UWIZM. There are five males in coll. Lamont (UWIZM) as *P. vacillans*; all have a blue dorsal stripe on the abdomen and the red reduced to the caudal tuft, and represent form *nigropeltata*.

Kaye and Lamont (1927) also listed ***P. rubiventer* Hampson**, referring to a specimen from Palmiste (1913, N. Lamont). We have not located a specimen likely to represent this record. However, there are four males of form *trinitatis* Strand in Lamont's collection (UWIZM) labelled as *P. rubiventer*, which suggests this is how Kaye and Lamont (1927) applied the name. Druce (1881-1900) misidentified *P. sanguinea* (Walker, 1854) and the species he treated under this name was renamed *P. rubiventer* Hampson, 1898 (♂ type NHMUK, Panama). Butler (1877) illustrated Druce's species; it resembles form *trinitatis* Strand. Fleming (1957) suggested *P. rubiventer* was likely to be a synonym of *P. vacillans*, but took no taxonomic action on this. LepIndex (Beccaloni *et al*. 2018) treats *P. sanguinea* Druce (nec Walker) as a synonym of *P. insperata* (Walker, 1856) (♀ type, OUMNH, Brazil, Para), but this seems to be an unpublished synonymy. Further, Cerda (2008) made *P. insperata*, but not *P. sanguinea*, a synonym of *P. vacillans*. For the purposes of treating the Trinidad fauna, we consider the use of the name *P. rubiventer* by Kaye and Lamont (1927) to be a misidentification for *P. vacillans* form *trinitatis* Strand, and do not attempt to resolve its taxonomic status.

One further name listed by Kaye and Lamont (1927) is considered to refer to *P. vacillans*, i.e. their record of ***Calonotos helymus*** which they report without data from Palmiste (N. Lamont). As discussed under *C. helymus craneae* above, *C. helymus* only occurs in Trinidad as ssp. *craneae* with white spots on the wings (Figs. 10–13). There is a female *P. vacillans* form *trinitatis* Rothschild with an identification label as *C. helymus* from Lamont's collection in NMS, and we accept this as the basis for Kaye and Lamont's (1927) record of *C. helymus* from Trinidad. Kaye and Lamont (1927) included Hampson's (1898) brief description of the larva of *C. helymus* which feeds on coffee, but this refers to *C. aterrima*, which Hampson treated as a synonym. Laurence's (2000) record of *C. helymus* as an occasional pest of coffee in Trinidad is likely to be based on this as we have seen no voucher material for this record.

There is a male of *P. vacillans* form *trinitatis* Strand from W.J. Kaye's collection in MGCL, which Kaye had labelled as ***P. sanguinea***, although this name was not used in Kaye and Lamont (1927). We believe this was based on Druce's misinterpretation of *P. sanguinea* which was subsequently named *P. rubiventer* (see above). *Phoenicoprocta sanguinea* is not considered to be a Trinidad species as discussed under taxonomic issues below.

In Lamont's collection in UWIZM, there are 5♂ with predominantly red UPS abdomen as *Phoenicoprocta rubiventer*; 5♂ with blue dorsal stripe on abdomen and red caudal tuft as *Phoenicoprocta vacillans*; and 3♀ with varying development of hyaline markings as *Mydropastea chrysonota.* Fleming (1957) recognized three male forms and four females in Trinidad, and recorded his captures at Simla as: 19♂ form *nigropeltata* Strand; 10♂ form *trinitatis* Strand; 1♂ un-named form darker than form *trinitatis*; 2♀ form I (*trinitatis* Rothschild), 3♀ form II (*chrysonota*), one with crimson patagia; an unspecified number of ♀ form III with more extensive hyaline areas; and 3♀ form IV with the most extensive hyaline areas.

Taxonomic issues. Walker (1856) described *Eunonia vacillans* from the 'Valley of the Amazon' and the male holotype is in NHMUK. Hampson (1898) referred to the type locality as São Paulo (presumably São Paulo de Olivencia as Walker referred to the valley of the Amazon), and transferred the species to *Phoenicoprocta*. Fleming (1957) recognized that although *P. vacillans* is a sexually dimorphic variable species, it is also part of a complex which he could only separate based on male genitalia. Thus, all

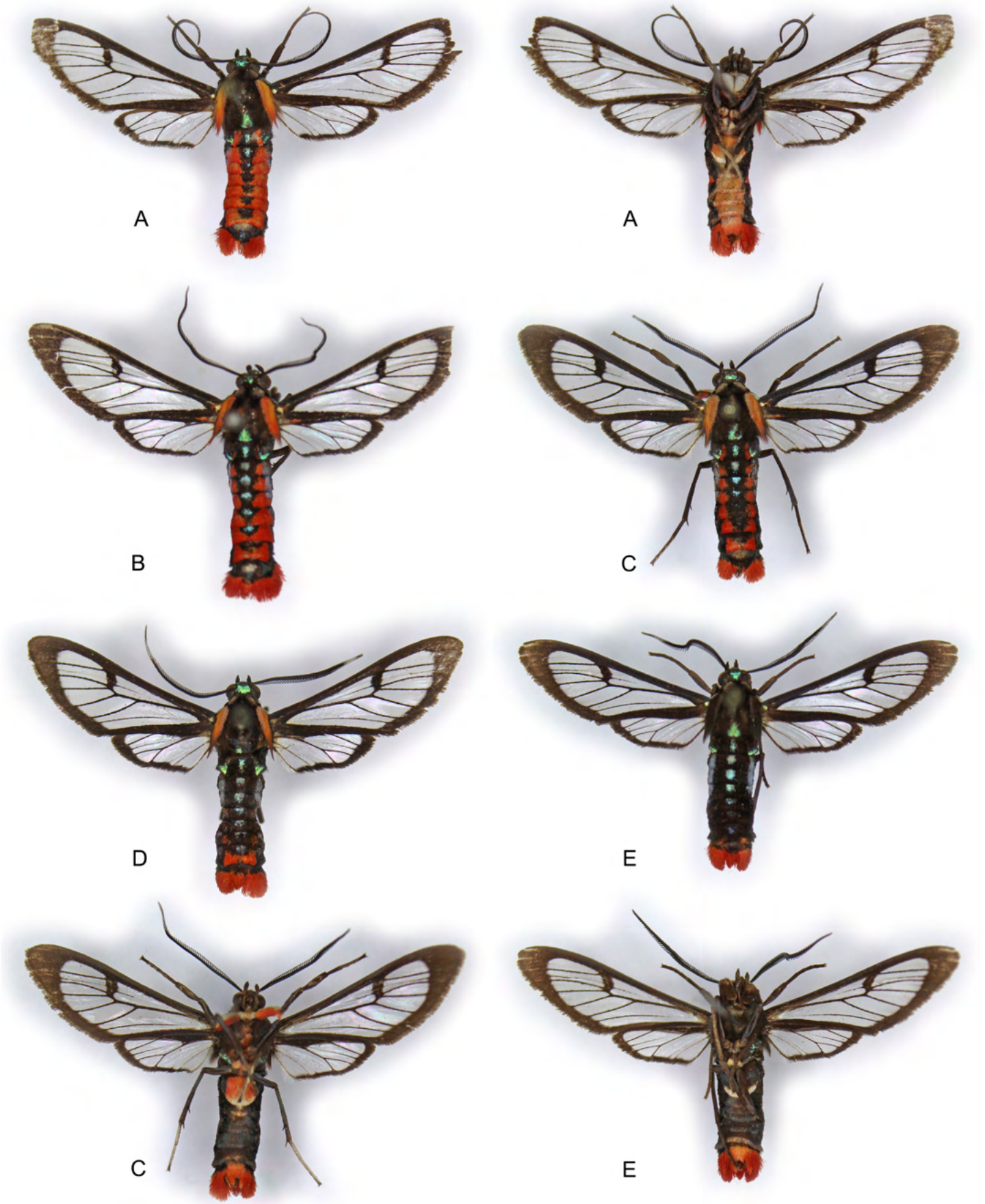

Fig. 101. Male *Phoenicoprocta vacillans.* **A**, Curepe, MVL, 13.xi.1978; 30 mm. **B**, Curepe, MVL, 13.ix.1979; 30 mm. **C**, f. *trinitatis* Strand, Curepe, at light, 8.ix.1978; 32 mm. **D**, Valencia Forest, MVL, 5.viii.1981; 30 mm. **E**, Caura Valley, Nr. Caura, MVL, 24.ix.1978; 33 mm.

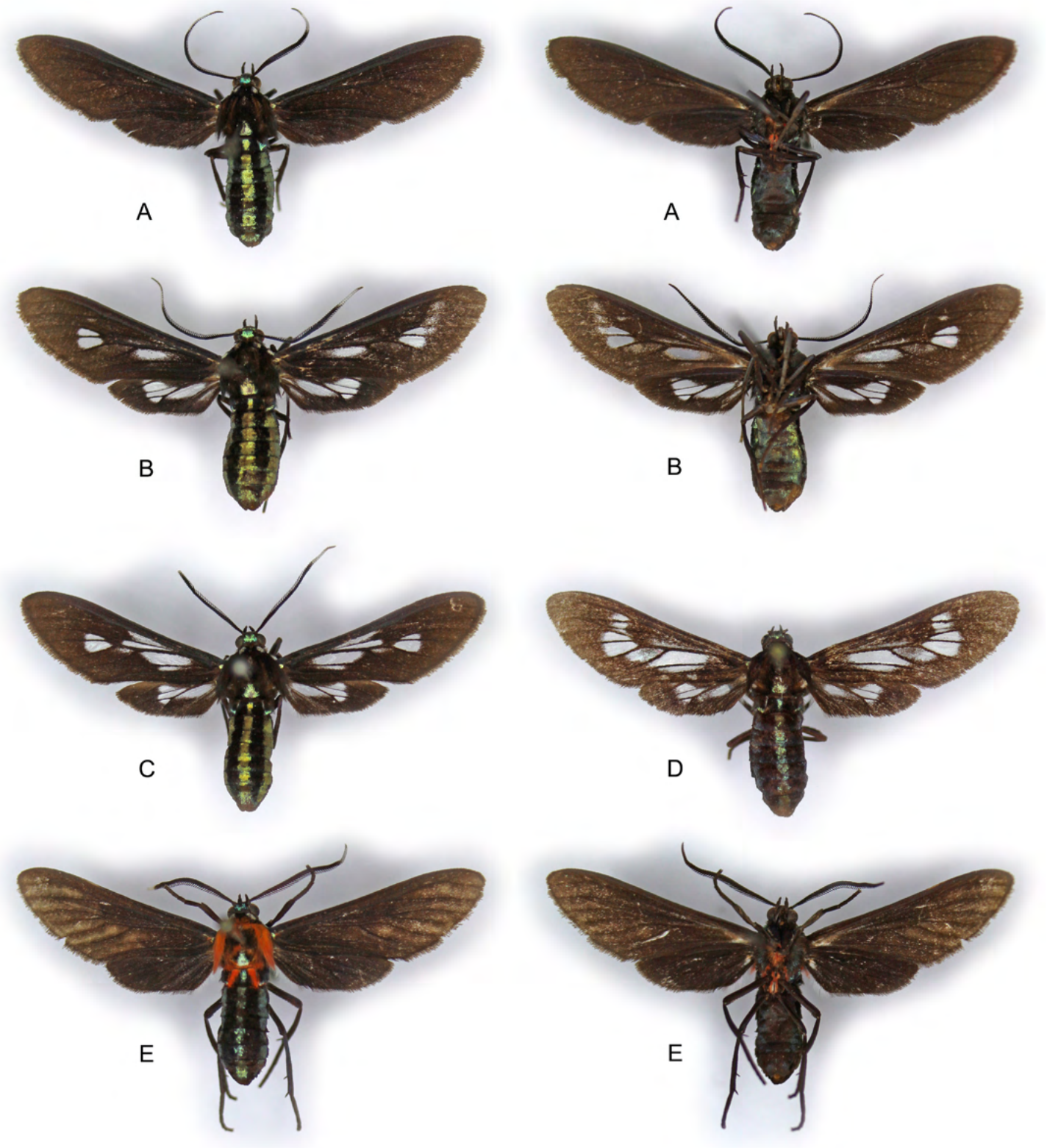

Fig. 102. Female *Phoenicoprocta vacillans*.. **A**, f. *trinitatis* Rothschild, Curepe, MVL, 13–20.ix.1981; 35 mm. **B**, f. *chrysonota*, Curepe, MVL, 1–10.ii.1982; 35 mm. **C**, f. *chrysonota*, Curepe, ix.1979; 33 mm. **D**, f. *chrysonota*, Curepe, MVL, 24.x.1978; 31 mm. **E**, un-named form, Curepe, MVL, 27.viii.1978; 33 mm.

Fig. 103. Male *Phoenicoprocta vacillans*, Penal, at light, 18.iv.2014 (left) and 25.i.2014 (right), K. Sookdeo; ©, with permission.

material from Trinidad, Venezuela (Carapito) and Guyana had similar genitalia, but differred from specimens from Peru (Candelopa) and Bolivia (Pitaguaya), which '*have a distinctly different pair of protuberances on either side of the base of the uncus. They are rounded and bulbous in the latter specimens and pointed in our vacillans*'.

In BOLD, *P. vacillans* appears as one BIN, BOLD:AAG9068 from Peru (17), Brazil (7), French Guiana (4), Argentina (1), Venezuela (3), Ecuador (1), Guyana (1), Suriname (3), and Colombia (1). It is 3.21 p-distance from its nearest neighbour, BOLD:ACE8772, which is restricted to Argentina, based on BOLD sequences. The Brazilian specimens of BOLD:AAG9068 are from Pará and Maranhão, but given that the range of this BIN extends to Argentina, it seems safe to say that it includes the type locality 'Valley of the Amazon' and until the complex is better understood, *P. vacillans* (including Trinidad material) may be interpreted as this BIN.

Phoenicoprocta sanguinea (Walker, 1854) (BOLD: AAA1390) is a separate BIN in BOLD, with sequences from Costa Rica (37), Guatemala (1) and a genetically rather distant member from Sucre, Venezuela (1). If this species occurs in Sucre, it could well also occur in Trinidad. Males resemble the reddest forms of Trinidad males (e.g. Fig. 101 A), but females have the wings always extensively hyaline, and have red and blue body markings. This female form has not been seen from Trinidad, so for now, it is assumed that this is not a Trinidad species. Walker (1854) described *P. sanguinea* with unknown origin, but Hampson (1898) referred to the holotype as from Honduras. Fleming (1957) pointed out that the handprinted label on the holotype stating Honduras is not in Walker's nor Hampson's writing.

Fleming (1957) questioned whether *P. capistrata* (Fabricius, 1775) (TL 'America') may be a female form of *P. vacillans*, in which case it would have priority. The focus of his concern is that *P. capistrata* as currently treated is a species restricted to the Greater Antilles, whereas Fabricius (1775) gave the type locality as 'America', implying the mainland. Fabricius' (1775) description of *P. capistrata* was based on one or more specimens in 'Mus. Tottianum'. Otto Thott was a Count in the Danish Government, and Fabricius used his entomological collection to describe several dozen new species indicated by "Mus. Tottianum" (Zimzen 1964). After Thott's death in 1785 his collection was sold by auction, and parts ended up in at least three museums, but no types of *capistrata* have been located in any of these, and the type material of this species is now assumed to be lost (Zimzen 1964). Pinheiro and Duarte (2010) treated this species as illustrated by Draudt (1915–1917), and commented '*neither in this nor any other work ... or collection consulted did we find a similar species that could put its identification in doubt. The fact that P. capistrata has at least three female phenotypes differing from males does not cast doubt on the identification of the species, since laboratory rearings have shown that they are indeed the same species (Rodríguez-Loeches and Barro 2009). This is why we decided not to designate a neotype for this species as well*.' Given Fleming's concerns, perhaps it would have been better if they had designated a neotype to match current use. Nevertheless, we follow this currently accepted treatment here.

Identification. As will be clear from the discussion in the preceding sections, this is a complex species. Males have transparent wings with a black border and bar across the end of the forewing cell; they may or may not have red streaks at the base of the dorsal forewing. The dorsal surface of the head, always has a metallic blue spot, as does the dorsal posterior margin of the thorax and at least the first five abdominal segments; the tegulae are usually brown or orange, but may be black; the dorso-lateral area of the

abdomen varies from black to completely red; and the distal end of the abdomen has red hair tufts giving it a truncate appearance (Figs. 101). Several different names have been applied to this continuous variation in the male.

The female occurs in (at least) three morphs, but all have black wings with or without transparent areas, the dorsal head metallic blue-green and the abdomen with dorsal and lateral metallic green stripes reminiscent of *Calonotos* spp., the dorsal stripe extending onto the posterior margin of the thorax, with the section on abdominal segment 1 being narrower than the others. Female form *trinitatis* Rothschild has the wings and thorax black (Fig. 102 A), resembling *C. helymus helymus* which is not known from Trinidad. Form *chrysonota* resembles form *trinitatis* except there are transparent windows of variable extent on both wings (Figs. 102 B–D), resembling *Autochloris almon* (Figs. 3-4). There is an unnamed form which is also similar to form *trinitatis*, but the dorsal thorax is mostly red, extending to subdorsal patches on abdominal segment 1 (Fig. 102E).

Biology in Trinidad. There are no observations at heliotrope or flowers, and almost all captures have been at light by night, suggesting a nocturnal species.

Status in Trinidad. A common and widespread species, particularly in disturbed habitats.

PLEUROSOMA ORFILA 1935

Type species *Sphecosoma angustatum* Möschler, 1878, TL Suriname.

Pleurosoma trinitatis (Rothschild, 1911)

Figs. 90, 104–105, Appendix Figs. 13, 33.

OD: Rothschild 1911: *Sphecosoma trinitatis*, TL Trinidad, Caparo, 4♂.

TT: *Sphecosoma trinitatis* Rothschild: Rothschild (1911), Zerny (1912), Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927)
Pleurosoma trinitatis (Rothschild): Orfila (1935), Fleming (1957)

Historical notes. Rothschild (1911) described *Sphecosoma trinitatis* from Trinidad, based on four males collected at Caparo, December 1905 by S.M. Klages. When MJWC examined the type series in NHMUK, he found a male curated as the holotype and three females. Kaye and Lamont (1927) included this species based on the type locality. Orfila (1935) created the new genus *Pleurosoma* to include *P. trinitatis*. Fleming (1957) recorded 15 males and eight females from Simla. Identified by comparison with the type (NHMUK, ♂ Trinidad) and NHMUK series.

Taxonomic issues. No public sequences in BOLD. A dissection of the male genitalia (Appendix Fig. 33) resembles that shown by Cerda (2008) for the similar species, *P. angustatum* (Möschler, 1878). Clearly the two are congeneric, but different species.

Identification. This is one of the three Euchromiina that closely mimic the two *Agelaia* sp. wasps known from Trinidad (Vespidae, Polybiinae) (C.K. Starr, pers. comm.). It lacks the sullied brown area on the outer half of the costal area which distinguishes *Myrmecopsis kenedyae* (Fig. 91–92). *Pleurosoma trinitatis* and *Sphecosoma aurantiipes* are very similar and perhaps most easily distinguished by the markings of the dorsal thorax. In *P. trinitatis* the patagia are yellow-brown with a diffuse transverse bar, whereas in *S. aurantiipes* the posterior third is black; the tegulae of *P. trinitatis* are yellow-brown with a central, dark, longitudinal stripe, whereas in *S. aurantiipes* they are yellow-brown with the margins narrowly black; and there is a black dorsal line in *P. trinitatis*, but a pair of subdorsal lines in *S. aurantiipes* (Fig. 78).

Biology in Trinidad. Rothschild (1931) suggested 'a species of *Polybia* near *P. fasciata* Saussure' is the wasp model for this species, and the two were collected together in Trinidad by S.M. Klages. We cannot trace the wasp species he mentions, and suspect he meant *P. bifasciata* Saussure, a widespread species in South America. As noted in the last paragraph, C.K. Starr (pers. comm.) suggests the models are *Agelaia* spp. wasps. All MJWC's records were of adults of both sexes attracted to heliotrope by day.

Status in Trinidad. A fairly common and widespread species in Trinidad, but more frequently attracted to heliotrope in forested areas.

POLIOPASTEA HAMPSON, 1898

Type species *Poliopastea plumbea* Hampson, 1898, TL Brazil, Amazon. Kaye and Lamont (1927) treated *P. plumbea* as a synonym of *Macrocneme eacus*, along with *M. vittata* (i.e. *P. vittata*) and *M. nigritarsia* (a misidentification of *P. vittata*). *Macrocneme eacus* is an unavailable name for which the replacement name is *P. errans* (see below under *P. maroniensis*). Since *P. plumbea* is the type species of *Poliopastea*, they concluded that *Poliopastea* must be a synonym of *Macrocneme*. Fleming (1957) maintained this arrangement, but Dietz and Duckworth (1976) re-established *Poliopastea* and listed its species. They noted that '*the markings of the head, patagia, tegulae, and first abdominal tergite are often metallic blue or blue white ... In the genus Macrocneme (sensu stricto) these markings are characteristically white with little or no iridescence.*' Moreover, the genitalia are completely different.

Hampson (1914) listed three females of *P. cyllarus* (Druce) (as *Macrocneme cyllarus*) from 'Tobago I.' in NHMUK; this is an error for Taboga Island (Panama), which Druce (1881-1900) mis-spelt Toboga Isl.' in the original

Fig. 104. Male *Pleurosoma trinitatis*, Lower Morne Catharine, to *Heliotropium*, 21.v.1982; 24 mm.

Fig. 105. Female *Pleurosoma trinitatis*, Parrylands Oilfield, to *Heliotropium*, 25.vii.1981; 27 mm.

description.

***Poliopastea chrysotarsia* (Hampson, 1898)**

Fig. 106.

OD: Hampson 1898: *Macrocneme chrysotarsia*, TL Panama, Taboga Is.

Historical notes. A new record for Trinidad. Identified by comparison with the type (NHMUK, ♂ Panama, Taboga Is.) and NHMUK series.

Taxonomic issues. There are only two short sequences in BOLD from Venezuela and Panama. Dietz and Duckworth

Fig. 106. Male *Poliopastea chrysotarsia*, Curepe, BLT, 6–11.xii.1981 (F.D. Bennett); 30 mm.

(1976) transferred this species to *Poliopastea*.

Identification. The orange tarsi of the hindlegs are very distinctive amongst Trinidad species, but we have not recognised the female, and do not know if it also shows this feature.

Biology in Trinidad. The only known Trinidad specimen was caught in a black light trap (BLT).

Status in Trinidad. A rare species with just one record from Curepe.

***Poliopastea maroniensis* (Schaus, 1905)**

Fig. 107, Appendix Figs. 14, 34.

OD: Schaus 1905: *Macrocneme maroniensis*, TL French Guiana.

Historical notes. This species has not previously been identified from Trinidad. Dissection of a Trinidad male (Appendix Fig. 34) showed it to be identical to *P. maroniensis* as treated by Cerda (2008). Accordingly, we use this name here.

Taxonomic issues. No public sequences in BOLD. Dietz and Duckworth (1976) transferred this species to *Poliopastea*.

Stoll (1782 in Stoll 1780–1782) described *Sphinx eacus* from Suriname, but it is an unavailable homonym of *Sphinx eacus* Cramer, 1780 (replacement name *Eumorpha megaeacus* (Hübner [1819]), Sphingidae) and *Sphinx aeacus* [Denis and Schiffermüller], 1775 (synonym of *Zygaena ephialtes coronillae* [Denis and Schiffermüller], 1775, Zygaenidae) (Dietz and Duckworth 1976, Kitching and Cadiou 2000). The unavailable name *P. eacus* (Stoll) still appears on the internet (e.g. LepIndex). The replacement name for Stoll's *Sphinx eacus* is *P. errans* (Hübner, [1819]), and MJWC had provisionally identified the Trinidad species as *P. errans* by comparison with the NHMUK series. However, Stoll's type material is believed lost, and the identity of this species should be considered uncertain (Dietz and Duckworth 1976), unless and until a neotype is designated.

Identification. At first sight, this species resembles one of the *Macrocneme* spp. However, all Trinidad *Macrocneme* spp. have the tarsi of the hind legs white, whereas in *Macrocneme maroniensis* they are black. The metallic green sheen to the dorsal forewings distinguishes this species from *P. vittata* which has bright iridescent green streaks in the basal two-thirds of the forewing.

Biology in Trinidad. The only Trinidad specimens were captured at light.

Status in Trinidad. A rare species with only two records revealing no particular habitat association.

***Poliopastea plumbea* Hampson, 1898**

Figs. 108–110, Appendix Figs. 15, 35.

OD: Hampson 1898: *Poliopastea plumbea*, TL Brazil, Parantins (Lower Amazons).

TT: *Poliopastea plumbea* (Hampson): Kaye (1901), Zerny (1912)
Macrocneme eacus (Stoll): Kaye and Lamont (1927) [misidentification; unavailable homonym]
Macrocneme albitarsia Hampson: Lamont and Callan (1950) [synonym]
Macrocneme plumbea (Hampson): Fleming (1957)

Historical notes. Identified by comparison with the type of *P. plumbea* (NHMUK, ♂ Brazil) and NHMUK series. Kaye (1901) recorded this species from Maraval Valley (C.W. Ellacombe); there is a specimen from Maraval Valley (no date or collector) in MGCL from W.J. Kaye's collection, which may be the basis of this record. Kaye and Lamont (1927) treated *P. plumbea* as a synonym of *Macrocneme eacus*. In addition to the Maraval specimen, they refer to specimens from Palmiste (14.vii.1917, 9.ix.1917, 5.iv.1921, N. Lamont); these specimens are in Lamont's collection in NMS – the first is *P. vittata* and labelled by Lamont as such, the other two are *P. plumbea* and were labelled by Lamont as *M. eacus*. Seven specimens in Lamont's collection in UWIZM as *M. eacus* appear to be a mixture of *Macrocneme* spp.

Fig. 107. Male *Poliopastea maroniensis*, Curepe, MVL, 31.viii.1978; 35 mm.

Macrocneme albitarsia (Hampson, 1898) (Type NHMUK, ♀ TL Brazil, Amazons, Tabatinga) is a synonym (Dietz and Duckworth 1976). Lamont and Callan (1950) listed *M. albitarsia* from Trinidad, referring to specimens from Palmiste (26.ii.1926, 2.ii.1936, N. Lamont). Neither of these specimens has been located, but four specimens in Lamont's collection in UWIZM as *M. albitarsia* are all *P. plumbea*.

Fleming (1957) considered *P. plumbea*, *P. vittata* and *P. nigritarsia* to all be distinct species, although he maintained *Poliopastea* as a synonym of *Macrocneme*. He recorded four male *P. plumbea* from Simla and reported males from Caparo and San Fernando in NHMUK, although we have not located these two specimens.

Fig. 108. Male *Poliopastea plumbea*, Curepe, MVL, 12-15.xii.1980; 26 mm.

Fig. 109. Female *Poliopastea plumbea*, Palmiste, 9.ix.1917 [N. Lamont] [NMS as *Macrocneme eacus*]; 28 mm; photo V. Blagoderov; © NMS, with permission.

Fig. 110. Male *Poliopastea plumbea*, Penal, 18.iv.2014, K. Sookdeo; ©, with permission.

Taxonomic issues. Dissection of a Trinidad male (Appendix Fig. 35) shows the genitalia do not match Cerda's (2008) *P. plumbea*, or any other species he treated. The genitalia do match those of a male in the collection of M. Laguerre from El Dorado, Bolivar, Venezuela. Cerda's (2008) *P. plumbea* is the species we treat below as *P. vittata*. The Trinidad species treated here as *P. plumbea* appears to match BIN BOLD:AAN5470 from Peru (6) and Guyana (1), the latter having been dissected and identified as *P. plumbea* by R.E. Dietz.

Identification. This species is distinctive by its smaller size, and the uniform blackish tone of the wings.

Biology in Trinidad. Attracted to light by night, but no observations at heliotrope.

Status in Trinidad. A fairly common and widespread species in disturbed areas.

***Poliopastea vittata* (Walker, 1854)**

Figs. 111–113, Appendix Figs. 16, 36.

OD: Walker 1854: *Euchromia vittata*, TL Brazil.
Strand 1917: *Macrocneme nigritarsia* ab. *trinitatensis*, TL Trinidad [unavailable infraspecific name]

TT: *Macrocneme nigritarsia* Hampson ab. 1: Hampson (1898) [synonym]
Macrocneme nigritarsia Hampson: Zerny (1912), Draudt (1915–1917) [misidentification]
Macrocneme nigritarsia ab. trinitatensis (Strand): Strand (1917) [unavailable infraspecific name]
Macrocneme nigrotarsia [sic] Hampson: Fleming (1950) [misidentification]
Macrocneme vittata Walker: Fleming (1957)

Historical notes. Hampson (1898) described *Macrocneme*

Fig. 111. Male *Poliopastea vittata*, Curepe, MVL, 23.i.1979; 28 mm.

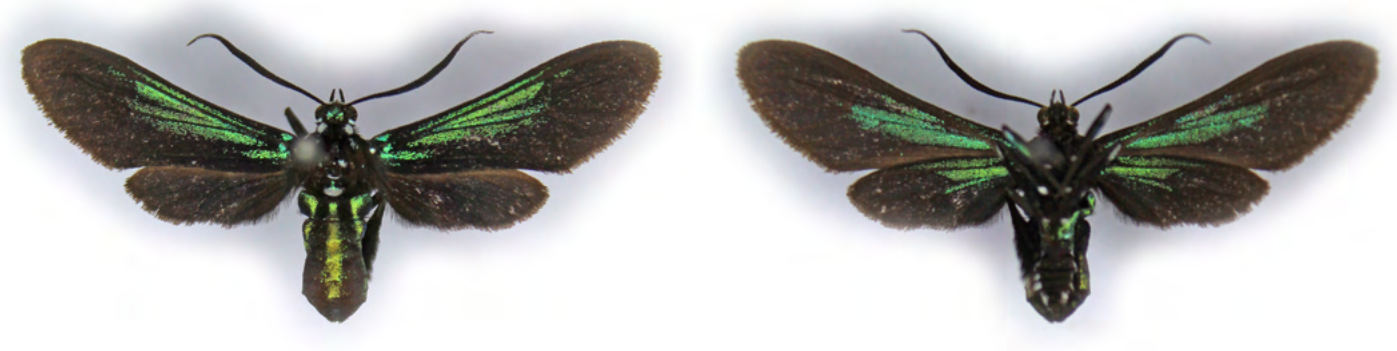

Fig. 112. Female *Poliopastea vittata*, Bordenal Savana, MVL, 20.ix.1979 (F.D. Bennett & R.M. Baranowski); 30 mm.

Fig. 113. Female *Poliopastea vittata*, Penal, 28.i.2014, K. Sookdeo; ©, with permission.

nigritarsia from Mexico, Guatemala (TL) and Trinidad. He segregated the Trinidad specimen as 'Ab. 1' noting 'white sublateral spots on the four medial segments of abdomen'. Strand (1917) named Hampson's Ab. 1 as 'ab.' *trinitatensis*, but as an infraspecific name that has not subsequently been used as a species or subspecies, it is an unavailable name. Kaye (1901) recorded *Macrocneme nigritarsia* from Trinidad, based on Hampson (1898). As noted above, Kaye and Lamont (1927) treated *M. nigritarsia* as a synonym of *Macrocneme eacus*. Dietz and Duckworth (1976) transferred *nigritarsia* to *Poliopastea* and designated a lectotype in NHMUK.

Walker (1854) described *Euchromia* (section *Macrocneme*) *vittata* from Para, Brazil (type NHMUK). Fleming (1957) recognized ab. *trinitatensis* as a normal female of *M. vittata* and recorded five males and four females from Simla, as well as 14 males and 16 females in NHMUK (Caparo (1), Ariapite Valley (4) and 'Trinidad' (25)), but MJWC failed to locate these specimens in NHMUK. Dietz and Duckworth (1976) confirmed this synonymy and designated a female lectotype for *M. vittata* (NHMUK). Identified by comparison with the type (now lectotype, NHMUK, ♀ Brazil, Para) and type of *trinitatensis* Strand.

Taxonomic issues. Dietz and Duckworth (1976) transferred this species to *Poliopastea*. The genitalia of a Trinidad specimen are a very close match to those illustrated by Cerda (2008) for *P. plumbea*.

BOLD includes specimen from Colombia and Ecuador identified as *P. vittata* by Dietz. The former is in BIN BOLD:AAD1862 which includes material with partially yellow hindleg tarsi identified as *P. auripes* (Walker). The latter has no sequence. More work is needed.

Identification. The most distal tarsi of the hind legs are white, so that this species resembles a small *Macrocneme* species. However, the uninterrupted, distinct bright metallic streaks in the basal two-thirds of the forewing distinguish it.

Biology in Trinidad. MJWC reared two specimens from caterpillars collected at Macoya Gardens on 'a vine' but recorded no details.

Status in Trinidad. A fairly common species in disturbed situations.

***PSEUDOMYA* HÜBNER, [1819]**

Type species: *Glaucopis tipulina* Hübner, [1812], TL not stated (Butler 1876). Hampson (1898) overlooked Butler's type species designation, when he treated *P. melanthus* as the type species. Cerda (2008) recognized three groups within this genus. Of the Trinidad species, *P. tipulina* and *P. afflicta* are in the first group, while *P. melanthus* is in the third (second on genitalia CD). It seems plausible that these groups will be found to represent distinct genera.

***Pseudomya afflicta* (Walker, 1854)**

Figs. 114–117.

OD: Walker 1854: *Glaucopis (Pseudomya) afflicta*, TL Amazons, Para.

TT: *Saurita temenus* (Cramer): Kaye (1901), Zerny (1912), Draudt (1915–1917), Kaye and Lamont (1927) [misidentification]
Saurita salta (Schaus): Kaye and Lamont (1927), Fleming (1957) [misidentification]
Saurita concisa (Walker): Kaye and Lamont (1927), Fleming (1957) [misidentification]
Saurita afflicta (Walker): Fleming (1957), Blest (1964)
Pseudomya afflicta (Walker): Cerda (2008)

Historical notes. Hampson (1898) treated *afflicta* as a synonym of *Saurita temenus* (Stoll) (TL Suriname). Forbes (1939) separated them and Fleming (1957) pointed out that several authors have incorrectly followed Hampson and treated *afflicta* as a synonym of *temenus*. Cerda (2008) confirmed this position. Thus, Kaye (1901) and Kaye and Lamont (1927) recorded *S. temenus* from Trinidad based on 'several specimens in May at Tabaquite (W.J. Kaye)'. We have not located any specimens labelled from Tabaquite in NHMUK, but there are three specimens of *P. afflicta* labelled as *S. temenus* in MGCL from W.J. Kaye's collection, which may be taken as representative. Fleming (1957) suggested that Kaye and Lamont's (1927) records of *S. temenus* refer to *P. afflicta* and the specimens in MGCL confirm this view. Fleming (1957) recorded 12 males and five females from Simla. Cerda (2008) moved this species from *Saurita* to *Pseudomya*, and reports a specimen from Chaguanas, Trinidad. This species was identified by comparison with the type of *afflicta* (NHMUK, ♀ Para, Brazil) and NHMUK series (over the name *S. temenus*).

Saurita salta (Schaus, 1905) (TL Venezuela) superficially resembles the male of *P. afflicta*. *Saurita salta* was recorded from Trinidad by Kaye and Lamont (1927) without comment, but this seems to have been a misidentification. *Saurita salta* is identified by comparison with the type (USNM, ♂ Venezuela) and NHMUK series (Venezuela to Ecuador); there are no specimens from Trinidad in NHMUK or USNM, and we know of no records. There is a male *P. afflicta* in OUMNH labelled by W.J. Kaye as *S. salta*; this may well be the basis of Kaye and Lamont's (1927) record and supports the view that this was a misidentification. According to Hampson (1898), Druce (1881-1900) treated *S. salta* as *S. afflicta*, which suggests the source of the error.

Kaye and Lamont (1927) also recorded *Sauritinia concisa* (Walker) from Trinidad (as *Saurita concisa*), referring to specimens from Palmiste (24.xi.1917, 10.iii.1918, 13.i.1921, N. Lamont), the first two of which are in Lamont's collection in NMS and are *S. afflicta*. There are two males and two females in Lamont's UWIZM collection as *S. concisa*, including the third of those referred to by Kaye and Lamont (1927); all are *P. afflicta*. MJWC examined the type of *S. concisa* (NHMUK, ♂ Para, Brazil) and NHMUK series, and did not recognize this as a Trinidad species. Kaye and Lamont's (1927) record is therefore considered to be a misidentification for *P. afflicta*. Hampson (1898) placed *concisa* in *Saurita*, but Cerda (2008) transferred it to *Sauritinia*.

Taxonomic issues. Sequenced specimens from Costa Rica currently identified as *Pseudomya afflicta* form BIN BOLD:AAA1455 are not this species, but probably *Pseudosphex leovazquezae* (Pérez and Sánchez).

Identification. This is the only Trinidad species with extensive translucent areas on the wings and a dark margin that is diffuse rather than sharply defined, combined with a red dorsal thorax. The translucent areas are more extensive

Fig. 114. Male *Pseudomya afflicta*, Curepe, to *Heliotropium*, 28.ix.1980; 22 mm

Fig. 115. Female *Pseudomya afflicta*, Parrylands Oilfield, to *Heliotropium*, 7.xi.1980; 21 mm.

Fig. 116. Male *Pseudomya afflicta*, La Vega Estate, at *Chromolaena* flowers, 13.i.2020, D. Gunn (iNaturalist observation 37571413); ©, under CC-BY-NC.

Fig. 117. Female *Pseudomya afflicta*, South Oropouche, Mon Desir, at eupatorium flowers, 2.x.2020, T.P. Maharaj (iNaturalist observation 91874904); ©, under CC-BY-NC.

in the female, coming closer to the margin (Figs. 114–117).
Biology in Trinidad. Attracted to heliotrope and flowers by day and light by night.
Status in Trinidad. A common and widespread species.

***Pseudomya melanthus* (Stoll, 1782)**
Figs. 118–121, Appendix Figs. 17, 37.
OD: Stoll 1782: *Sphinx melanthus*, TL Suriname.
TT: *Pseudomya melanthus* (Stoll): Hampson (1914), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1957)
Historical notes. Hampson (1914) listed a specimen from Ariapite Valley in the Rothschild collection. Kaye and Lamont (1927) recorded this species from Maraval Valley, flying in sunshine viii.1917 (W. Buthn). Buthn's specimen was examined in MGCL (ex. W.J. Kaye coll.). Fleming (1957) recorded one male and one female from Simla. Identified by comparison with the NHMUK series.
Taxonomic issues. No public sequences in BOLD. This species is close to *P. nigrozona* Schaus (TL French Guiana) as treated by Cerda (2008), the main difference being the red dots on the thorax of *P. melanthus*. The male genitalia (Appendix Fig. 37) are also similar, but different enough to indicate that they are separate species.
Identification. This species has transparent wings with dark veins, a narrowly black margin, and broad bars from the costa across the distal one third of the forewing cell to the dorsum and across the apex of the hindwing. It also has red spots on the thorax and a white spot dorso-laterally on abdominal segment 1. No other Trinidad species has this combination of characters. The sexes are similar but the female is less heavily marked.
Biology in Trinidad. Elizabeth Rankin reared this species from citrus (Rutaceae) in 1968, as did Rachel Cruttwell in 1971. The latter, who was studying Psychinae (Tineidae) at the time, including epiphyte-feeding species, added a note '?feeds on lichens'. Sattvika Ragoonanan reared a female from a cocoon found on *Spondias dulcis* Parkinson (golden apple, Anacardiaceae) in San Francique (Fig. 121), but there was no evidence to show what the caterpillar had fed upon.

Fig. 118. Male *Pseudomya melanthus*, Curepe, 19.ix.1980; 23 mm.

Fig. 119. Female *Pseudomya melanthus*, Curepe, MVL, 3.i.1980; 23 mm.

Fig. 120. Male *Pseudomya melanthus*, South Oropouche, Mon Desir, on flowers of *Austroeupatorium inulaefolium*, 1.x.2020, T.P. Maharaj (iNaturalist observation 91860995); ©, under CC-BY-NC.

Fig. 121. Female *Pseudomya melanthus* newly emerged with cocoon on *Spondias dulcis*, San Francique, 29.i.2022, S. Ragoonanan (iNaturalist observation 105776698); ©, with permission.

There are records of adults at euphorbia and eupatorium flowers by day (Fig. 120), and they are also attracted to lights by night.

Status in Trinidad. An occasional species in disturbed areas.

***Pseudomya tipulina* (Hübner, [1812]) complex**

Fig. 122.

OD: Hübner [1812] (in Hübner 1806–[1819]): *Glaucopis tipulina*, TL not stated.

Historical notes. This species has not previously been reported from Trinidad, and MJWC has not collected it himself. Hence, he was surprised to find a series in the NHMUK supplementary material collected at Caparo by F. Birch and S.M. Klages early last century. Identified by comparison with the NHMUK series including the type of *P. bibia* Walker, 1854 (NHMUK, ♂ Brazil, Para), a synonym according to Butler (1877).

Taxonomic issues. Sequences in BOLD from Mexico to Peru as *P. tipulina* form BIN BOLD:ABZ3603, but this material lacks the blue-green markings on the thorax and base of the forewing seen in Trinidad material, and the forewings of the Trinidad specimens are more evenly smoky (Fig. 122). This group is badly in need of revision and an identification is presently very difficult, especially based on images only. The specimens comprising BOLD:ABZ3603 resemble Hübner's figures (Hübner 1806–[1819], pl. [163]). Given that the Trinidad material was compared with the type of *P. bibia*, it may be that this is a separate valid species, and potentially the correct name for the material from Trinidad.

Identification. Like *P. afflicta*, this species has extensive translucent areas on both wings, with a diffuse margin. Unlike *P. afflicta*, the thorax is black with a dorsal metallic blue-green spot posteriorly and similar spots on the head and base of the dorsal forewings. Like *P. afflicta*, the translucent areas are less extensive in the male (Figs. 122).

Biology in Trinidad. Nothing known.

Status in Trinidad. Only known from an old series collected at Caparo, when the area was probably still well forested.

***PSOLOPTERA* BUTLER 1876**

Type species: *Euchromia thoracica* Walker, 1854, TL Brazil, Amazon. Simmons (2006) revised this genus and illustrated the male and female genitalia.

***Psoloptera leucosticta* (Hübner, 1827)**

Figs. 123–124, Appendix Figs. 18, 38.

OD: Hübner 1827: *Glaucopis leucosticta*, TL Venezuela.

TT: *Psoloptera leucosticta* (Hübner): Strand (1915), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1950), Fleming (1957), Cerda (2008)

Historical notes. Strand (1915) recorded three examples from Caparo in German museums. Kaye and Lamont (1927) listed specimens from Guaico (18.iv.1915, N. Lamont) and Palmiste (22.v.1917, 30.ix.1917, N. Lamont), all three of which MJWC have examined in NMS. Fleming (1957) had no records, but Cerda (2008) had seen one from Arima. Identified by comparison with the NHMUK series.

Taxonomic issues. As the type is apparently lost, Simmons (2006) designated a lectotype (USNM, ♂ Venezuela, Maroni River), but clearly this is not part of the original material described by Hübner, so it is potentially a neotype designation. However, Simmons' action does not meet the qualifying conditions for designation of a neotype (ICZN Article 75.3) and is therefore invalid.

Two Trinidad females have been sequenced and the DNA barcodes placed in BOLD, forming part of BIN BOLD:AAA1364. There is significant variation within this BIN (average distance 0.85%, maximum distance 2.44%), which includes material resembling *P. thoracica* with a rufous thorax. BOLD:AAA1364 is 4.43% distant from its nearest neighbour (*P. basifulva*, BOLD:AAX7536). Within BOLD:AAA1364, there at least five groups, including

Fig. 122. Male (left) and female (right) *Pseudomya tipulina*, Caparo (F. Birch) [NHMUK supplementary]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/

Fig. 123. Male *Psoloptera leucosticta*, Inniss Field, MVL, 17.v.1999; 35 mm.

Fig. 124. Female *Psoloptera leucosticta*, Inniss Field, MVL, 17.v.1999; 35 mm.

(1) a large group of identical DNA barcodes, comprising material identified as *P. thoracica* DHJ03 from Costa Rica (many), *P. thoracica* from Panama, French Guiana, Brazil (Para), and the two Trinidad samples. Other clusters within BOLD:AAA1364 suggest additional taxa, including (2) *P. thoracica* DHJ01 from Costa Rica, Peru and French Guiana, (3) *P. thoracica* DHJ02 from Costa Rica, (4) *P. thoracica* from Peru, and (5) *P. thoracica* from Peru and French Guiana. The first cluster (1) including *P. thoracica* DHJ03, comprises material from Central America that resembles *P. thoracica* and material from South America (including Trinidad and Tobago) which resembles *P. leucosticta*. In view of this complexity, it will be necessary to dissect males from the different groups to assess potential species level differences. Furthermore, at this point it cannot be certain which groups within BOLD:AAA1364 can be associated with the genitalia which Simmons (2006) figured for *P. leucosticta* and *P. thoracica*.

MJWC dissected a Trinidad male (Appendix Fig. 38) which is a reasonable match to the genitalia for *P. leucosticta* illustrated by Simmons (2006, Figs. 9-10), but as only Trinidad females have been sequenced, to match Appendix Fig. 38 with the group of sequences that includes *P. thoracica* DHJ03 requires the assumption that only one DNA cluster occurs in Trinidad. Pending further work we consider it appropriate to refer to the material from Trinidad as *P. leucosticta*, in line with the treatment of Simmons (2006).

Identification. This species is black with a blue tone. At least five Trinidad species of Ctenuchina are superficially similar, with plain black forewings, but in *P. leucosticta* the small white spots at the base of the dorsal forewings, anterior to the forewing base, subdorsally and subventrally on abdominal segment 1, and in a ventral row on abdominal segments 2–6 are distinctive. The male has very broad bipectinate antennae.

Biology in Trinidad. Adults have been captured on flowers by day and at light by night.

Status in Trinidad. An uncommon species primarily from forested areas.

RHYNCHOPYGA FELDER 1874

Type species: *Rhynchopyga ichneumonea* Felder, 1874, TL Colombia, Bogota.

Rhynchopyga flavicollis (Druce, 1884)

Figs. 125–128, Appendix Figs. 19, 39.

OD: Druce 1884: *Amycles flavicollis*, TL Guatemala

TT: *Rhynchopyga flavicollis* (Druce): Fleming (1957)

Historical notes. Fleming (1957) introduced *R. flavicollis* to the Trinidad list, based on a single male from Simla.

Taxonomic issues. Fleming (1957) commented that his '*male specimen lacks the orange streak on the patagia present on the holotype'* and *'also has less orange on the tegulae*'. The holotype (Fig. 125) does not have an orange

streak on the patagia, although it does have some orange on the tegulae, so it is not clear how to interpret Fleming's comment. Provisionally, we accept Fleming's identification, and add a female from Parrylands that closely resembles the male holotype.

There is a second morph in Trinidad, with a white discal spot, quite similar to *R. discalba* Kaye (type NHMUK, ♂ Panama); the male and female both have the white spot on the forewing, but coming closer to the costa than in Trinidad specimens. However; the distal half of the ventral abdomen is orange in *R. discalba*, but white in Trinidad material. *Rhynchopyga albigutta* Draudt (1915–1917, pl. 15e) (type MNHM, ♀ Peru) is similar and may prove to be the female of *R. discalba*. Here we treat the morph with a white forewing spot as a morph of *R. flavicollis*, as follows.

Fig. 125. Male type of *Rhynchopyga flavicollis*, Guatemala [NHMUK]; ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/

ML dissected a DNA barcoded male of *R. flavicollis* from Guatemala (BIN BOLD:AAA1305), and MJWC dissected a Trinidad male with a white spot on the forewing (Appendix Fig. 39). No Trinidad males without a white spot were available for dissection. There is little difference between the two dissections, so for now we treat the two Trinidad forms as morphs of *R. flavicollis* pending further study. DNA barcodes of the two forms from Trinidad should be compared with those for *R. flavicollis* from Guatemala.

Identification. This is one of the smallest Trinidad Euchromiina. Both morphs have mostly dark wings and body apart from an orange-brown patagia. The morph with a white forewing spot also has a translucent pale streak basal to this, mostly in space 2 (Cu_1-Cu_2); no other Trinidad species has such markings. The morph without a white forewing spot (*flavicollis* habitus) has faint slightly translucent areas

Fig. 126. Female *Rhynchopyga flavicollis* (morph with no white forewing spot), Parrylands Oilfield, to *Heliotropium*, 7.xi.1980; 18 mm.

Fig. 127. Male *Rhynchopyga flavicollis* (morph with white forewing spot), Curepe, to *Heliotropium*, 21.v.1981; 21 mm.

Fig. 128. Female *Rhynchopyga flavicollis* (morph with white forewing spot), Curepe, MVL, ii.1973 [R.E. Cruttwell]; 18 mm.

in space 2 (Cu_1-Cu_2) and cell; which combined with the small size and orange-brown colour make it distinctive.

Biology in Trinidad. Most records are of specimens of both sexes attracted to heliotrope.

Status in Trinidad. An uncommon species from diverse habitats.

SAURITA HERRICH-SCHÄFFER 1855

Type species: *Sphinx cassandra* Linnaeus, 1758, TL America.

***Saurita cassandra* (Linnaeus, 1758)**

Figs. 129–132.

OD: Linnaeus 1758: *Sphinx cassandra*, TL America.

TT: *Saurita cassandra* (Linnaeus): Hampson (1898), Kaye (1901), Zerny (1912), Strand (1915), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1950), Fleming (1957), Cerda (2008)

Historical notes. Hampson (1898) first recorded this species from Trinidad collected by Capt. Clark; presumably this specimen was in NHMUK, but we have not located it

Fig. 129. Male *Saurita cassandra*, Curepe, MVL, 6–11.xii.1980; 34 mm.

Fig. 130. Female *Saurita cassandra*, Curepe, BLT, 23.i-10.ii.1982 (F.D. Bennett); 34 mm.

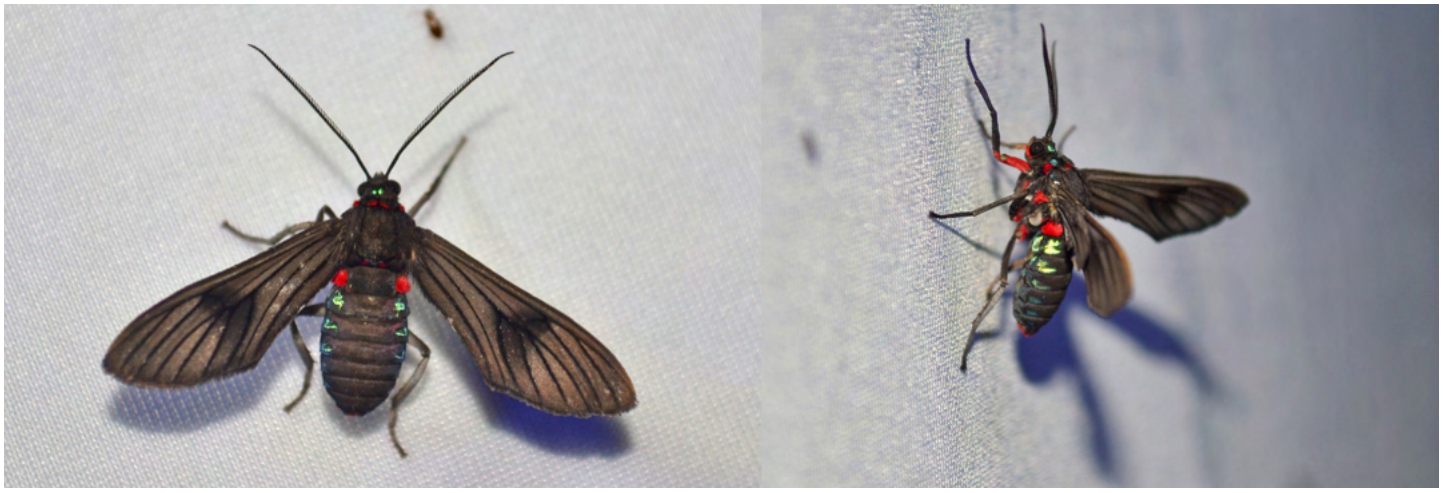

Fig. 131. Female *Saurita cassandra*, Penal, 29.xi.2014, K. Sookdeo; ©, with permission.

Fig. 132. Mating pair of *Saurita cassandra*, Union to Carital, 18.i.2022, S. Ramsaroop (iNaturalist observation 105154325); ©, under CC-BY-NC.

there. Kaye (1901) collected it at flowers and at light in July 1898. Kaye and Lamont (1927) added records from Palmiste (3.ii.1921, 11.iii.1921, 27.xii.1921, 19.iii.1922, N. Lamont) and Morne Diable (1.v.1921, N. Lamont); three of the Palmiste specimens are in NMS and the Morne Diable specimen is in NHMUK. Fleming (1957) recorded just one male from Simla, and Cerda (2008) one specimen from Chaguanas. Identified by comparison with the NHMUK series.

Taxonomic issues. A series from French Guiana and Brazil (Para) constitute BIN BOLD:AAM8412, which is expected to be where Trinidad sequences will cluster when available.

Identification. The brown forewings with black veins are similar to some *Episcepsis* spp. (Ctenuchina), but the red spots on the patagia and laterally on abdominal segment 1, and the metallic blue spots on the dorsal head and laterally on abdominal segments 2–4 are distinctive. Sexes similar, the female a little darker.

Biology in Trinidad. This species is most frequently found attracted to lights by night, but also flies by day when it is attracted to flowers, but not to heliotrope.

Status in Trinidad. A common and widespread species, primarily in open disturbed areas.

Saurita concisa Walker (see *Pseudomya afflicta*)
Saurita lacteata Schaus (see *Hypocharis arimensis*)

***Saurita perspicua* Schaus, 1905**

Figs. 133–136, Appendix Figs. 20–21, 40.

OD: Schaus 1905: *Saurita perspicua*, TL Trinidad.

TT: *Saurita perspicua* Schaus: Schaus (1905), Hampson (1914), Zerny (1912), Draudt (1915–1917), Kaye and Lamont (1927), Fleming (1957)

Historical notes. *Saurita perspicua* was described from Trinidad (Schaus 1905) and included in Kaye and Lamont (1927) and Fleming (1957) based on the original description, without further records.

Taxonomic issues. No public sequences in BOLD. MJWC initially identified this species as *Chrostosoma guianensis* Kaye by comparison with the types (NHMUK, ♂, ♀ Guyana). However, he subsequently examined the type of *S. perspicua* (USNM, ♀ Trinidad), and concluded that they are probably synonyms. Either way, *S. perspicua* is the older name and appropriate to use for Trinidad.

The male genitalia (Appendix Fig. 40) show little resemblance to those of *S. cassandra* as illustrated by Cerda (2008), which is the type species of *Saurita*. The two species should not be considered congeneric, but at this stage we cannot suggest an appropriate genus for *S. perspicua*.

Identification. This small species has smoky transparent wings with black veins and margins, resembling species of *Valvaminor*. However, unlike any Trinidad species of *Valvaminor*, *S. perspicua* has a red spot anterior to the base of the forewing, a red streak on the tegulae. The wings of the female are more smoky, and in the male only, the femora of the fore and mid legs are white.

Biology in Trinidad. All adults for which information is available seem to have been attracted to light.

Fig. 133. Male *Saurita perspicua*, Inniss Field, MVL, 17.v.1999; 20 mm.

Fig. 134. Female *Saurita perspicua*, Inniss Field, MVL: ♀ 17.v.1999; 25 mm.

Fig. 135. Female holotype *Saurita perspicua*, Trinidad [USNM].

Status in Trinidad. Usually an uncommon species in forested areas, mostly recorded from the South.

Saurita salta (Schaus) (see *Pseudomya afflicta*)
Saurita temenus (Stoll) (see *Pseudomya afflicta*)

SPHECOSOMA BUTLER, 1876

Type species *Sphecosoma fasciolatum* Butler, 1876, TL, Brazil, Matto Grosso, by original designation. Synonyms include *Sphecops* Orfila, 1935 (Simmons and Weller 2006 [as stated by Cerda 2008]). *Pleurosoma trinitatis* was previously in the combination *Sphecosoma trinitatis*.

***Sphecosoma aurantiipes* Rothschild, 1911**

Figs. 90, 137, Appendix Figs. 22, 41.
OD: Rothschild 1911: *Sphecosoma aurantiipes*, TL San Esteban, Venezuela.
TT: *Sphecops aurantiipes* (Rothschild): Fleming (1957)

Fig. 136. Male *Saurita perspicua*, Penal, at light, 15.iii.2014, K. Sookdeo; ©, with permission.

Historical notes. The first Trinidad record was by Fleming (1957), who recorded seven males from Simla. Identified by comparison with the type (NHMUK, ♂ San Esteban, Venezuela) and NHMUK series.

Taxonomic issues. Rothschild (1911) described *S. aurantiipes* from Venezuela, Paraguay and Bolivia, designating a male from San Esteban. Venezuela the holotype. He notes that the material from Paraguay and Bolivia is much smaller, the forewing being 10 mm compared to the 14 mm of the type. Fleming (1957) identified this species by comparison with the holotype in NHMUK. He indicated that the forewing length of the holotype is actually 12.5 mm, whereas Trinidad specimens have a forewing length of 10–11 mm. Trinidad specimens in MJWC measure 10–12 mm. Given that Trinidad material is comparable with the type in size, there seems no reason to doubt this identification. However, dissection of a Trinidad male shows the genitalia (Appendix Fig. 41) to be more or less identical with those illustrated by Cerda (2008) for *S. testaceum* (Walker, 1854), which was described from Demerara, Guyana. As illustrated by Cerda (2008), the habitus of *S. testaceum* is similar to that of *S. aurantiipes*, but the thorax is more heavily marked in black, and the abdomen banded in brown with less contrasting pale rings. Neither type has been dissected. There are no sequences available in BOLD to help clarify this, so we do not resolve this issue at this time, but retain the existing names.

Identification. See under *Pleurosoma trinitatis* above. The female of *S. aurantiipes* is not known to us, but is expected to resemble the male closely.

Biology in Trinidad. All Trinidad records are of males flying by day, and all except one were attracted to heliotrope.

Status in Trinidad. An occasional species, mostly in forested areas.

Sphecosoma trinitatis (see *Pleurosoma trinitatis*)

SYNTOMEIDA HARRIS, 1839

Type species: *Glaucopis ipomoeae* Harris, 1839, TL USA, Georgia.

Syntomeida melanthus (Cramer, 1779)

Figs. 138–139.

OD: Cramer 1779: *Sphinx melanthus*, TL Suriname.

TT: *Syntomeida melanthus* (Cramer): Kaye and Lamont (1927), Fleming (1957).

Historical notes. Kaye and Lamont (1927) recorded a specimen from San Fernando (7.x.1917, R.M. Farmborough), which MJWC examined in OUMNH (Fig. 139). Fleming (1957) had no records. Identified by comparison with the NHMUK series.

Taxonomic issues. In BOLD, material identified as *S. melanthus* from Costa Rica and USA forms BIN BOLD:AAA1416. As this species was described from Suriname, sequences from South America would be useful to confirm that just one species is present, and this is the correct BIN for this species. Based on BOLD:AAA1416,

Fig. 137. Male *Sphecosoma aurantiipes*, Chaguaramas, to *Heliotropium*, 24.iii.1982; 24 mm.

Fig. 138. Male *Syntomeida melanthus*, Curepe, MVL, 1971 (R.E. Cruttwell); 38 mm.

Fig. 139. Female *Syntomeida melanthus* (basal and apical spots F only), San Fernando, mostly on hill, 7.x.1917 (R.W. Farmborough) [OUMNH].

this species is highly variable in the extent of the yellow spotting on the wings.

Identification. The wings are dark with yellow spotting. The two specimens from Trinidad indicate that the forewing spotting is variable, but both have spots near the base of the wing and on the costa at about two-thirds to apex. This combined with white bands on abdominal segments 1 and 2, and red bands on segments 3–5 make this species readily recognizable. *Napata broadwayi* (Schaus) (Ctenuchina) has a superficially similar habitus, but the abdomen is bronzy green, and the spotting of the wings and body is differently arranged. The male of *S. melanthus* has strongly bipectinate antennae, the female less so. The single male from Trinidad (Fig. 138) is slightly more heavily spotted than Cramer's original illustration of a male (Cramer 1777–1782, pl. 248C), whereas the female has much reduced spotting in comparison (Fig. 139). We anticipate that this species is very variable in Trinidad, as noted for BOLD:AAA1416 in Costa Rica and USA.

Biology in Trinidad. The San Fernando female specimen appears to have been captured by day, whereas the male Curepe specimen was caught in a mercury vapour light trap.

Status in Trinidad. Two Trinidad records: the original female from San Fernando (Fig. 139), and a male in poor condition from Curepe (Fig. 138).

VALVAMINOR CERDA, 2020

Type species *Laemocharis masa* Druce, 1889, TL Mexico. Cerda (2020) established this genus for a group of species previously placed in *Mesothen* Druce – the first species complex of *Mesothen* in Cerda (2008). *Mesothen* has also been referred to as *Mesothen* Hampson, but Druce has accidental precedence (Watson *et al*. 1980). Based on previous definitions, *Mesothen* and *Loxophlebia* DNA barcodes intermingle. *Valvaminor* is the branch that groups material identified as *Valvaminor* sp. (Panama) (BOLD:ADS3115), *desperata* (BOLD:AAU3098), *davisi* (BOLD:AAE9322), and *masa* (BOLD:AAE4864).

Valvaminor desperata (Walker, 1856)

Figs. 140–141.

OD: Walker 1856: *Pseudomya desperata*, TL Amazon [OUMNH].

TT: *Mesothen desperata* (Walker): Lamont and Callan (1950), Fleming (1957)

Historical notes. Lamont and Callan (1950) recorded one specimen on Asteraceae (= Compositae) by day at Palmiste, 20.iv.1926. This specimen was examined in NMS. Fleming (1957) had no additional records. Identified by comparison with the holotype (OUMNH, ♀ 'Amaz'), NHMUK series, and Cerda (2008).

Taxonomic issues. Cerda (2020) transferred this species to *Valvaminor* and illustrated the genitalia. BINs BOLD:AAA1393 and BOLD:AAU3098 from Brazil, Parana are identified as *M. desperata*. The images are inadequate to say, but our impression is that neither is *M. desperata*. ML suggests that BIN BOLD:ADS3115 currently identified as *Valvaminor* sp. is the true *V. desperata*.

Identification. Like *Saurita perspicua* and *V. endoleuca*, this small species has smoky transparent wings, black veins and wing margins. *Valvaminor desperata* and *V. endoleuca* do not have the red spots on the thorax seen in *S. perspicua*. *Valvaminor desperata* and *V. endoleuca* are very similar, but whereas the forewing termen margin of *V. desperata* is of

Fig. 140. Male *Valvaminor desperata*, Arima Valley, Simla, MVL, 30.vii.1981; 17 mm.

Fig. 141. Female *Valvaminor desperata*, Arima Valley, Simla, to *Heliotropium*, 28.i.1981; 19 mm.

even width to the apex, in *V. endoleuca* the apical margin is distinctly wider. Sexes similar apart from the strongly bipectinate antennae of the male.

Biology in Trinidad. Adults are attracted to heliotrope by day and to light by night.

Status in Trinidad. Uncommon; it is curious that Fleming (1957) did not record this species from Simla, as all MJWC's specimens were collected there.

***Valvaminor endoleuca* (Druce, 1905)**

Figs. 142–143. For figures of the details of body and male genitalia, see Cock and Laguerre (2022).

OD: Druce 1905: *Mesothen endoleuca*, TL Venezuela.

TT: *Mesothen endoleuca* Druce: Fleming (1957)
Valvaminor endoleuca (Druce): Cock and Laguerre (2022)

Historical notes. Fleming (1957) recorded six males and 5 females from Simla. Identified by comparison with the type (NHMUK, ♂ Venezuela) and NHMUK series. Cock and Laguerre (2022) transferred this species to *Valvaminor* having documented the male genitalia.

Taxonomic issues. No public DNA barcodes in BOLD.

Identification. As discussed under *V. desperata* above. Sexes similar apart from the strongly bipectinate antennae of the male.

Biology in Trinidad. Adults are attracted to heliotrope by day and to light by night.

Status in Trinidad. An uncommon, but widespread species, mainly in forested areas.

***Valvaminor jacerda* Cock and Laguerre, 2022**

Figs. 144–147. For figures of the details of body and male genitalia, see Cock and Laguerre (2022).

OD: Cock and Laguerre 2022: *Valvaminor jacerda*, TL Trinidad.

TT: *Mesothen pyrrha* (Schaus): Kaye and Lamont (1927), Fleming (1957)
Valvaminor jacerda Cock and Laguerre: Cock and Laguerre (2022)

Historical notes. Kaye and Lamont (1927) recorded *Mesothen pyrrha* from Palmiste (22.ix.1916, 16.i.1921, 23.ii.1921, 5.iv.1921, N. Lamont), noting that it is a common

Fig. 142. Male *Valvaminor endoleuca* ♂, Parrylands Oilfield, to *Heliotropium*, 25.vii.1981; 18 mm.

Fig. 143. Female *Valvaminor endoleuca*, Parrylands Oilfield, to *Heliotropium*: ♀ 25.vii.1981; 19 mm.

Fig. 144. Male *Valvaminor jacerda*, Las Lomas, Spanish Farm, to *Heliotropium*, 12.x.1980; 20 mm.

Fig. 145. Female *Valvaminor jacerda*, Curepe, v–vi.1979; 20 mm.

Fig. 146. Male *Valvaminor jacerda*, Penal, at light, 18.iv.2014, K. Sookdeo; ©, with permission.

Fig. 147. Male *Valvaminor ?jacerda*, Tobago, Arnos Vale, at light, 11.vi.2022 R. Deo (iNaturalist observation 121361203) ©, with permission.

species. Fleming (1957) recorded four males and a female from Simla. Building on the work of Cerda (2008, 2020), Cock and Laguerre (2022) described this species from Trinidad and Venezuela as *Valvaminor jacerda.* A 2022 photographic record from Arnos Vale (Fig. 147) is the first from Tobago, but needs confirmation.

Taxonomic issues. No DNA barcodes available.

Identification. A small species with transparent wings, black veins and sharply defined black margin. The orange-red thorax distinguishes it from other small Euchromiina, apart from *Pseudomya afflicta*. The latter species has a diffuse edge to the black wing margins, whereas in *V. jacerda* it is sharply defined. Sexes similar apart from the strongly bipectinate antennae and grey or whitish ventral flap of the male.

Biology in Trinidad. Adults are attracted to heliotrope by day and to light by night.

Status in Trinidad. A common species and widespread in lowland areas.

XANTHYDA DOGNIN, 1919

Type species *Xanthyda anaxantha* Dognin, 1919, TL French Guiana, which is now a synonym of *X. chalcosticta* Butler, 1876, TL Brazil, Pará (Cerda 2008). This was to be a Hampson genus with a different type species that Dognin accidentally published prematurely (Cerda 2008).

Xanthyda beebei (Fleming, 1957)

Figs. 148–149, Appendix Figs. 23–24.

OD: Fleming 1957: *Pheia beebei*, TL Trinidad

TT: *Pheia beebei* Fleming: Fleming (1957)

Xanthyda beebei (Fleming): Cock and Laguerre (2022)

Historical notes. Fleming (1957) described and illustrated *Pheia beebei* based on three males from Simla. MJWC's material was identified from Fleming (1957) and subsequently by comparison with an image of the holotype (AMNH 2022).

Taxonomic issues. No public sequences in BOLD. As Fleming (1957) stated, this species is close to *P. gaudens*

Fig. 148. Male *Xanthyda beebei*, Parrylands Oilfield, to *Heliotropium*, 25.vii.1981; 24 mm.

Fig. 149. Female *Xanthyda beebei*, Lalaja South Road, eupatorium flowers, 25.ix.1982; 26 mm.

Walker, 1856 (♂ type in OUMNH, TL Brazil, Para). Cerda (2008) transferred *P. gaudens* to the combination *Xanthyda gaudens* based on the male genitalia. Noting that the two species are congeneric, Cock and Laguerre (2022) transferred *P. beebei* to the combination *Xanthyda beebei*.

Identification. This small wasp mimic superficially resembles the three *Agelaia* wasp mimics treated above (*Myrmecopsis kenedyae*, *Pleurosoma trinitatis* and *Sphecosoma aurantiipes*, Fig. 78), but both sexes of *X. beebei* have a black margin to the wings – narrow in the female, broader in the male. With the extensive yellow markings on the body, they also superficially resemble three *Pseudosphex* species (Ctenuchina): *P. fulvisphex* (Druce), *P. nigricornis* (Fabricius) and an unidentified species, but *X. beebei* differs in having black transverse bands the length of the abdomen.

Biology in Trinidad. Both Trinidad records were by day, the female at eupatorium flowers and the male to heliotrope. Cerda (2008) stated that *X. gaudens* is attracted to light.

Status in Trinidad. A rare species in Trinidad; both records are from forested areas, one in the Northern Range and the other in the south.

***Xanthyda* sp.**

Fig. 150.

Historical notes. This record is based on a single specimen in Sir Norman Lamont's collection in UWIZM from 1947 (Fig. 150), labelled as *Cosmosoma gemmata* (Butler, 1875). Kaye would not have seen this specimen and Lamont and Callan (1950) did not include this name in their paper of new records.

Taxonomic issues. This is not *C. gemmata*, and seems closest to *C. elegans* (Butler, 1876). However, having examined the type of *C. elegans* (NHMUK, ♂ Brazil, Espiritu Santo) and NHMUK series, we conclude that this Brazilian species is not the same as Lamont's specimen. Based purely on superficial habitus, Lamont's specimen may be a *Xanthyda* sp. (as may *C. elegans*), but we have not found any comparable species of *Xanthyda* or indeed Euchromiina with the rather distinctive bowed margin to the dark apical area of the forewing, combined with the dark notch at the end of veins 1 and 2, yellowish transparent areas, thickened basal dorsum of forewing (and/or basal costa of hindwing), even narrow hindwing margin, and metallic blue-green spots on head, thorax, abdomen and

Fig. 150. Male ?*Xanthyda* sp., Palmiste, 16.v.1947, [N. Lamont] [UWIZM].

base of dorsal forewings. It will be necessary to dissect this specimen to try and establish its affinities, and more material and DNA barcodes will help to characterise it better.
Identification. See characters highlighted in last paragraph.
Biology in Trinidad. Nothing known.
Status in Trinidad. Just one 1947 record from Palmiste.

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REFERENCES

AMNH (American Museum of Natural History) 2022. Invertebrate Zoology [Online database]. Available at: https://emu-prod.amnh.org/imulive/iz.html (Accessed 14 June 2022).

Beccaloni, G., Scoble, M., Kitching, I., Simonsen, T., Robinson, G., Pitkin, B., Hine, A. and **Lyal, C.** (eds) 2018. The Global Lepidoptera Names Index (LepIndex). [Online]. Available at: https://www.nhm.ac.uk/our-science/data/lepindex/lepindex/ (Accessed 11 August 2021).

Beebe, W. 1955. Two little-known selective insect attractants. *Zoologica* 40: 27-32, pl. 1-4.

Beebe, W. and **Kenedy, R.** 1957. Habits, palatability and mimicry in thirteen ctenuchid moth species from Trinidad, B.W.I. *Zoologica* 42: 147-158, plates I-II.

Betz, J.T. 1972. Contribution a la connaissance des lépidoptères Amatidae del la Guyane française (1). *Annales de la Société entomologique de France* 8(2): 397-407.

Bland, K.P. 2010. Name-bearing types of Lepidoptera (Insecta), excluding Rhopalocera, in the National Museums of Scotland, Edinburgh. *Zootaxa* 2394: 1-22.

Blest, A.D. 1964. Protective display and sound production in some new world arctiid and ctenuchid moths. *Zoologica* 49: 161-181.

Butler, A.G. 1876. Notes on the Lepidoptera of the family Zygaenidae, with descriptions of new genera and species. *Journal of the Linnean Society, Zoology* 12: 342-407, pl. XXVII-XXVIII.

Butler, A.G. 1877. Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British Museum. Part I. London: British Museum (Natural History). xiii, 62 p., 20 pl.

Cerda, J.-A. [2008]. Euchromiini de Guyane française Lepidoptera: Arctiidae, Arctiinae. [Luxembourg]: The author. [iv], 172 p., IV (index).

Cerda, J.-A. 2017. Addenda à la monographie « Euchromiini de Guyane française » (Cerda, 2008) (2e partie) (Noctuoidea Erebidae Arctiinae Arctiini Euchromiina). *Antenor* 4(2): 158-163.

Cerda, J.-A. 2020. Descriptions d'un nouveau genre :

Valvaminor gen. nov. et d'une nouvelle espèce de Bolivie : *Valvaminor bleuzeni* sp. nov. (Lepidoptera, Noctuoidea, Erebidae, Arctiinae, Arctiini, Euchromiina). Septième note. *Bulletin Mensuel de la Société Linnéenne de Lyon* 89(7-8): 205-212.

Cock, M.J.W. 1981. An assessment of the occurrence and potential of natural enemies of Mikania spp. in the Neotropics. Final report (May 1978 - March 1981). Unpublished report. Curepe, Trinidad and Tobago: Commonwealth Institute of Biological Control. 64 p.

Cock, M.J.W. 1982. Potential biological control agents for Mikania micrantha HBK from the Neotropical Region. *Tropical Pest Management* 28: 242-254.

Cock, M.J.W. 2003. On the number of species of moths (Lepidoptera) in Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2003: 49-58.

Cock, M.J.W. 2017. A preliminary catalogue of the moths (Lepidoptera except Papilionoidea) of Tobago, West Indies. *Insecta Mundi* 0585: 1-58.

Cock, M.J.W. 2021. The prominent moths (Lepidoptera, Notodontidae) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2021: 1-102, Appendix 1-50.

Cock, M.J.W. and **Laguerre, M.** 2022. Taxonomic changes in the Neotropical wasp moths, Euchromiina and Ctenuchina (Lepidoptera, Erebidae, Arctiinae, Arctiini) relating to the fauna of Trinidad & Tobago, with descriptions of new species. *Zootaxa* 5222(2): 101–132.

Cock, M.J.W. and **Robbins, R.K.** 2016. Annotated checklist and biogeographic composition of the Lycaenidae (Lepidoptera) of Trinidad, West Indies. *Insecta Mundi* 0506: 1-33.

Cock, M.J.W., Kelly, M., Deacon, A. and **Gibson, M.** 2022. New records and identifications of butterflies and moths (Lepidoptera) from Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2022: 00-00.

Cramer, P. 1775–1782. De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America. Papillons exotiques des trois parties du monde l'Asie, l'Afrique et l'Amérique. Vol. 1. Amsteldam: S. J. Baalde; Utrecht, Barthelemy Wild and J. Van Schoonhoven & Comp. frontispiece (1782), title-page (1779), xxx, p. 1-16, 1-132, pls. 1-84 (1775); p. 133-155, pls. 85-96 (1776).

Cramer, P. 1777–1782. De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America. Papillons exotiques des trois parties du monde l'Asie, l'Afrique et l'Amérique. Vol. 3. Amsteldam: S. J. Baalde; Utrecht: Barthelemy Wild and J. Van Schoonhoven & Comp., title-page (1782), p. 1-128, pls. 193-264 (1779), p. 129-176, pls. 265-288 (1780).

Deo, R.N., Ali, H. and **Cock, M.J.W.** (2020) Night walks generate unexpected new observations of moths (Lepidoptera) from Trinidad, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2020: 72-79.

Dietz, R.E., IV 1994. Systematics and biology of the genus *Macrocneme* Hübner Lepidoptera: Ctenuchidae). *University of California Publications in Entomology* 113: 121 p. + figures.

Dietz, R.E., IV and **Duckworth, W.D.** 1976. A review of the genus *Horama* Hübner and the reestablishment of the genus *Poliopastea* Hampson (Lepidoptera: Ctenuchidae). *Smithsonian Contributions to Zoology* 215: 53 p.

Dowdy, N.J., Keating, S., Lemmon, A.R., Lemmon, E.M., Conner, W.E., Scott Chialvo, C.H., Weller, S., Simmons, R.B., Sisson, M.S. and **Zaspel, J.M.** 2020. A deeper meaning for shallow-level phylogenomic studies: nested anchored hybrid enrichment offers great promise for resolving the tiger moth tree of life (Lepidoptera: Erebidae: Arctiinae). *Systematic Entomology* 45(4): 874-893.

Draudt, M. 1915–1917. 3. Family Syntomidae. p. 37-230, pl. 9-31. In: Seitz, A., ed. 1913-1939. II. Division: The Macrolepidoptera of the American Region. 6. Volume The American Bombyces and Sphinges. Stuttgart: A. Kernan. 1327 p., 185 pl.

Druce, H. 1881-1900. Insecta. Lepidoptera-Heterocera. Biologia Centrali-Americana. London: The Editors. Vol. I. (Text.) xxxii, 490 p.; Vol II. (Text), 622 p.; Vol III (Plates), 101 pl.

Druce, H. 1896. Descriptions of some new genera and species of Heterocera from Central and tropical South America. *Annals & Magazine of Natural History*, Series 6 18: 103-108.

Druce, H. 1898. Descriptions of some new species of Syntomidae, chiefly in the Oxford Museum. *Annals & Magazine of Natural History*, Series 7 1: 401-408.

Druce, H. 1905. Descriptions of some new species of Syntomidae and Arctiadae from Tropical South America. *Annals & Magazine of Natural History*, Series 7 15: 460-467.

Druce, H. 1906. Descriptions of some new species of Heterocera from tropical South America. *Annals and Magazine of Natural History*, Series 7 18: 77-94.

Dunning, D.C. 1968. Warning sounds of moths. *Zeitschrift fur Tierpsychologie* 25(2): 129-138.

Dyar, H.G. 1915. New American Lepidoptera chiefly from Mexico. *Insecutor Inscitae Menstruus* 3: 79-85.

Fabricius, J.C. 1775 Systema entomologiae, sistens insectorvm classes, ordines, genera, species, adiectis synonymis, locis, descriptionibvs, observationibvs. Flensburgi et Lipsiae [= Flensburg and Leipzig]: Korte. [iv], [xii], [xvi], 832 p.

Felsenstein, J. 1985. Confidence limits on phylogenies: An approach using the bootstrap. *Evolution* 39:783-791.

Fleming, H. 1950. The Euchromiidae (Moths) of Kartabo, British Guiana, and Caripito, Venezuela. *Zoologica* 35: 209-216.

Fleming, H. 1957. The Ctenuchidae (moths) of Trinidad, B.W.I. Part I. Euchromiinae. *Zoologica* 42: 105-130, pl. 1-3.

Fleming, H. 1959. The Ctenuchidae (Moths) of Trinidad, B.W.I. Part II. Ctenuchinae. *Zoologica* 44: 85-104, pl. 1-3.

Forbes, W.T.M. 1939. The Lepidoptera of Barro Colorado Island, Panama. *Bulletin of the Museum of Comparative Zoology at Harvard College* 85: 97-406, 8 pl.

Gernaat, H.B.P.E., Van Den Heuvel, J., Barten, F. and **Van Andel, T.** 2018. Lectotype designation and life history of *Histioea cepheus cepheus* (Erebidae: Arctiinae) in Suriname. *Journal of the Lepidopterists' Society* 72(3): 192-202.

Grados, J. 1999. Lista preliminar de los Ctenuchinae (Lepidoptera: Arctiidae) de la Zona Reservada Tambopata-Candamo, Madre de Dios, Peru. *Revista peruana de Entomología* 41(1): 9-14.

Hampson, G.F. 1898. Catalogue of the Syntomidae in the collection of the British Museum. Catalogue of the Phalaenae in the collection of the British Museum. Volume I. London: Trustees of the British Museum. xxi, 559 p., pl. 1-17.

Hampson, G.F. 1914. Catalogue of the Amatidae and Arctiadae (Nolinae and Lithosiane) in the Collection of the British Museum. Catalogue of the Lepidoptera Phalaenae in the British Museum. Supplement. Volume I. London: Trustees of the British Museum. xxviii, 838 p. (pl. I-XLI published 1915).

Hebert, P.D.N., Cywinska, A., Ball, S.L. and **deWaard, J.R.** 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society (London), Series B Biological Sciences* 270: 313-321.

Hernández-Baz, F. and **Bailey, A.C.** 2006. The Ctenuchinae (Insecta: Lepidoptera: Arctiidae) of the Republic of Guatemala: A preliminary synthesis. p. 403–413. In: **Cano, E.,** ed. State of the Biodiversity of Guatemala. Vol. 1. Guatemala: University of the Valley of Guatemala and Mexico City: CONCYT.

Hernández-Baz, F. and **Grados, J.** 2004. Lista de los Ctenuchinae (Insecta: Lepidoptera: Arctiidae) del Estado de Veracruz, México y algunas notas sobre su riqueza en el Continente Americano. *Folia Entomologica Mexicana* 43: 203-213.

Hernández-Baz, F., Morón, M.A., Chamé-Vázquez, E. and **González, J.M.** 2013. Ctenuchina and Euchromiina (Lepidoptera: Erebidae: Arctiinae) of three biological research stations of México's ECOSUR. *Journal of the Lepidopterists' Society* 67(3): 145-155.

Hernández-Baz, F., González, J.M. and **Heppner, J.B.** 2017. Inventory of wasp moths of the Tumilco Mangrove, Tuxpan, Veracruz, Mexico (Lepidoptera: Erebidae: Ctenuchina - Euchromiina). *Entomological News* 126(4): 274-280.

Herrich-Schäffer, G.A.W. 1850–[1858]. Sammlung neuer oder wenig bekannter aussereuropäischer Schmetterlinge. Regensburg: G. J. Manz. 1: p. 1-52 (1856]), p. 53-84 ([1858]); pls. [butterflies]: p. [1-10] (1850), p. 11-14 ([1853]), p. 15-18 ([1855]), p. [19-22] ([1856]), p. 23-24 ([1858]).

Hübner, J. (1806–[1819]) Sammlung exotischer Schmetterlinge. Erster Band. Augsburg: Jacob Hübner. 1: p. [1–10], pl. [1–213].

Janzen, D. H. and **Hallwachs, W.** 2022. Dynamic database for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), northwestern Costa Rica. [Online]. Available at http://janzen.sas.upenn.edu (Accessed 14 June 2022).

Kaye, W.J. 1901. A preliminary catalogue of the Lepidoptera Heterocera of Trinidad. *Transactions of the Entomological Society of London* 1901: 115-158, 2 pl.

Kaye, W.J. 1911. New species of Syntomidae from British Guiana and south Brazil. *The Entomologist* 44: 142-146.

Kaye, W.J. 1913. A few observations in mimicry. *Transactions of the Entomological Society of London* 1913: 1-10, pl. 1.

Kaye, W.J. 1920. New species and sub-species of S. American Lepidoptera. *Entomologists' Record and Journal of Variation* 32(10): 187-189.

Kaye, W.J. and **Lamont, N.** 1927. A catalogue of the Trinidad Lepidoptera Heterocera (moths). *Memoirs of the Department of Agriculture, Trinidad and Tobago* 3: 144 pp.

Kirby, W.F. 1892. A synonymic catalogue of Lepidoptera Heterocera. (Moths.) London: Gurney & Jackson. xii, 951 p.

Kitching, I.J. and **Cadiou, J.-M.** 2000. Hawkmoths of the World. An Annotated and Illustrated Revisionary Checklist (Lepidoptera: Sphingidae). Ithaca, USA and London: Cornell University Press. viii, 227 p.

Klages, E.A. 1906. On the syntomid moths of southern Venezuela collected in 1898-1900. *Proceedings of the United States National Museum* 29: 531-552.

Kumar, S., Stecher, G., Li, M., Knyaz, C. and **Tamura, K.** 2018. MEGA X: Molecular Evolutionary Genetics Analysis across computing platforms. *Molecular Biology and Evolution* 35: 1547-1549.

Laguerre, M. 2014. Partial revision of the genus *Homoeocera* Felder, 1874, and description of three new species. *Antenor* 1(2): 153-172.

Lamont, N. and **Callan, E.McC.** 1950. Moths new to Trinidad, B.W.I. *Zoologica* 35: 197-207.

Laurence, G.A. 2000. The insect pests of coffee. *Journal of*

the Agricultural Society of Trinidad and Tobago 89: 19-20.
Lesieur, X. and **Lévêque, A.** 2017. Description et éthologie d'une nouvelle sous-espèce d'*Histioea meldolae* du Panama (Lepidoptera Erebidae Arctiinae Ctenuchini). *Antenor* 4(1): 67-70.
Linnaeus, C. 1767. Systema naturae. Editio duodecima reformata. Holmiae [= Stockholm]: Laurentius Salvius. 1(2): [ii], p. 533-1328, [36] p.
Marchant, J. 1916. Raphael Meldola. London: Williams and Norgate. xv, 225 p.
Miller, S.E., Hausmann, A., Hallwachs, W. and **Janzen, D.H.** 2016. Advancing taxonomy and bioinventories with DNA barcodes. *Philosophical Transactions of the Royal Society B* 371: 20150339.
Nishida, R. 2002. Sequestration of defensive substances from plants by Lepidoptera. *Annual Review of Entomology* 47: 57-92.
Orfila, R.N. 1935. Lepidoptera neotropica I. El género *Sphecosoma* y descripción de tres géneros nuevos de Amatidae. *Revista de la Sociedad Entomológica Argentina* 7: 177-182.
OUMNH (Oxford University Museum of Natural History) 2022. Life Collections: collections database. [Records 547 and 1102, 1105, 3708]. [Online]. Available at http://www.oum.ox.ac.uk/database/entom/collects.htm (Accessed 26 June 2022).
Piñas, F.S.J. and **Manzano, I.** 2003. Mariposas del Ecuador. Vol. 21 b. Arctiidae, subfamilia: Ctenuchinae. Quito, Ecuador: Compañía de Jesús, 95 p., 1 CD.
Pinheiro, L.R. and **Duarte, M.** 2010. Revision of the Neotropical moth genera *Mallodeta* Butler and *Erruca* Walker, revalidated (Noctuidae, Arctiinae, Arctiini, Euchromiina). *Zootaxa* 2573: 1-34.
Pliske, T.E. 1975. Attraction of Lepidoptera to plants containing pyrrolizidine alkaloids. *Environmental Entomology* 4: 455-473.
Ratnasingham, S. and **Hebert, P.D.N.** 2013. A DNA-based registry for all animal species: the Barcode Index Number (BIN) System. *PLoS ONE* 8(8): e66213. doi:10.1371/journal.pone.0066213
Rodríguez-Loeches, L. and **Barro, A.** 2008. Life cycle and immature stages of the arctiid moth, *Phoenicoprocta capistrata. Journal of Insect Science* 8(5): 13 p.
Rothschild, W. 1910. Descriptions of a new hawk-moth and some new Syntomidae. *Annals & Magazine of Natural History*, Series 8 5: 506-511.
Rothschild, W. 1911. The Syntomidae of the Tring Museum. *Novitates Zoologicae* 18: 24-45.
Rothschild, W. 1912. New Syntomidae. *Novitates Zoologicae* 19: 151-186.
Rothschild, W. 1913. Some unfigured Syntomidae. *Novitates Zoologicae* 20: 470-472, pl. XIII-XIV.
Rothschild, Lord [W.] 1931. Notes on Syntomidae (Amatidae) with descriptions of new species. *Novitates Zoologicae* 37: 149-158.
Saitou, N. and **Nei, M.** 1987. The neighbor-joining method: A new method for reconstructing phylogenetic trees. *Molecular Biology and Evolution* 4:406-425.
Schaus, W. 1889. Descriptions of new species of Mexican Heterocera. *Entomologia Americana* 5: 87-90.
Schaus, W. 1896. New species of Heterocera from tropical America. *Journal of the New York Entomological Society* 4: 147-154.
Schaus, W. 1905. Descriptions of new South American Moths. *Proceedings of the United States National Museum* 29(1420): 179-345.
Schaus, W. 1924. New species of moths in the United States National Museum. *Proceedings of the United States National Museum* 65(2520): 1-74.
Seitz, A. 1915. 3. Family: Syntomidae. [Introductory remarks]. p. 33-37. In: Seitz, A., ed. 1913-1939. II. Division: The Macrolepidoptera of the American Region. 6. Volume The American Bombyces and Sphinges. Stuttgart: A. Kernan.
Sepp, J. 1843–1848. Surinaamsche Vlinders. Naar het leven geteekend. Papillons de Surinam. Dessinés d'après nature. Vol. 2. Amsterdam: Jan Christian Sepp en Zoon. i-iv, p. 109-224, pl. 51-100.
Simmons, R.B. 2006. A revision of *Psoloptera* Butler, including a redescription of its known species (Arctiidae: Arctiinae: Euchromiini). *Journal of the Lepidopterists' Society* 60(3): 149-155.
Simmons, R.B., Weller, S.J. and **Johnson, S.J.** (2012) The evolution of androconia in mimetic tiger moths (Noctuoidea: Erebidae: Arctiinae: Ctenuchina and Euchromiina). *Annals of the Entomological Society of America* 105(6): 804-816.
Simmons, R.B. and **Weller, S.J.** 2006. Review of the *Sphecosoma* genus group using adult morphology (Lepidoptera: Arctiidae). *Thomas Say Publications in Entomology: Monographs* 31: 108 p.
Starr, C.K. 2009. Trinidad and Tobago. p. 926-929. In: **Gillespie, R.** and **Clague, D.**, eds. The Encyclopedia of Islands. Berkeley, California, University of California Press.
Stoll, C. 1780–1782. In: Cramer, P. De uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America. Papillons exotiques des trois parties du monde l'Asie, l'Afrique et l'Amérique. Vol. 3 [part; the earlier part was authored by Cramer, P.] Title-page (1782), p. 29-90, pls. 305-336 (1780), p. 91-164, pls. 337-372 (1781), p. 165-252, pls. 373-400 (1782). Amsteldam [= Amsterdam]: S. J. Baalde; Utrecht: Barthelemy Wild.
Strand, E. 1915. Über einige exotosche (exklus. Asiatische) Syntomididen des Deutschen Entomologischen Museums. *Deutsche entomologische Zeitschrift* 1915: 19-29.
Strand, E. 1917. Neue und wenig bekannte Nebenformed

von Syntomididen. *Archiv fur Naturegeschichte* 82A(2) (1916): 79-86.

Strand, E. 1927. Enumération des Hétérocères exotiques (à l'exclusion des Noctuides, des Microlépidoptéres, des espèces de l'île Formosa et des espèces que j'ai décrites dans Seitz „Macrolépidoptères") qui jusqu'à l'année 1926 sont nommés et publieés. *Entomologisches Nachrichtenblatt*, Troppau 1(3): 42-55.

Tamura, K., Nei, M. and **Kumar, S.** 2004. Prospects for inferring very large phylogenies by using the neighbor-joining method. *Proceedings of the National Academy of Sciences* (USA) 101: 11030-11035.

The Linnean Collections (2022) LINN 0875 *Sphinx auge* (Ins Linn). Available at https://linnean-online.org/15778/.

Walker, F. 1854. List of the specimens of lepidopterous insects in the collection of the British Museum. Part I. - Lepidoptera Heterocera. London: The British Museum (Natural History). p. 1-278.

Walker, F. 1856. List of the specimens of lepidopterous insects in the collection of the British Museum. Part VII. - Lepidoptera Heterocera. London: The British Museum (Natural History). p. 1509-1808.

Waterhouse, C.O. 1880–1882. Aid to the identification of insects. Vol. 1. London: E. W. Janson. 1: 16 p., pl. 1-100.

Watson, A., Fletcher, D.S. and **Nye, I.W.B.** 1980. The Generic Names of Moths of the World. Volume 2. Noctuoidea (part); Arctiidae Cocytiidae Ctenuchidae Dilobidae Dioptidae Lymantriidae Notodontidae Strepsimanidae Thaumetopoeidae Thyretidae. London: British Museum (Natural History). xiv, 228 p.

Zahiri, R., Kitching, I.J., Lafontaine, J.D., Mutanen, M., Kaila, L., Holloway, J.D. and **Wahlberg, N.** 2011. A new molecular phylogeny offers hope for a stable family level classification of the Noctuoidea (Lepidoptera). *Zoologica Scripta* 40(2): 158-173.

Zerny, H. 1912. Syntomidae. *Lepidopterorum Catalogus* 7: 1-179.

Zerny, H. 1931a. Beitrage zur Kentnis der Syntomiden. *Deutsche Entomologische Zeitschrift, "Iris"*, Dresden 45: 1-27, pl. 1.

Zerny, H. 1931b. Ergebnisse einer zoologischen Sammelreise nach Brasilien, insbesondere in das Amazonasgebiet, ausgeführt von Dr. H. Zerny. VII. Teil. Lepidoptera III: Die Syntomiden des Staates Para. *Annalen des Naturhistorischen Museums in Wien* 45: 225-263.

Zimzen, E. 1964. The type material of I. C. Fabricius. Copenhagen: Munksgaard. 656 p.

Elf moths (Lepidoptera Euteliidae) of Trinidad & Tobago

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ABSTRACT
Information and images are summarized for five genera and 12 species recorded from Trinidad, of which one genus and three species also occur in Tobago. Five species are newly recorded from Trinidad. More taxonomic investigation is needed regarding the *Marathyssa ablatrix* (Guenée) complex. *Paectes devincta* (Walker) is only known from an image taken on Chacachacare Island. As yet, no Euteliidae from Trinidad & Tobago have been DNA barcoded, but when sequences become available, this is expected to raise more taxonomic questions.

Key Words: Euteliinae, *Marathyssa*, *Nagara*, *Paectes*, Stictopterinae, checklist, inventory, new records, DNA barcodes, iNaturalist

INTRODUCTION

Euteliidae is a small family of somewhat undistinguished noctuoid moths. van Nieukirken *et al*. (2011) estimated Euteliidae to comprise 29 genera and 520 species. Here I treat five genera and 12 species from Trinidad (Fig. 1), of which one genus and three species also occur in Tobago. Five species are newly recorded from Trinidad. Wagner *et al*. (2012) coined the name 'elves' for Euteliidae, referring to the relatively small size compared to other Noctuoids and the way the caterpillar "prolegs curl upward in much the same way as elfin boots in many renderings".

As currently constituted, Euteliidae comprises two subfamilies, Euteliinae and Stictopterinae, both of which occur in Trinidad & Tobago. Until quite recently, these two subfamilies have been treated as subfamilies of Noctuidae, families in their own right or as subfamilies of Erebidae (Fibiger & Lafontaine 2005, Lafontaine & Fibiger 2006, Mitchell *et al*. 2006). However, Zahiri *et al*. (2011) reinstated Euteliidae as a family and placed Stictopterinae as a subfamily. Euteliidae is now considered to group with Erebidae, Nolidae and Noctuidae as the quadrifine Noctuoidea (Zahiri *et al*. 2013, Regier *et al*. 2016). Zahiri *et al*. (2023) provided a new analysis of relationships within the family, confirmed the two subfamilies Euteliinae and Stictopterinae, and made some taxonomic changes (see under *Marathyssa*).

Euteliinae most commonly feed on lactiferous Anacardiaceae (Janzen & Hallwachs 2022) and in the Old World also on Burseraceae, Dipterocarpaceae, Moraceae and Hamamelidaceae (Holloway 1985, Powell *et al*. 1998), while Stictopterinae are associated primarily with Calophyllaceae and Clusiaceae (Janzen & Hallwachs 2022), and in the Old World on Dipterocarpaceae as well (Holloway 1985, Powell

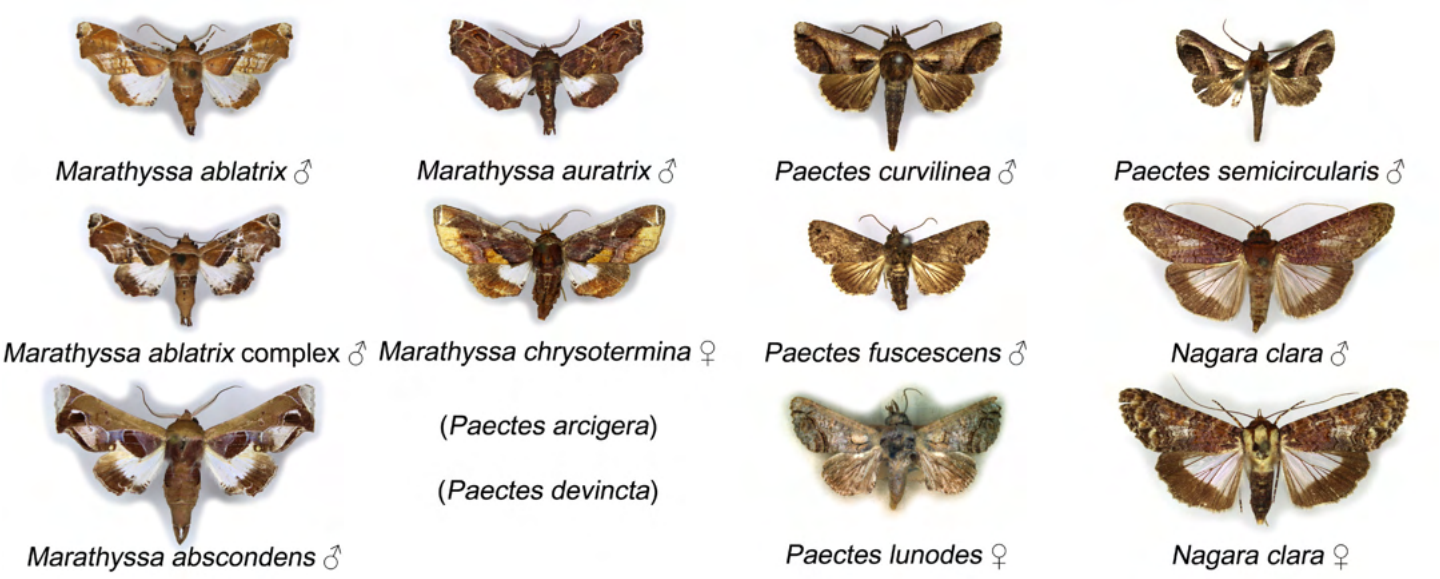

Fig. 1. Euteliidae of Trinidad & Tobago (two species missing as indicated). Life size; see species figures for details.

et al. 1998). No reports on the life history of members of this family have been found from Trinidad & Tobago, but indications of the food plants are given where known from Janzen and Hallwachs (2022).

The reader is referred to the lengthy introductions in Cock (2021a) and Cock and Laguerre (2023) regarding the approach and layout used here. Some reiteration and additional comments on the use of genetic data and tools are warranted. DNA barcoding based on sequences of a defined section of the CO1 mitochondrial gene (Hebert *et al.* 2003) provides a tool that can be used to help clarify the status of different populations of taxa in the future, based on the increasing numbers of publicly available DNA barcodes in BOLD (Barcode of Life Database, http://www.boldsystems.org/) and GenBank (http://www.ncbi.nlm.nih.gov/genbank). Barcode Index Numbers (BINs) (Ratnasingham and Hebert 2013) have been introduced to provide a permanent numbering system for clusters of similar barcodes (haplotypes) normally separated from others by at least 2% base pairs substituted, which in a high percentage of cases correspond to known taxonomic species and can also help flag species complexes or clusters needing taxonomic research (Ratnasingham and Hebert 2013, Miller *et al.* 2016). For example, Zahiri *et al*. (2014) compared BINs with current taxonomic treatment of 1,541 species of Canadian Noctuoidea (99.1% of the known total), and found that DNA barcodes unambiguously discriminated 90% of the noctuoid species recognized through prior taxonomic study. They found high agreement between taxonomic names and sequence clusters delineated by the BIN system with 1,082 species (70%) assigned to a unique BIN. However, they also found BINs that contained more than one species, and species that occurred as more than one BIN. BINs are a strong proxy for species, but still need to be interpreted in light of other taxonomic and biological information.

MJWC checked all Trinidad genera of Euteliidae against BOLD in 2022 and constructed BOLD TaxonID Trees using public DNA barcodes in BOLD (and others shared with him by project managers) and the standard BOLD function for the genera thus far recognized from Trinidad. In many cases, there were very few DNA barcodes from South America, but often a large sample from Costa Rica based on the work of Dan Janzen and Winnie Hallwachs' inventory programme (Janzen and Hallwachs 2022). It was quite common to find that one phenotypic species in Costa Rica comprised more than one BIN in BOLD, and when DNA barcodes were available from South America, they did not necessarily match those from Costa Rica and appeared as different BINs.

Only one species of Euteliidae recorded from Trinidad was described from the island: *Paectes semicircularis*. Some were described from the Guianas or Venezuela, both of which have a high affinity with the Trinidad Lepidoptera fauna (e.g. Cock and Robbins 2016), and so these names are likely to be reliable for Trinidad. On the other hand, many Euteliidae recorded from Trinidad, but described from further south, e.g. southern Brazil or from Central America could well prove to be part of a species complex, for which the current name will not be applied to the Trinidad population in the future. Interpretation of these differences needs intensive museum work, including dissection of the genitalia and careful study of type material. Many types have yet to be dissected, which means this cannot yet be done. The BOLD database does not have adequate coverage yet to fully address these questions, so there would be value to building up a library of DNA barcodes for the Trinidad & Tobago fauna, which in due course can help solve some of these questions, resolve which species (and BINs) occur in Trinidad & Tobago, and as the technology becomes more accessible, facilitate rapid identification. For taxa that have been described from Trinidad, characterisation by their DNA barcodes will be an important contribution, to stabilise and define the use of these names.

In preparing this work, I consulted the following collections:

MJWC	the private research collection of M.J.W. Cock, UK;
NHMUK	Natural History Museum, London, UK;
NMS	National Museum of Scotland, Edinburgh, UK;
OUMNH	Oxford University Museum of Natural History, Oxford, UK;
USNM	National Museum of Natural History (formerly United States National Museum), Washington DC, USA;
UWIZM	University of the West Indies Zoology Museum, St. Augustine, Trinidad & Tobago.

FAMILY EUTELIIDAE GROTE, 1882
Subfamily Euteliinae Grote, 1882

Marathyssa Walker, 1865

Type species: *Marathyssa basalis* Walker, 1865; type locality not given [North America]. The Trinidad species of this genus were placed in *Eutelia* Hübner, [1823] (type species: *Eutelia adulatrix* Hübner, TL Europe), which was considered a pantropical genus of more than 100 species, including one Nearctic and 17 Neotropical (Poole 1989, Barbut and Lalanne-Cassou 2005). Zahiri *et al*. (2023) showed that *Eutelia* was polyphyletic, and transferred all the American species to *Marathyssa*.

Adults of *Marathyssa* habitually rest with their abdomen twisted to one side, e.g. Fig. 4, an uncommon habit in other groups, but also seen for example in *Phiditia cuprea* (Kaye) (Phiditiidae) (Cock 2021b, Fig. 14).

***Marathyssa ablatrix* (Guenée, 1852)**

Figs. 2–5.

OD: Guenée (1852): *Penicillaria ablatrix*, TL unknown [Neotropical].

TT: *Eutelia ablatrix* (Guenée): Lamont & Callan (1950), Cock (2017)

Historical notes. Lamont & Callan (1950) recorded a specimen from Palmiste, 27.iv.1926 (N.L.). This specimen is in RSM and matches material in MJWC compared with the NHMUK series. Cock (2017) recorded this species from Tobago.

Taxonomic issues. Public DNA barcodes in BOLD of material identified as *Eutelia ablatix* are in two BINs: BOLD:AAC0412 from French Guiana, Costa Rica and Guatemala, and BOLD:AAC0411 from Dominican Republic, Cuba, Jamaica and Costa Rica. As *M. ablatrix*

Fig. 2. Male *Marathyssa ablatrix*, Curepe, MVL,29.v.1979.

Fig. 3. Female *Marathyssa ablatrix*, Brigand Hill, MVL light, 28.iii.2003.

Fig. 4. Male *Marathyssa ablatrix*, Tobago, Englishman's Bay, at light, 2.vii.2022, M. Gibson (iNaturalist observation 124491079); ©, with permission.

Fig. 5. Female *Marathyssa ablatrix*, Tobago, Arnos Vale, at light, 12.vi.2022, R. Deo (iNaturalist observation 121386112); ©, with permission.

was described from a single male of unknown origin (Guenée 1852, p. 303), further research will be needed to assess whether the name can be applied to one of these BINs. In preparing this account, I realised that I had two species under this name from Trinidad. The first of these I treat provisionally as *M. ablatrix*; it is close to, perhaps the same as, BOLD:AAC0411, so DNA barcodes from Trinidad would be helpful. In the second species present in Trinidad, the male is darker than the male of Trinidad *M. ablatrix*, and with serrate rather than bipectinate antennae. This species is treated below as *M. ablatrix* complex. Both BOLD:AAC0412 and BOLD:AAC0411 have bipectinate antennae, so neither can be this second species.

Identification. The separation of the two species treated here as part of a *M. ablatrix* complex is discussed below under *M. ablatrix* complex.

Biology in Trinidad. Unknown

Status in Trinidad and Tobago. An occasional and widespread species in both Trinidad and Tobago.

Brigand Hill, lighthouse security MVL lights: 2♀ 28.iii.2003 (M.J.W. Cock) [MJWC] (Fig. 3)

Curepe: ♂ vi.1979 (M.J.W. Cock) [NHMUK, TL-478]

Curepe, MVL: ♀ 12.v.1979 (M.J.W. Cock) [MJWC, TL-414]; ♂ 29.v.1979 (M.J.W. Cock) [MJWC, TL-478] (Fig. 2); ♂ 14-21.iii.1982 (M.J.W. Cock) [UWIZM CABI.3521]

Palmiste: ♀ 27.iv.1926 [N. Lamont] [RSM]; ♀ 25.iv.1948 [N. Lamont] [UWIZM.2013.13.1329, as *Eutelia auratrix*]

Nr. St. Augustine: ♀ 24.ix.1924 (W.C. Lester-Smith) [OUMNH]

Toco, at light: ♀ 3.vi.1978 (M.J.W. Cock) [NHMUK, TL-414]

TOBAGO, Arnos Vale, 11.206 -60.751, at light: ♀ 12.vi.2022 (R. Deo photo) [iNaturalist observation 121386112] (Fig. 5)

TOBAGO, Englishman's Bay, at light: ♀ 1.vii.2022 (M. Gibson photo) [iNaturalist observation 124323607]; ♂ 2.vii.2022 (M. Gibson photo) [iNaturalist observation 124491079] (Fig. 4); ♂ 8.iv.2023 (A. Deacon photo) [iNaturalist observation 154045226]

TOBAGO, Nr. Speyside, MVL: ♀ 14-17.v.1982 (M.J.W. Cock) [MJWC]

***Marathyssa ablatrix* (Guenée, 1852) complex**

Figs. 6–7.

Historical notes. I have only recently separated Trinidad material of *M. ablatrix* into two species. The species I treat as *M. ablatrix* (above) has bipectinate antennae in the male, as shown by Hampson (1912, Fig. 13) in his treatment of *M. ablatrix*, whereas the species treated here as '*M. ablatrix* complex' has serrate antennae in the male.

Taxonomic issues. I have yet to review the known species to see if this taxon has already been described. Furthermore, the sequences in BOLD indicate there is greater diversity in this group than currently recognised as named species.

Identification. The male can easily be separated from the male of *M. ablatrix* by its serrate rather than bipectinate antennae. Further, the male of *M. ablatrix* has a distinctly orange tone to its forewing markings, whereas that of *M. ablatrix* complex is darker, more like the females of both species. There are other less obvious differences in the markings, of which perhaps the most useful is in the orange-brown or brown pre-apical area of the dorsal forewing, which has two angled lines through it in *M. ablatrix* (Figs. 2–3), but none in *M. ablatrix* complex (Figs. 6–7). Based on this character I have associated females with the two different males.

Biology in Trinidad. Unknown.

Status in Trinidad. Just two records from Trinidad, but this species could easily be overlooked for *M. ablatrix*.

Curepe, BLT: ♂ 21-28.ii.1982 (F.D. Bennett) [MJWC] (Fig. 6)

Palmiste: ♀ 25.v.1947 [N. Lamont] [UWIZM. 2013.13.1328, as *Eutelia auratrix*] (Fig. 7)

Fig. 6. Male *Marathyssa ablatrix* complex, Curepe, BLT, 21-28.ii.1982 (F.D. Bennett).

Fig. 7. Female *Marathyssa ablatrix* complex, Palmiste, 25.v.1947 [N. Lamont] [UWIZM.2013.13.1328]; © UWIZM, with permission.

***Marathyssa abscondens* (Walker, 1858)**

Figs. 8–10.

OD: Walker (1858): *Penicillaria abscondens*, TL Colombia.

TT: *Eutelia abscondens* (Walker); Lamont & Callan (1950), Cock *et al*. (2022)

Historical notes. A specimen from Golden Grove, 20.vii.1923, was the basis for Lamont and Callan (1950) adding this species to the Trinidad list. This specimen is in RSM and matches one collected by the author and compared with the NHMUK series.

Taxonomic issues. DNA barcodes in BOLD of material from Costa Rica and Peru identified as *M. abscondens* form BIN BOLD:AAE5738. Barbut and Lalanne-Cassou (2005) illustrate the male genitalia.

Identification. This is the largest member of the genus in Trinidad. It can be further recognised by the forewing markings, such as the continuous brown area from the forewing base to short of apex, the dark dome-shaped marking on mid-termen, outlines with white on three sides, etc. Sexes similar, but male has antennae clearly bipectinate in basal half.

Biology in Trinidad. Unknown.

Status in Trinidad and Tobago. A rare but widespread species, present on both islands.

Golden Grove: ♂ 20.vii.1923 [N. Lamont] [RSM]

Morne Bleu, Textel Installation, at light: ♂ 11.x.1978 (M.J.W. Cock) [MJWC] (Fig. 8)

Toco, 10.826 -60.933: ♂ 8.vi.2022 (R. Deo photo)

Fig. 8. Male *Marathyssa abscondens*, Morne Bleu, Textel Installation, at light, 11.x.1978.

Fig. 9. Male *Marathyssa abscondens*, Toco, 8.vi.2022, R. Deo (iNaturalist observation 120804044); ©, with permision.

Fig. 10. Female *Marathyssa abscondens*, Tobago, Englishman's Bay, at light, 1.vii.2022 (M. Gibson photo) [iNaturalist observation 124324151]; ©, with permission.

[iNaturalist observation 120804044] (Fig. 9)
TOBAGO, Englishman's Bay, at light: ♀ 1.vii.2022 (M. Gibson photo) [iNaturalist observation 124324151] (Fig. 10); ♀ 9.iv.2023 (A. Deacon photo) [iNaturalist observation 154217861]

***Marathyssa auratrix* (Walker, 1858)**

Figs. 11–14.

OD: Walker (1858): *Penicillaria auratrix*, TL Brazil.

TT: *Eutelia auratrix* (Walker): Kaye & Lamont (1927), Cock *et al*. (2022)

Historical notes. Specimens from Palmiste, vii.1915, 7.ix.1917 (N.L.) are the basis for Kaye & Lamont (1927) recording this species from Trinidad; both specimens are now in RSM. They match material in MJWC which was identified by comparison with the type (NHMUK, ♂ Amazons) and NHMUK series.

Taxonomic issues. DNA barcodes in BOLD identified as *M. auratrix* fall into three BINs: BOLD:AAC7973 from Mexico, and BOLD:AAC7974 and BOLD:AAC7975, both from French Guiana. As *M. auratrix* was described from Brazil, the first of these is unlikely to be the true *M. auratrix*, but one of the other two may well be. DNA barcodes from Trinidad may link the local population to one of these BINs.

Identification. The projection of the forewing margin, matching the species above should help to recognise this as a *Marathyssa* species. Five specimens identified as this species in Lamont collection in UWIZM comprise three *M. auratrix* and two *M. ablatrix*. *Marathyssa auratrix* is the only *Marathyssa* species in Trinidad with basically dark wings with rather obscure markings in narrow, paler lines. Males have strongly bipectinate antennae, whereas those of females are simple.

Biology in Trinidad. Unknown.

Status in Trinidad. A fairly common and widespread species in both Trinidad and Tobago.

Arima Valley, Asa Wright Nature Centre: ? 6.xii.2013 (P. Prior photo) [iNaturalist 1788420, 5429978]
Arima Valley, Simla, MVL: ♂ 22.iii.1981 (M.J.W. Cock) [UWIZM CABI.4406]; ♀ (no abdomen) 10.v.1981 (M.J.W. Cock) [UWIZM CABI.4408]; ♀ 30.vii.1981 (M.J.W. Cock) [MJWC]; ♀ (no head) 18.x.1982 (M.J.W. Cock) [MJWC]
Caparo: ♂ xi.1905 (S.M. Klages) [NHM]
Concord, 10.235 -61.486: ♀ 26.viii.2021 (sheneller photo) [iNaturalist observation 92624995] (Fig. 14)

Fig. 11. Male *Marathyssa auratrix*, Curepe, MVL, 5-11.x.1981.

Fig. 12. Female *Marathyssa auratrix*, Morne Bleu, Textel Installation, at light, 10.vii.1978.

Fig. 13. Male *Marathyssa auratrix*, Tobago, Englishman's Bay, at light, 16.vii.2022, M. Gibson (iNaturalist observation 126620056); ©, with permission.

Fig. 14. Female *Marathyssa auratrix*, Concord, 26.viii.2021, sheneller (iNaturalist observation 92624995); ©, under CC-BY-NC.

Curepe, MVL: ♀ 23-31.x.1980 (M.J.W. Cock) [UWIZM CABI.4407]; ♂ 5-11.x.1981 (M.J.W. Cock) [MJWC] (Fig. 11); 12-18.x.1981 (M.J.W. Cock) [MJWC]
Morne Bleu, Textel Installation, at light: ♀ 10.vii.1978 (M.J.W. Cock) [MJWC] (Fig. 12)
Palmiste: ♀ (no abdomen) vii.1915 [RSM]; ♂ 7.ix.1917 [N. Lamont] [RSM]; ♀ 24.xi.1927 [N. Lamont] [RSM]; ♂ (broken, no head, no abdomen) 9.xii.1929 [N. Lamont] [UWIZM.2013.13.1326]; ♀ 8.iii.1948 [N. Lamont] [UWIZM.2013.13.1325]; ♀ 9.ix.1948 [N. Lamont] [UWIZM.2013.13.1327]
Parrylands Oilfield, MVL: ♂ 25.vii.1981 (M.J.W. Cock) [MJWC]
Port of Spain, Caparo Valley: ♀ xii.1896 (Dr Rendall) [NHM]
Talparo, at light: ♂ 1.ix.2020 (K. Sookdeo photo, moths 90)
TOBAGO, Black Rock, 11.197 -60.788: ♂ 28.xii.2021 (figtree photo) [iNaturalist observation 103911366]
TOBAGO: Englishman's Bay, at light: ♂ 16.vii.2022 (M. Gibson photo) [iNaturalist observation 126620056] (Fig. 13)

***Marathyssa chrysotermina* Hampson, 1905**

Fig. 15.

OD: Hampson (1905): *Eutelia chrysotermina*, TL French Guiana.

Historical notes. This is a species not previously recorded from Trinidad. It was identified by comparison with type (NHMUK, ♂ French Guiana) and NHMUK series.

Taxonomic issues. Two BINs in BOLD are attributed to the *M. chrysotermina* complex from Costa Rica. One of these may be the true *M. chrysotermina* described from French Guiana. The name *M. chrysotermina* is likely to be appropriate for the Trinidad population based on the type locality.

Identification. This is a distinctive species in Trinidad,

Fig. 15. Female *Marathyssa chrysotermina*, Caura Valley, nr. Caura, MVL, 24.ix.1978.

with the forewing margin extensively yellow-brown, an orange marking on the forewing dorsum, and the base of the hindwing intensely white.

Biology in Trinidad. Unknown.

Status in Trinidad. Just one record from Caura Valley. Caura Valley, nr. Caura, MVL: ♀ 24.ix.1978 (M.J.W. Cock) [MJWC] (Fig. 15)

***Paectes* Hübner 1818**

Type species: *Paectes pygmaea* Hübner, TL USA, Georgia. This is a genus of 57 species, of which 43 are from the New World (Poole, 1989, Barbut and Lalanne-Cassou 2005). Pogue (2013) noted 12 North America species and 40 Neotropical (two in both regions). Much of the genus still need revision. Species of *Paectes* habitually rest with the abdomen curled upwards at an angle to the substrate, sometimes even at right angles, a habit also seen in some Nolidae. Unfortunately, the photos of living adults included here do not show any individuals 'at rest' in this position.

***Paectes arcigera* (Guenée, 1853)**

OD: Guenée 1853: *Ingura arcigera*, TL St. Thomas & Dominica.

TT: *Paectes arcigera* (Guenée): Pogue (2013)

Historical notes. Pogue (2013) treats this species as occurring from Puerto Rico to Trinidad, the latter based on a Trinidad female collected by A. Busck in USNM, which I have not seen.

Taxonomic issues. Pogue (2013) treats at least two other species of this complex that might occur in Trinidad: *P. nana* (Walker) (Florida through the Greater Antilles, except for Puerto Rico, Mexico to Costa Rica, Venezuela, Colombia, and northern Ecuador), and *P. tumida* Pogue (Colombia and Guyana, Suriname, and French Guiana). As this complex can only reliably be separated by examination of the genitalia, it is unfortunate that the single Trinidad specimen has not been examined in this way.

Identification. Like *P. fuscescens*, *P. arcigera* has a dark subterminal spot just below the forewing apex, and there is an irregular post medial line from the dorsum just short of the tornus, to the costa short of the apex, with the section basal to the subterminal spot clearly marked in black. However, *P. arcigera* has the irregular submedial line strongly angled basally in a spike above the dorsum, and the area on the costal side of this spike distinctly paler, whereas *P. fuscescens* has a complete more or less straight irregular submedial line, and no paler area. Further the male of *P. arcigera* has the antennae very strongly bipectinate to two-thirds, whereas those of *P. fuscescens* are simple (Fig. 10). Worn female specimens might prove difficult to allocate to species without dissection or checking barcodes.

Biology in Trinidad. Unknown.

Status in Trinidad. Just the one published record of a female in USNM (Pogue 2013). I have not seen this species from Trinidad or Tobago.

Trinidad: ♀ (A. Busck) [USNM] (Pogue 2013; not seen)

***Paectes curvilinea* Schaus, 1911**

Figs. 16–17.

OD: Schaus (1911): *Paectes curvilinea*, TL Costa Rica.

Historical notes. Material from MJWC was identified by comparison with the type (USNM, ♂ Costa Rica) and NHMUK series.

Taxonomic issues. There are no public DNA barcodes in BOLD identified as this species.

Identification. The curved line from two-thirds on dorsum to three-quarters on termen separates this species from other Trinidad *Paectes* species, apart from *P. lunodes* and *P. semicircularis*, the last named being much smaller. In *P. curvilinea* the curved line is continuously smooth, whereas in *P. lunodes* there is a slight step at vein 4 (M_3). The sexes are similar apart from the strongly bipectinate antennae of the male.

Biology in Trinidad. Unknown.

Fig. 16. Male *Paectes curvilinea*, Valencia Forest, MVL, iv.1980.

Fig. 17. Female *Paectes curvilinea*, Hollis Reservoir, at light, 13.xii.1978.

Status in Trinidad. An uncommon species from forested areas.

Arima Blanchisseuse Road, milestone 9.75, MVL: ♂ 21.ix.1982 (M.J.W. Cock) [MJWC]
Hollis Reservoir, at light: ♀ 13.xii.1978 (M.J.W. Cock) [MJWC] (Fig. 17)
Morne Bleu, Textel Installation, at light: ♂ 17.x.1979 (M.J.W. Cock) [NHMUK, TL962]
Valencia Forest, MVL: ♂ iv.1980 (M.J.W. Cock) [MJWC] (Fig. 16)

***Paectes devincta* (Walker, 1858)**

Fig. 18.

OD: Walker (1858): *Abrostola devincta*, TL Venezuela.

Historical notes. A photograph from Chacachacare Island is the only record from Trinidad & Tobago. It was identified by comparison with material from Costa Rica illustrated in BOLD:ABY4649, mostly identified by Daniel H. Janzen.

Taxonomic issues. BOLD:ABY4649 contains material from Mexico and Costa Rica, consistently identified as *P. devincta*. I have not examined the type (NHMUK, ♀ Venezuela) to compare with this material, and the use of this name must be considered provisional. Confirmation of this record with specimens from Chacachacare Island or elsewhere in Trinidad & Tobago would be desirable.

Identification. This species can be recognised by the russet colouring on the dorsal head and thorax, and over the postmedial irregular double narrow line, and the area distal to this (Fig. 18). Males have very broadly bipectinate antennae.

Biology in Trinidad. Unknown, but in Costa Rica this species feeds on Myrtaceae, including guava (*Psidium guajava*) (Janzen and Hallwachs 2022).

Status in Trinidad. One photographic record from Chacachacare Island by Rainer Deo.

CHACACHACARE ISLAND, Old Leprosy Hospital, at light: ♀ 9.vii.2022 (R. Deo photo) [iNaturalist observation 125719912] (Fig. 18)

Fig. 18. Female *Paectes devincta*, Chacachacare Island, Old Leprosy Hospital, at light, 9.vii.2022, R. Deo (iNaturalist observation 125719912); ©, with permission.

***Paectes fuscescens* (Walker, 1855)**

Figs. 19–20.

OD: Walker (1855): *Edema fuscescens*, TL Honduras.

Historical notes. This is a new record from Trinidad. Specimens were identified by comparison with the NHMUK series.

Taxonomic issues. There are no public DNA barcodes in BOLD identified as this species. Given that this species was described from Honduras, it may well be that South American material will be found to be a separate species, so the use of this name for Trinidad shouldbe considered provisional pending further revisionary work.

Identification. This is a rather undistinguished species. In common with *P. arcigera*, *P. fuscescens* has a dark subterminal spot just below apex of the forewing, and there is an irregular post medial line from the dorsum just short of the tornus, to the costa short of the apex, with the section basal to the subterminal spot clearly marked in black. However, where *P. fuscescens* has a complete more or less straight irregular submedial line, *P. arcigera* has this line

Fig. 19. Male *Paectes fuscescens*, Curepe, MVL, 31.xii.1979.

Fig. 20. Female *Paectes fuscescens*, St Benedict's, Pax Guest House, at light, 10-16.vii.1996.

strongly angled basally in a spike above the dorsum, and the area on the costal side of this spike distinctly paler. The male of *P. arcigera* has the antennae very strongly bipectinate to two-thirds, whereas those of *P. fuscescens* are simple (Fig. 19). Worn female specimens might prove difficult to allocate to species without dissection or checking barcodes.

Biology in Trinidad. Unknown, but in Costa Rica, this species feeds on Anacardiaceae, particularly *Anacardium* spp. and *Tapirira mexicana*, and less often on *Protium* spp. (Burseraceae) (Janzen and Hallwachs 2022).

Status in Trinidad. An uncommon species mostly from forested areas

Arima Valley, Simla, MVL: ♀ 18.x.1982 (M.J.W. Cock) [MJWC]

Curepe, MVL: ? 26.viii.1978 (M.J.W. Cock) [NHMUK, TL-855]; ♂ 31.xii.1979 (M.J.W. Cock) [MJWC, TL-855] (Fig. 19)

Morne Bleu, Textel Installation, at light: ♀ 29.iii.1979 (M.J.W. Cock) [MJWC]

St Benedict's, Pax Guest House, at light: ♀ 10-16. vii.1996 (M.J.W. Cock) [MJWC] (Fig. 20)

***Paectes lunodes* (Guenée, 1852)**

Fig. 21.

OD: Guenée (1852): *Ingura lunodes*, TL French Guiana.

TT: *Paectes lunodes* (Guenée): Hampson (1912), Kaye & Lamont (1927)

Historical notes. Hampson (1912) and Kaye & Lamont (1927) recorded a specimen of *P. lunodes* from Caparo, x.1904 (F. Birch) in NHMUK. This specimen has not been located, although it may be amongst the museum's supplementary material. If Birch's specimen can be located, this record can be checked, but there seems no reason to doubt Hampson's identification. I have examined the type of *P. lunodes* (NHMUK, ♂ French Guiana) and have identified a specimen from Palmiste in UWIZM by comparison.

Taxonomic issues. Hampson (1912) treats *P. lunodes* as present in small numbers from USA (Florida) and throughout the Neotropics. Sequences of material in BOLD identified as *P. lunodes* falls into three clustered BINs: BOLD:AAX1890 (USA, Florida – as *P. hercules*, Costa Rica – as *Paectes* sp., Brazil, Rio Grande do Sul – as *P. lunodes*), BOLD:AAC2512 (Mexico, Costa Rica, Peru and Mexico) and BOLD:ACI4119 (Jamaica). Troubridge (2020) described *P. hercules* Troubridge based on females from Key Largo, Florida, referring it to BOLD:AAX1890, and treating *P. lunodes* as BOLD:AAC2512. Given the French Guiana type locality, it seems most appropriate to treat *P. lunodes*, including the Trinidad record, as BOLD:AAC2512, but further research is needed

Identification. *Paectes lunodes* resembles *P. curvilinea*, except that there is a slight step in the curved forewing line of *P. lunodes* at vein 4 (M_3) not seen in *P. curvilinea*.

Biology in Trinidad. Unknown, but in Costa Rica this species feeds on Lauraceae, especially *Mespilodaphne veraguensis* (Janzen and Hallwachs 2022).

Fig. 21. Female *Paectes lunodes*, Palmiste, 4 November 1946, [N. Lamont] [UWIZM.2013.13.1331].

Status in Trinidad. Just two records from Caparo (1904) and Palmiste (1946).

Caparo: ♂ x. 1904 (F. Birch) [NHMUK] (Hampson 1912, Kaye and Lamont 1927; not seen)

Palmiste: ♀ 4.xi.1946 [N. Lamont] [UWIZM.2013.13.1331, as *Paectes ? abrostoloides* Guen.] (Fig. 21)

***Paectes semicircularis* Hampson, 1912**

Figs. 22–24.

OD: Hampson (1912): *Paectes semicircularis*, TL Trinidad.

TT: *Paectes semicircularis* Hampson: Hampson (1912), Kaye & Lamont (1927)

Historical notes. Hampson (1912) described this species from Trinidad based on two females from Caparo (as Cuparo) supposedly collected by Kaye. However, Kaye & Lamont (1927) refer to the type in NHMUK being from Caparo, x.1904 (F. Birch). The two types are labelled x.1904 without collector, but from other specimens we know that although

Fig. 22. Male *Paectes semicircularis*, Curepe, MVL, 8-14.iii.1982.

Fig. 23. Female *Paectes semicircularis*, Parrylands Oilfield, MVL, 13.xi.1980.

Fig. 24. Male *Paectes semicircularis*, Brasso Seco, by night, 26.ii.2022, R. Deo (iNaturalist observation 107635126); © with permision.

W.J. Kaye did not collect at Caparo or in October 1904, F. Birch did, and so we accept Kaye & Lamont's (1927) information. Recent material in MJWC was identified by comparison with the type and NHMUK series

Taxonomic issues. No public DNA barcodes in BOLD.

Identification. A distinctive small species.

Biology in Trinidad. Unknown.

Status in Trinidad. An uncommon species from scattered localities.

Arima Valley, Verdant Vale: ♂ 20.ix.2022 (S. Tran photo) [iNaturalist observation 135755707]

Brasso Seco, by night: ♂ 26.ii.2022 (R. Deo photo) [iNaturalist observation 107635126] (Fig. 24)

Brasso Seco, at light: ♀ 22.iv.2023 (A. Deacon photo) [iNaturalist observation 156337191]

Caparo: ♀ (holotype) x.1904 [NHM] (photo); ♀ (paratype) x.1904 [NHM]; ? i.1906, S.M. Klages [NHM]

Curepe, MVL: ♂ 8-14.iii.1982 (M.J.W. Cock) [MJWC] (Fig. 22)

Parrylands Oilfield, MVL: ♀ 13.xi.1980 (M.J.W. Cock) [MJWC] (Fig. 23)

Subfamily Stictopterinae Hampson, 1894

Type genus *Stictoptera* Guenée, 1852 (type species *Stictoptera cucullioides* Guenée, 1852, TL Indonesia, Java. This is predominantly an Old World subfamily of ten genera. Most genera and species are found in South East Asia, no species are Nearctic, and the four species of *Nagara* are restricted to the Neotropics.

***Nagara* Walker [1866] (1865)**

Type species: *Nagara phryganealis* Walker, TL, Jamaica, a synonym of *P. vitrea* Guenée, 1852, TL Jamaica. This is a neotropical genus of four species, one of which occurs in Trinidad.

***Nagara clara* (Stoll, 1782)**

Figs. 25–30.

OD: Stoll (1782): *Phalaena Noctua clara*, TL not given, [South America].

TT: *Stictoptera clara* (Stoll): Kaye & Lamont (1927)

Historical notes. Kaye & Lamont (1927) recorded this species (as *Stictoptera clara* Cramer) from Palmiste, 23.xii.1921 (N.L.). This specimen, a male, was examined in RMS. This identification was confirmed by comparison with the NHMUK series.

Taxonomic issues. DNA barcode sequences in BOLD of material identified as *N. clara* from French Guiana and Costa Rica form BIN BOLD:AAB8763. There seems no reason not to apply this name also to Trinidad material.

Identification. The long pointed forewings, particularly of the males, make this species distinctive in Trinidad. Note *N. vitrea* (Guenée, 1852) (TL Jamaica; BIN BOLD:AAB1825) is very similar, but does not seem to occur in South America (Hampson 1912). There is moderate individual variation. Males (Figs. 25–26, 29) have longer, more pointed forewings and females (Figs. 27–28, 30) have more clearly defined and contrasting forewing wing markings.

Biology. No information from Trinidad. Janzen & Hallwachs (2022) document the food plants of *N. vitrea* as *Clusia cylindrica* (Clusiaceae) and *Calophyllum brasiliense* (Calophyllaceae) in Costa Rica, and include images of the plain green caterpillar.

Status in Trinidad. An occasional species, mostly in forested areas.

Brasso Seco: ♀ 14.iii.2015 (K. Sookdeo photo, moths 66)

Brasso Seco, 10.74 -61.26, by night: ♀ 24.vii.2021 (R. Deo photo) [iNaturalist observation 88706059]; ♂ 25.vii.2021 (R. Deo photo) [iNaturalist observation 88668086] (Fig. 29)

Brasso Seco, 10.76 -61.25, by night: ♀ 16.v.2021 (R. Deo photo) [iNaturalist observation 79101604] (Fig. 30)

Brigand Hill, lighthouse security MVL lights: ♂ 17.i.2004 (M.J.W. Cock) [MJWC]

Cumaca Road, 4.6.miles, MVL: ♂ 18.vii.1981 (M.J.W. Cock) [MJWC] (Fig. 25)

Curepe, MVL: ♀ 6-11.i.1981 (M.J.W. Cock) [UWIZM CABI.3649]

Nr. Matura, off Edwards Trace, 10.13 -61.26: ♂ 30.viii.2019 (S. Manchouk photo) [iNaturalist observation 33717149]

Morne Bleu, Textel Installation, at light: ♀ 10.vii.1978 (M.J.W. Cock) [UWIZM CABI.3648]; ♂ 17.vii.1978 (M.J.W. Cock) [MJWC] (Fig. 26); ♀ 10.viii.1978 (M.J.W. Cock) [MJWC] (Fig. 28); ♀ , ?♀ 20.ix.1978 (M.J.W. Cock) [MJWC, TL-417; ?♀ NHMUK, TL-417] (Fig. 27); ♀ 29.iii.1979 (M.J.W. Cock) [UWIZM CABI.3520]

Fig. 25. Male *Nagara clara*, Cumaca Road, 4.6.miles, MVL, 18.vii.1981.

Fig. 26. Male *Nagara clara*, Morne Bleu, Textel Installation, at light, 17.vii.1978.

Fig. 27. Female *Nagara clara*, Morne Bleu, Textel Installation, at light, 20.ix.1978.

Fig. 28. Female *Nagara clara*, Morne Bleu, Textel Installation, at light, 10.viii.1978.

Fig. 29. Male *Nagara clara*, Brasso Seco, by night, 25.vii.2021, R. Deo (iNaturalist observation 88668086); ©, with permission.

Fig. 30. Female *Nagara clara*, Brasso Seco, by night, 16.v.2021, R. Deo (iNaturalist observation 79101604); ©, with permission.

Palmiste: ♂ 23.xii.1921 [N. Lamont] [RSM]; ♂ 23.iv.1926 [N. Lamont] [UWIZM.2013.13.1330]
St Benedict's: ♀ 19.x.1979 (M.J.W. Cock) [UWIZM CABI.3647]
[Trinidad]: ♀ [N. Lamont] [RSM]

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REFERENCES

Barbut, J. and **Lalanne-Cassou, B.** 2005. Description de trois Euteliinae néotropicaux appartenant aux genres *Eutelia* et *Paectes* et nouvelles synonymies (Lepidoptera, Noctuidae). *Bulletin de la Société entomologique de France* 110, 97-102.

Cock, M.J.W. 2017. A preliminary catalogue of the moths (Lepidoptera except Papilionoidea) of Tobago, West Indies. *Insecta Mundi*, 0585: 1-58.

Cock, M.J.W. 2021a. The prominent moths (Lepidoptera, Notodontidae) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2021: 1-102, Appendix 1-50.

Cock, M.J.W. 2021b. New records of butterflies and moths (Lepidoptera) from Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club* 2021: 103-109.

Cock, M.J.W. and **Laguerre, M.** 2023. Euchromiina wasp moths (Lepidoptera, Erebidae, Arctiinae, Arctiini) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2023: 1-83, Appendix 1-58.

Cock, M.J.W. and **Robbins, R.K.** 2016. Annotated checklist and biogeographic composition of the Lycaenidae (Lepidoptera) of Trinidad, West Indies. *Insecta Mundi*, 0506: 1-33.

Cock, M.J.W., Kelly, M., Deacon, A. and **Gibson, M.** 2022. New records and identifications of butterflies and moths (Lepidoptera) from Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2022: 12-29.

Fibiger, M. and **Lafontaine, J.D.** 2005. A review of the higher classification of the Noctuoidea (Lepidoptera) with special reference to the holarctic fauna. *Esperiana*, 11: 7-92.

Guenée, A. 1852. Histoire naturelle des Insectes – Species general des Lepidopteres par MM. Boisduval et Guenée. Noctuélites Tome II. Paris: Roret, 444 p.

Hampson, G.F. 1912. Catalogue of the Lepidoptera Phalaenae in the British Museum. Supplement Volume XI. London: Trustees of the British Museum. xvii + 689 pp.

Hebert, P.D.N., Cywinska, A., Ball, S.L. and **deWaard, J.R.** 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society (London), Series B Biological Sciences*, 270: 313-321.

Holloway, J.D. 1985. The moths of borneo (part 14): Family Noctuidae: Subfamilies Euteliinae, Stictopterinae, Plusiinae, Pantheinae. *Malayan Nature Journal*, 38: 157-317.

Janzen, D. H. and **Hallwachs, W.** 2022. Dynamic database for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), northwestern Costa Rica. [Online]. Available at http://janzen.sas.upenn.edu (Accessed 14 June 2022).

Kaye, W.J. and **Lamont, N.** 1927. A catalogue of the Trinidad Lepidoptera Heterocera (moths). *Memoirs of the Department of Agriculture, Trinidad and Tobago* 3: 144 pp.

Lafontaine, J.D. and **Fibiger, M.** 2006. Revised higher classification of the Noctuoidea (Lepidoptera). *Canadian Entomologist*, 138: 610-635.

Lamont, N. and **Callan, E.McC.** 1950. Moths new to Trinidad, B.W.I. *Zoologica*, 35: 197-207.

Miller, S.E., Hausmann, A., Hallwachs, W. and **Janzen, D.H.** 2016. Advancing taxonomy and bioinventories with DNA barcodes. *Philosophical Transactions of the Royal Society B* \, 371: 20150339.

Mitchell, A., Mitter, C. and **Regier, J.C.** 2006. Systematics and evolution of the cutworm moths (Lepidoptera: Noctuidae): evidence from two protein-coding nuclear genes. *Systematic Entomology* 31: 21-46.

Pogue, M.G. 2013. A review of the *Paectes arcigera* species complex (Guenée) (Lepidoptera, Euteliidae). *ZooKeys*, 264: 125-163.

Poole, R.W. 1989. Noctuidae. Lepidopterorum catalogus. (New Series, edited by J. B. Heppner, Fasc. 118, 3 vols). Leiden, Netherlands: E. J. Brill. 1314 p.

Powell, J.A., Mitter, C. and **Farrell, B.** 1998. Evolution of larval food preferences in Lepidoptera. In: **Kristensen, N.P.** (Ed.) Handbook of Zoology, Lepidoptera, Moths and Butterflies. Berlin: W. de Gruyter, p. 403-422.

Ratnasingham, S. and **Hebert, P.D.N.** 2013. A DNA-based registry for all animal species: the Barcode Index Number (BIN) System. *PLoS ONE*, 8: e66213. doi:10.1371/journal.pone.0066213

Regier, J.C., Mitter, C., Mitter, K., Cummings, M.P., Bazinet, A.L., Hallwachs, W., Janzen, D.H. and **Zwick, A.** 2016. Further progress on the phylogeny of Noctuoidea (Insecta: Lepidoptera) using an expanded gene sample. *Systematic Entomology*, 42: 82-93.

Troubridge, J.T. 2020. A new genus and 37 new noctuoid species from peninsular Florida and the Keys (Lepidoptera: Noctuoidea). *Insecta Mundi*, 789: 1-56.

van Nieukerken, E.J., Kaila, L., Kitching, I.J., Kristensen, N.P., Lees, D.C., Minet, J., Mitter, C., Mutanen, M., Regier, J.C., Simonsen, T.J., Wahlberg, N., Yen, S.-H., Zahiri, R., Adamski, D., Baixeras, J., Bartsch, D., Bengtsson, B.A., Brown, J.W., Bucheli, S.R., Davis, D.R., De Prins, J., De Prins, W., Epstein, M.E., Gentili-Poole, P., Gielis, C., Hättenschwiler, P., Hausmann, A., Holloway, J.D., Kallies, A., Karsholt, O., Kawahara, A.Y., Koster, S., Kozlov, M.V., Lafontaine, J.D., Lamas, G., Landry, J.-F., Lee, S., Nuss, M., Park, K.-T., Penz, C., Rota, J., Schintlmeister, A., Schmidt, B.C., Sohn, J.-C., Solis, M.A., Tarmann, G.M., Warren, A.D., Weller, S., Yakovlev, R.V., Zolotuhin, V.V. and **Zwick, A.** 2011.Order Lepidoptera Linnaeus, 1758. In: **Zhang, Z.-Q.** (Ed.) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa*, 3148: 212-221.

Wagner, D.L., Schweitzer, D.F., Sullivan, J.B. and **Reardon, R.C.** 2012. Owlet Caterpillars of Eastern North America. Princeton, New Jersey, USA: Princeton University Press, 576 p.

Zahiri, R., Kitching, I.J., Lafontaine, J.D., Mutanen, M., Kaila, L., Holloway, J.D. and **Wahlberg, N.** 2011. A new molecular phylogeny offers hope for a stable family level classification of the Noctuoidea (Lepidoptera). *Zoologica Scripta*, 40: 158-173.

Zahiri, R., Lafontaine, D., Schmidt, C., Holloway, J.D., Kitching, I.J., Mutanen, M. and **Wahlberg, N.** 2013. Relationships among the basal lineages of Noctuidae (Lepidoptera, Noctuoidea) based on eight gene regions. *Zoologica Scripta*, 42: 488-507.

Zahiri, R., Lafontaine, J.D., Schmidt, B.C., deWaard, J.R., Zakharov, E.V. and **Hebert, P.D.N.** 2014. A transcontinental challenge - a test of DNA barcode performance for 1,541 species of Canadian Noctuoidea (Lepidoptera). *PLoS ONE*, 9: e92797. doi:10.1371/journal.pone.0092797

Zahiri, R., Holloway, J.D., Rota, J., Schmidt, B.C., Pellinen, M.J., Kitching, I.J., Miller, S.E. and **Wahlberg, N.** 2023. Evolutionary history of Euteliidae (Lepidoptera, Noctuoidea). *Systematic Entomology*, 48: 445-462.

New records of butterflies and moths (Lepidoptera) from Tobago, West Indies, with two new combinations and one new synonym in Erebidae.

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ABSTRACT

Details of two new butterfly and 65 new moth records from Tobago are presented, including species of Aididae (1), Crambidae (8), Erebidae (23), Euteliidae (1), Geometridae (12), Lasiocampidae (1), Limacodidae (1), Noctuidae (5), Nolidae (3), Notodontidae (2), Nymphalidae (2), Pyralidae (5), Sphingidae (2) and Tortricidae (1). All except one of these records are based solely on photographs from life, and representative images are included as vouchers. One duplicate record in the Tobago checklist is corrected and two species are reidentified. The total number of Lepidoptera species known from Tobago is now 524 moths and 159 butterflies. All newly reported species except one are also known from Trinidad (although some have not been previously published from Trinidad). *Rhosologia pantina* Schaus, 1901 is a **new synonym** of *Scolecocampa xanthipterygia* Kaye, 1901. *Ophisma ablunaris* Guenée, 1852, currently in the combination *Achaea ablunaris* is placed in the **new combination** *Mimophisma ablunaris*. *Bleptina dejecta* Schaus, 1916 is placed in the **new combination**, *Monochroides dejecta*.

Key words: Trinidad, Aididae, Crambidae, Erebidae, Euteliidae, Geometridae, Lasiocampidae, Limacodidae, Noctuidae, Nolidae, Notodontidae, Nymphalidae, Pyralidae, Sphingidae, Tortricidae

ZooBank registration: https://zoobank.org/urn:lsid:zoobank.org:pub:6A63241E-4C89-4259-82AC-C5E3D907E0E3

INTRODUCTION

Trinidad and Tobago are two small islands off the northeast coast of South America with a combined land area of about 5100 km^2 and a maximum elevation slightly below 1000 m. Together with some very small associated islands, they make up the country Trinidad & Tobago. As continental islands, they have a biota that is a subset of that of the nearby South American mainland. The fauna of Trinidad is by far the better known of the two, and Tobago being further offshore has a biota that is largely a subset of that of Trinidad (Starr 2009, Cock 2017a, 2017b). Here, we use Trinidad & Tobago to refer to the country, whereas Trinidad and Tobago refer to the two separate islands.

The butterflies of Tobago are fairly well known, and an updated checklist of 150 species was recently published (Cock 2017a). Since then, seven species have been added to this total (Cock 2021b, Cock *et al*. 2022). In contrast, the moths of Tobago are not well known and only in 2017 was the first checklist of 355 species published (Cock 2017b). Cock and Kelly (2020) added 45 new records of moths from Tobago, based mostly on photographs taken by MK at the lights of his house near Englishman's Bay, Deo *et al*. (2020) pointed out an old literature record, and Cock (2021b) added a further 11 moths based on images posted on iNaturalist (www.iNaturalist.org). Cock *et al*. (2022) added a further 49 moths based on the authors' images and photographic records from iNaturalist, and removed one misidentified species. Here we add new records of 65 moths and two butterflies, and remove one duplicate record. Most of these were observed when attracted to lights at night, but some were photographed during night walks (Deo *et al*. 2020). The total number of Lepidoptera species known from Tobago is now 524 moths and 159 butterflies. This is still a relatively small total for moths compared to the more than 742 species extrapolated by Cock (2003). Many more moth species are expected to occur in Tobago, particularly those of smaller size. All species newly recorded here from Tobago except *Glyphodes sibillalis* Walker (Crambidae) are also known to occur in Trinidad, although not all have been previously published as occurring in Trinidad.

We refer to material examined in the following collections: Matthew J.W. Cock's, private research collection (MJWC), The Natural History Museum, London, UK (NHMUK),

National Museums of Scotland (NMS), Oxford University Museum of Natural History (OUMNH), United States National Museum (USNM), and the University of the West Indies Zoology Museum, St. Augustine, Trinidad and Tobago (UWIZM). Identifications were made by comparison with the first author's collection of Trinidad Lepidoptera (MJWC), which have been named primarily in the context of the collections of NHMUK and USNM. In selected cases, we also refer to species' barcode index numbers (BINs) (Ratnasingham and Hebert 2013) as used in the Barcode of Life database (Hebert *et al.* 2003, https://www.boldsystems.org/).

Species are arranged by family alphabetically, and alphabetically within families; subfamilies (where used) are included in parentheses after each species heading. Comments on the status of each species in Trinidad are based on the first author's unpublished records; these indicate how commonly and in which habitats these species may occur in Tobago. The figures show photographs taken in Tobago, except as indicated. © in the figure legend refers to the photographer. As the photographs are without any indication of scale, the forewing length (F: base of forewing – wing tip) is provided in the figure legends based on Trinidad material in MJWC or the original descriptions.

AIDIDAE

***Aidos amanda* (Stoll, 1782)**

This species has been reported from Trinidad by Lamont and Callan (1950) and Laurence (1974), and MJWC compared specimens with the NHMUK series. Known food plants in Trinidad include chenette, *Melicoccus bijugatus* Jacq. (Sapindaceae; Laurence 1974), cocoa, *Theobroma cacao* L. (Malvaceae; specimens in UWIZM), *Terminalia* (Combretaceae; specimens in MJWC and UWIZM), and an ornamental *Acalypha* (Euphorbiaceae, M.J.W Cock unpublished). In Trinidad, this is an occasional but widespread species occurring in both forested and suburban areas. SMT photographed a female at Castara (Fig. 1).

Fig. 1. Female *Aidos amanda*, Castara, 15 September 2022, S.M. Tran (iNaturalist observation 135230466); F 25 mm.

CRAMBIDAE

***Argyria lacteella* (Fabricius, 1794) (Crambinae)**

The identity of *A. lacteella* and some synonyms has been clarified by Landry *et al*. (2023), who considered that it is found from Florida and Mexico, through the Caribbean to Argentina. Further, the name *A. lacteella* has been applied to comparable Trinidad material by Kaye and Lamont (1927) and in both NHMUK and USNM, and so it is used here for matching material from Tobago photographed at Englishman's Bay by MK (22 January 2022, photo 1357), AED (Fig. 2) and MK (15 December 2022). However, specimens to dissect and/or DNA barcode are needed to confirm this treatment.

Fig. 2. *Argyria lacteella*, Englishman's Bay, at light, 3 December 2022, A. Deacon (iNaturalist observation 143615179); F 5.5–7 mm.

***Arthromastix lauralis* (Walker, 1859) (Spilomelinae)**

This species has not previously been reported from Trinidad or Tobago. However, it is a widespread but uncommon species in Trinidad, with specimens from Curepe (20 August 1978, 10 November 1978, 13 January 1979), and photographic records from Penal (14 January 2010, K. Sookdeo) and St. Ann's (18 November 2019, M. Gibson, iNaturalist observation 35836413; Fig. 3). One of the Curepe specimens was identified by the late Michael Shaffer (NHMUK). Recently, John Morrall collected a male at Lowlands, Tobago, 28 June 2022 (now in MJWC).

Fig. 3. *Arthromastix lauralis*, Port of Spain, St. Ann's, 18 November 2019, M. Gibson (iNaturalist observation 35836413); F 13 mm.

***Ategumia matutinalis* (Guenée, 1854)**
This species was recorded from Trinidad by Kaye and Lamont (1927), based on specimens from Tabaquite (W.J. Kaye) and Palmiste (N. Lamont). However, MJWC did not find either of these specimens in NHMUK, NMS or UWIZM, and so could not confirm their identification. Nevertheless, this species is common in forested areas of Trinidad, where the caterpillars feed on *Miconia crenata* (Vahl) Michelang. (= *Clidemia hirta* (L.) D.Don.) (Melastomataceae) (Nakahara *et al*. 1992). MK photographed one at Englishman's Bay (Fig. 4).

Fig. 4. *Ategumia matutinalis*, Englishman's Bay, at light, 17 November 2022, M. Kelly; F 11 mm.

***Glyphodes sibillalis* Walker, 1859 (Spilomelinae)**
This species has not previously been recorded from Trinidad or Tobago, although it is widespread in the Neotropics, including the Caribbean. Stephen_WV photographed the first observation for the country near Castara (Fig. 5).

***Microthyris prolongalis* (Guenée, 1854) (Spilomelinae)**
Kaye and Lamont's (1927) record of this species from Trinidad is based on specimens from Verdant Vale (S. Kaye), Guaico (18 April 1915, N. Lamont) and 'Trinidad' (F.W. Jackson). MJWC examined Lamont's specimen (a male with abdomen missing) in NMS and Jackson's (two females) in NHMUK. It is a common and widespread species in Trinidad. SMT photographed a mating pair at Charlotteville during a night walk (Fig. 6). The male is in the lower half of the figure and can be distinguished by the strong lobe at the tornus of the hindwing, which is also useful for recognising this species.

***Neurophyseta* sp.**
This species is close to *Neurophyseta narcissusalis* (Walker), but is likely to be an undescribed species. There are no published records, but there are voucher specimens from Trinidad in MJWC, NHMUK, and UWIZM (Simla, Morne Bleu Textel). RND photographed the same species at light on the Tobago Main Ridge (Fig. 7).

Fig. 5. Female *Glyphodes sibillalis*, Castara, Indus Springs, 15 November 2022, Stephen_WV (iNaturalist observation 142078103); F 11 mm; ©, under CC-BY-NC. The dark brown patches of the forewing and hindwing are actually transparent, with or without a yellow tint, and the dark brown colour here is due to the substrate showing through.

Fig, 6. Mating pair of *Microthyris prolongalis*, Charlotteville, by night, 13 November 2022, S.M. Tran (iNaturalist observation 142265613); F 13–14 mm.

***Petrophila opulentalis* (Lederer, 1863) (Acentropinae)**
This species has not been previously reported from Trinidad, but MJWC compared material from Arima Valley, Cumaca Road, and Hollis Reservoir with the type

Fig. 7. Female *Neurophyseta* sp., Tobago Main Ridge, 11.28 -60.60, at light, 4 December 2022, R. Deo (iNaturalist observation 143704515); F 6 mm.

(NHMUK Colombia) and NHMUK series. It seems to be a common species in Trinidad. However, this is a genus that needs much more work, so this identification should be considered provisional. It is now recorded from Tobago based on photographs from Englishman's Bay by MK (♀ 22 November 2021) and AED (Fig. 8).

Fig. 8. Female *Petrophila opulentalis*, Englishman's Bay, at light, 9 December 2022, A. Deacon (iNaturalist observation 144046072); F 7–7.5 mm.

***Pycnarmon* sp. (Spilomelinae)**

It is not clear whether the material examined from Trinidad represents a single species, or two species most readily separated by size, the smaller being recorded from the Nariva Swamp, and the larger from Curepe, Simla and Lalaja Ridge. One or both of these is likely to be *Pycnarmon levinia* (Cramer). AED photographed one at Englishman's Bay (Fig. 9), but further research on the genus and specimens from Tobago will be needed to evaluate this record.

***Wanda sadotha* Schaus, 1922 [misplaced] (Epipaschiinae)**

[*Phidotricha baradata* Schaus, 1922 (Epipaschiinae)]

Cock *et al*. (2022) reported and illustrated *Phidotricha baradata* from Tobago, but the figures have now been

Fig. 9. Male *Pycnarmon* sp., Englishman's Bay, at light, 3 December 2022, A. Deacon (iNaturalist observation 143615144); F 7–8 mm.

reidentified by M. Alma Solis, USDA Systematic Entomology Lab (pers. comm.). *Wanda sadotha* is misplaced in the genus *Wanda*, as it will need a new genus (Solis pers. comm.)

EREBIDAE

***Amolita sentalis* (Kaye, 1901)**

Kaye (1901) described and illustrated this small pale species from Tabaquite, Trinidad and Panama. Implicitly, the type should be the Trinidad specimen and it should be in NHMUK. However, Hampson (1910) refers to the Panama specimen as the type and lists eight males and a female from Trinidad in NHMUK, which MJWC has not examined. This species is fairly common, mostly in disturbed lowland areas of Trinidad. In Tobago, MK photographed a male attracted to light at Englishman's Bay (Fig. 10). Females are larger and usually more heavily marked, and we show a female photographed in Trinidad (Fig. 11) for comparison.

Fig. 10. Male *Amolita sentalis*, Englishman's Bay, at light, 17 November 2022, M. Kelly; F 8.5 mm.

Fig. 11. Female *Amolita sentalis*, La Romain, Concord, 25 January 2022, sheneller (iNaturalist observation 105808197); F 10–11 mm; ©, under CC-BY-NC.

***Antiblemma imitans* (Walker, 1858) (Eulepidotinae)**
Although not previously reported from Trinidad, this is an occasional species, particularly in the forested Northern Range. Trinidad material was identified by comparison with the NHMUK series. Here we report one record at light in the Tobago Main Ridge forest (Fig. 12) photographed by RND.

Fig. 12. Female *Antiblemma imitans*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121324944); F 18 mm.

***Coremagnatha orionalis* (Walker, 1859) (Herminiinae)**
This species is known from Trinidad (Kaye and Lamont 1927), where it is occasional in both forest and suburban situations. RND photographed a male feeding at a guava bait on the Tobago Main Ridge (Fig. 13).

***Dyomyx cimolia* Guenée, 1852 (Eulepidotinae)**
This subfamily placement is not authoritatively documented, but we refer *Diomyx* to Eulepidotinae because the DNA barcodes of *Dyomyx* and *Eulepidotis* (the type genus of Eulepidotinae) are intermingled. This is a new record for both Trinidad and Tobago. MJWC identified the only

Fig. 13. Male *Coremagnatha orionalis*, Main Ridge, at guava bait by night: 10 June 2022, R. Deo (iNaturalist observation 121322211); F 18 mm.

known Trinidad specimen (Curepe, 22–31 May 1982) by comparison with the NHMUK series. Since then there have been two further records from Trinidad (Brasso Seco, 25 September 2021, R. Deo, iNaturalist observation 96328996; Blanchisseuse Lookout, 19 November 2022, S. Tran, iNaturalist observation 142456522), and here we report the first from Tobago, based on RND's photograph on the Main Ridge (Fig. 14).

Fig. 14. *Dyomyx cimolia*, Main Ridge, 4 December 2022, R. Deo (iNaturalist observation 143704691); F 21 mm.

***Dysgonia expediens* (Walker, 1858) (Erebinae)**
Kaye and Lamont (1927) did not know this species from Trinidad, where it is an uncommon species, mostly found in the forests of the Northern Range. Trinidad material was identified by comparison with the NHMUK series. A DNA barcode from Trinidad in BOLD (sample no EJS-TRIN-021) forms part of BIN BOLD:AEN6919. The current generic placement is incorrect (the type species of *Dysgonia* is an Old World species that is not closely related), and a new genus

will probably be needed for *D. expediens*, *D. purpurata* Kaye and related species. The first Tobago record of *D. expediens* is RND's photo at light on the Main Ridge (Fig. 15).

Fig. 15. *Dysgonia expediens*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121321444); F 30 mm.

***Elysius conspersus* Walker, 1855 (Arctiinae)**

In spite of a specimen from Caparo in NHMUK dating back to the beginning of last century, this species has not previously been reported from Trinidad. MJWC collected one further specimen (Curepe, MVL, 18 December 1978) which he identified by comparison with the NHMUK series. RND's photograph from the Main Ridge (Fig. 16) is the first record from Tobago, and SMT's of 3 December 2022 from the same location (iNaturalist observation 143906873) is the second.

Fig. 16. Male *Elysius conspersus*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121322497); F 27 mm.

***Epidromia* sp. (Erebinae)**

In spite of recent valuable work on this genus (Becker 2001, Lafontaine and Dickel 2008, Barbut 2009), more needs to be done to understand and characterise all species, delineate their distributions, and establish which (if any) characters can be relied upon to identify them from images. As an interim measure, DNA barcodes could be used to characterise species, but none are available yet for Trinidad & Tobago. Judging from DNA barcodes four species of *Epidromia* are likely to be present in Trinidad: BOLD:AAA3449, BOLD:ABX5280, BOLD:AAB4684 (*E. poaphiloides* Guenée, 1852) and BOLD:AAC2736 (*E. dickeli* Barbut, 2009), but it is not clear which names should be applied to the first two BINs – possibly *E. lienaris* (Hübner, 1823) and *E. pannosa* Guenée, 1852. These two species as currently treated (Lafontaine and Dickel 2008) can only be reliably identified by their genitalia, and the variable females in particular lack useful characters for their separation. One of these species was recorded from Trinidad as *E. zetophora* Guenée (Kaye and Lamont 1927), and one or both of *E. lienaris* and *E. pannosa* is not uncommon in Trinidad, mainly in disturbed and suburban areas. The only record from Tobago is a female photographed by MG (Fig. 17). Specimens from Tobago will be needed to further evaluate which species are present there.

Fig. 17. Female *Epidromia* sp., Englishman's Bay, at light, 2 July 2022, M. Gibson (iNaturalist observation 124323737); F 20–21 mm.

***Eulepidotis hermura* (Schaus, 1898) (Eulepidotinae)**

This species has not previously been reported from Trinidad, but two females (Curepe, MVL, 24 December 1978; Mount St. Benedict, at light, 8 May 1995) collected by MJWC were identified by comparison with the USNM and NHMUK series. MG photographed adults at Englishman's Bay on 2 July 2022 (Fig. 18) and 9 July 2022 (iNaturalist observation 125532498).

***Eulepidotis perducens* (Walker, 1858) (Eulepidotinae)**

This species has not previously been recorded from Trinidad or Tobago. MJWC collected specimens at MV light at Curepe (♂ 7 November 1978, ? 23 November 1978) and Simla (♂ 14 June 1981, ♀ 30 July 1981, ♂ 9 October 1982), which he identified by comparison with the NHMUK

Fig. 18. *Eulepidotis hermura*, Englishman's Bay, at light, 2 July 2022, M. Gibson (iNaturalist observation 124491710); F 12 mm

series. Recently, Tarran P. Maharaj photographed a further individual at South Oropuche, Mon Desir (19 February 2022, iNaturalist observation 149125945). MG photographed one at Englishman's Bay (Fig. 19).

Fig. 19. *Eulepidotis perducens*, Englishman's Bay, at light, 5 July 2022, M. Gibson (iNaturalist observation 124955789); F 11 mm.

***Eulepidotis micca* (Druce, 1889) (Eulepidotinae)**

This is another species of *Eulepidotis* not previously recorded from Trinidad or Tobago, although there is a male specimen with no data label from Sir Norman Lamont's collection in NMS (the lack of a data label usually implies that the specimen was collected at Palmiste before April 1915). MJWC collected a female at Simla (6 August 1982) which he identified by comparison with NHMUK series. Since then RND photographed one in Upper Caura Valley (11 February 2023, iNaturalist observation 148577657) and Tarran P. Maharaj photographed one at South Oropuche, Mon Desir (19 February 2022, iNaturalist observation 149123347). MG's photograph (Fig. 20) is the first record from Tobago.

***Gonodonta sinaldus* Guenée, 1852 (Calpinae)**

This species is known from Trinidad (Lamont and Callan

Fig. 20. *Eulepidotis micca*, Englishman's Bay, at light, 15 July 2022, M. Gibson (iNaturalist observation 126413967); F 12 mm.

1950, Todd 1959), and MJWC identified Trinidad material from Todd (1959). This is an occasional and widespread species in both forested and suburban habitats in Trinidad, but MG's photograph from Englishman's Bay (Fig. 21) is the first record for Tobago.

Fig. 21. *Gonodonta sinaldus*, Englishman's Bay, at light, 2 July 2022, M. Gibson (iNaturalist observation 124491647); F 16–18 mm.

***Lascoria orneodalis* (Guenée, 1854) (Herminiinae)**

This species has previously been reported from Tobago as *Tortricodes orneodalis* (Longstaff 1912), but Cock (2017b) could not locate Longstaff's specimen in OUMNH and knew of no other records. A photograph by SMT on a night walk near Charlotteville (Fig. 22), onfirms that this is a Tobago species. There is also a female specimen in poor condition in MJWC (Crown Point, at light, 15–17 May 1981), which is probably this species. A photograph by Tarran Maharaj (Fig. 23) shows a female from Trinidad, where this species is common and widespread, mostly in disturbed areas. The females of several *Lascoria* spp. are rather similar.

Fig. 22. Male *Lascoria orneodalis*, Charlotteville, by night, 13 November 2022, S.M. Tran (iNaturalist observation 142265617); F 9.5–11 mm.

Fig. 23. Female *Lascoria orneodalis*, Trinidad, South Oropouche, 28 November 2022, T.P. Maharaj (iNaturalist observation 143219527); F 11 mm; ©, under CC-BY-NC.

***Hypocala andremona* (Stoll, 1781) (Hypocalinae)**

This species has not been previously reported from Trinidad, although there are specimens from Curepe (♀ 29 August 1980, ♂ 1 September 1980, ♀16–19 December 1980, ♂ 28 May–2 June 1981) and Morne Bleu, Textel Installation (♂, ♀ 26 July 1978, ♀ 21 July 1989) in MJWC and UWIZM. MJWC identified these by comparison with the NHMUK series. A photographic record by MG (Fig. 24) is the first for Tobago.

***Macrodes cynara* (Cramer, 1775) (Calpinae)**

Kaye and Lamont (1927) recorded this species from Trinidad (as *M. gyges* (Cramer)) based on specimens in NHMUK and from Palmiste in RSM. MJWC has examined these and

Fig. 24. *Hypocala andremona*, above Englishman's Bay, 11.288 -60.674, 6 July 2022, M. Gibson (iNaturalist observations 125101149); F 18–21 mm.

identified further specimens, which show that this species is occasional and widespread in Trinidad, mostly in forested areas. RND photographed a female attracted to guava bait at Englishman's Bay (Fig. 25). This species is moderately sexually dimorphic, so a male from Trinidad is shown for completeness (Fig. 26).

Fig. 25. Female *Macrodes cynara*, Englishman's Bay, at guava bait by night, 3 December 2022, R. Deo (iNaturalist observation 143618871); F 25–27 mm.

***Micramma croceicosta* Schaus, 1916 (Herminiinae)**

This species was reported from Trinidad by Kaye and Lamont (1927) based on a specimen from Caparo in NHMUK. MJWC has examined this specimen and the type in USNM (♀, French Guiana). In Trinidad, this is an uncommon species in forested areas (Arima Valley, Brasso Seco). A female at guava bait photographed by RND is the first record for Tobago (Fig. 27)

Fig. 26. Male *Macrodes cynara*, Trinidad, Trinity Hills Reserve, by night, 14 November 2020, R. Deo (iNaturalist observation 64982546); F 25–27 mm.

Fig. 27. Female *Micramma croceicosta*, Englishman's Bay, at guava bait by night, 3 December 2022, R. Deo (iNaturalist observation 143619016); F 14 mm.

***Mimophisma ablunaris* (Guenée, 1852) comb. nov. (Erebinae)**

Guenée (1852) described *Ophisma ablunaris* from Colombia and *Ophisma delunaris* (unknown type locality). Hampson (1913) treated *ablunaris* in the Asian genus *Achaea* (type species *Noctua melicerta* Drury, a synonym of *Geometra janata* Linnaeus, a widespread Old World species). Druce (1881–1890) recognised *Ophisma delunaris* as occurring from Mexico to south-east Brazil. Hampson (1926) described *Mimophisma* and made *O. delunaris* the type species. The two species are similar and somewhat variable, *M. delunaris* being darker, but can be easily distinguished by the spined mid- and hind-tibiae of *A. ablunaris*, which are unspined in *M. delunaris* (J.G. Franclemont in Dickel 1991).

Mimophisma delunaris appears in BOLD as BIN BOLD:AAB2848 from Canada to Argentina, whereas *A. ablunaris* appears as BOLD:AAB7888, from Puerto Rico, and Costa Rica to south-east Brazil and Paraguay. The two BINs are only 4.69% different, and it is clear that *A. ablunaris* is not close to the Old World *Achaea* species, but instead belongs in the **new combination** *Mimophisma ablunaris*.

Kaye and Lamont (1927) recorded *Mimophisma delunaris* from Trinidad based on specimens from San Fernando (22 February [1916]) and Palmiste (16 April 1922), both collected by Sir Norman Lamont. MJWC examined these two specimens, which are now in NMS. They, and all other material examined from Trinidad of this common and widespread species, are *M. ablunaris*. A photograph by Rachael Williams-Littzen from near Black Rock (Fig. 28) is the first record from Tobago. A clearer picture from Trinidad (Fig. 29) is included for comparison.

Fig. 28. *Mimophisma ablunaris*, Buccoo to Black Rock, 20 November 2022, R. Williams-Littzen (iNaturalist observation 142641039); F 21–23 mm; ©, under CC-BY-NC.

Fig. 29. *Mimophisma ablunaris*, Trinidad, Wa Samaki Ecosystems, 23 July 2022, R. Deo (iNaturalist observation 127612632); F 21–23 mm.

***Monochroides* sp. (Herminiinae)**

The genus *Monochroides* Kaye and Lamont was inadvertently introduced by Kaye and Lamont (1927) for *M. olivescens* (Warren, 1889), based on a Hampson manuscript on Herminiinae that was never published. Because of this, the genus has never been properly defined, nor other members clarified. There are at least three similar-looking species of *Monochroides* found in Trinidad (Fig. 30): *M. olivescens*, a very similar but larger species with different male genitalia which appears to be unnamed (*Monochroides* sp.), and *Bleptina dejecta* Schaus, 1916. The last-named closely resembles *M. olivescens* rather than other species currently placed in *Bleptina*, including the type species *B. caradrinalis* Guenée, so it is appropriate to transfer it to the **new combination** *Monochroides dejecta*.

Of the three Trinidad species, *Monochroides* sp. is clearly larger (F 15–16 mm) than *M. dejecta* (F 14 mm) and *M. olivescens* (F 12–13 mm); *M. dejecta* is a paler brown than the dark olive-brown of *M. olivescens* and *M*. sp.; the forewing white discal dot is strongest in *Monochroides* sp. (which may also have a smaller white dot distal to this), and more or less absent in *M. dejecta*; the hind wing discal dot of *Monochroides* sp. and *M. olivescens* is white, but in *M. dejecta* it is black. It is very difficult to separate *M. olivescens* and *Monochroides* sp. in photos without a scale.

SMT's photograph (Fig. 31 taken on a night walk at Charlotteville is *Monochroides* sp. based on markings and estimated size; it is the only record to date of a *Monochroides* from Tobago.

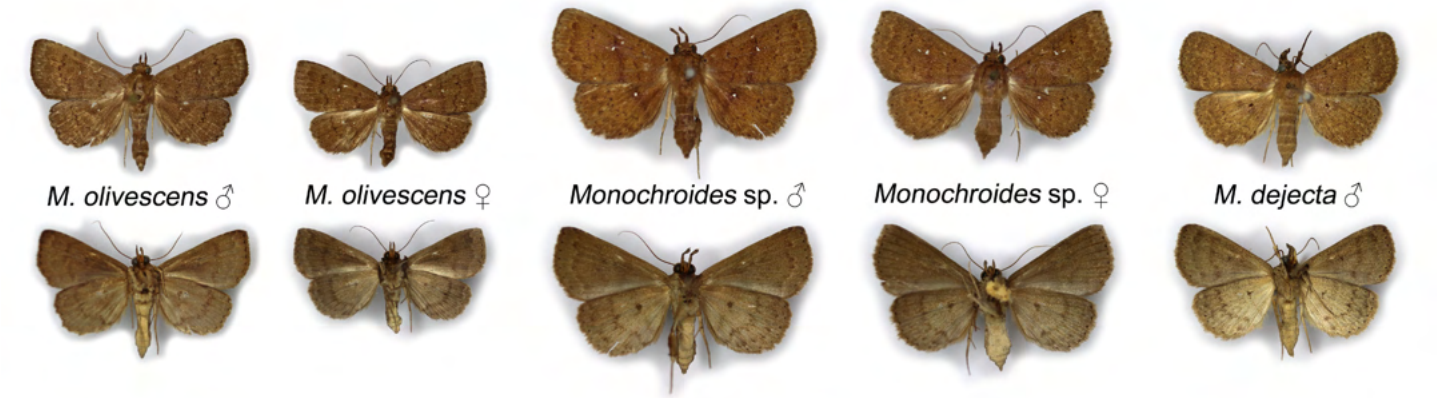

Fig. 30. *Monochroides* spp. *M. olivescens* ♂, Curepe, MVL, 18 December 1978; *M. olivescens* ♀, Cumaca Road, 4.6.miles, MVL, 18 July 1981; *M*. sp. ♂, Morne Bleu, Textel Installation, at light, 14 October 1980; *M*. sp. ♀, Arima Valley, Simla, MVL, 6 August 1982; *M. dejecta* ♂, Curepe, MVL, 18 October 1979. Life size.

Fig. 31. *Monochroides* sp., Charlotteville, by night, 13 November 2022, S.M. Tran (iNaturalist observation 142265612).

***Plusiodonta clavifera* (Walker, 1869) (Calpinae)**

This species was recorded from Trinidad by Kaye and Lamont (1927), and MJWC confirmed this identification by reference to the NHMUK. It is an occasional and widespread species in disturbed lowland areas Trinidad. SMT's photograph (Fig. 32) taken on a night walk at Charlotteville is the first record from Tobago.

***Rejectaria* sp. nr. *arata* Druce (Herminiinae)**

This is an uncommon species from the forested Northern Range of Trinidad (Brasso Seco, Cumaca Road, Morne Bleu), which MJWC did not find in NHMUK or USNM. RND photographed a male attracted to guava bait by night on the Main Ridge of Tobago (Fig. 33).

***Rejectaria theclalis* Walker, [1859] (Herminiinae)**

This is an occasional species of the forests of the Northern Range (Brasso Seco, Cumaca Road), that has not previously been reported from Trinidad. In Trinidad, it has most frequently been seen when attracted to fruit baits, and RND photographed a male attracted to guava bait by night on the Main Ridge of Tobago (Fig. 34).

***Salia anna* (Druce, 1891) (Herminiinae)**

This species is a new record for both Trinidad and Tobago. MJWC identified a male from Curepe (MVL, 4 February 1979) by comparison with the type (NHMUK, ♂ Panama). Since then photographic records by RND and AED show this to be an occasional species in Trinidad, predominantly in forested areas. RND photographed females at what seemed to be damaged or fermented flowers (Inniss Field, 16 April

Fig. 32. *Plusiodonta clavifera*, Charlotteville, 13 November 2022, S.M. Tran (iNaturalist observation 142265618); F 14 mm.

Fig. 33. Male *Rejectaria* sp. nr. *arata*, Main Ridge, at guava bait by night, 10 June 2022, R. Deo (iNaturalist observation 121323787); F 14 mm.

Fig. 34. Male *Rejectaria theclalis*, Main Ridge, at guava bait by night, 10 June 2022, R. Deo (iNaturalist observation 121324223); F 14 mm.

2021, iNaturalist observation 74383171) and at *Rollinia* bait (Wa Samaki Ecosystems, 15 January 2021, iNaturalist observation 68136666). He also photographed a female at guava bait at Englishman's Bay (Fig. 35). The male has long pale brown labial palps that extend back over the head (Fig. 36).

Fig. 35. Female *Salia anna*, Englishman's Bay, at guava bait by night, 3 December 2022, R. Deo (iNaturalist observation 143618502); F 14 mm.

Fig. 36. Male *Salia anna*, Trinidad, Wa Samaki Ecosystems, by night, 30 November 2022, R. Deo (iNaturalist observation 143408571); F 14 mm.

***Scolecocampa xanthipterygia* (Kaye, 1901) (Scolecocampinae)**

Species currently placed in *Scolecocampa* were placed in the genus *Herminodes* (and often still are on the internet), but Franclemont (1949) made *Herminodes* a synonym of *Scolecocampa.* Kaye (1901) described and illustrated *S. xanthipterygia* (Kaye) from Trinidad, and the male type (Fig. 39A) was examined in NHMUK. Based on a review of Trinidad material to hand, this seems to be a moderately variable species, in colour, markings, size and wing proportions (Figs. 37A–F), and this was confirmed by examination of the male genitalia of three dissimilar examples (Figs. 37C, D, F). The congeneric North American species *S. liburna* (Geyer) is similarly variable (Pogue 2012), which may be linked to the caterpillar feeding on dead wood, which is likely to be variable in quality.

Rhosologia pantina Schaus, 1901 was described from Trinidad (Schaus 1901), and the type (Fig. 37B) was examined in USNM. Given the demonstrated variability of *S. xanthipterygia*, and the common type locality, it is clear that *Rhosologia pantina* Schaus, 1901 is a **new synonym** of *S. xanthipterygia* Kaye, 1901, the latter being published 10 July 1901 (taken from journal end papers), and the former in August 1901 (journal part date).

There is a second species of this group in Trinidad of which one male was available (Fig. 37G); it can be separated by the male genitalia (Fig. 38), but the markings are almost identical, and although this second species has broader forewings in the male, we hesitate to conclude that this character is diagnostic based on the single male available. The forewing costa is slightly concave in most examples of male S. *xanthipterygia* (Figs. 37A–F), but straight in the single male of the second species (Fig. 37G). The single female of this group to hand (Fig. 37H) is larger, with broader, more rounded wings, and could be associated with either species. Further research, with more material and DNA barcodes will help clarify these species.

Given the foregoing, the identification of photographs of these two species is challenging. The five photographs

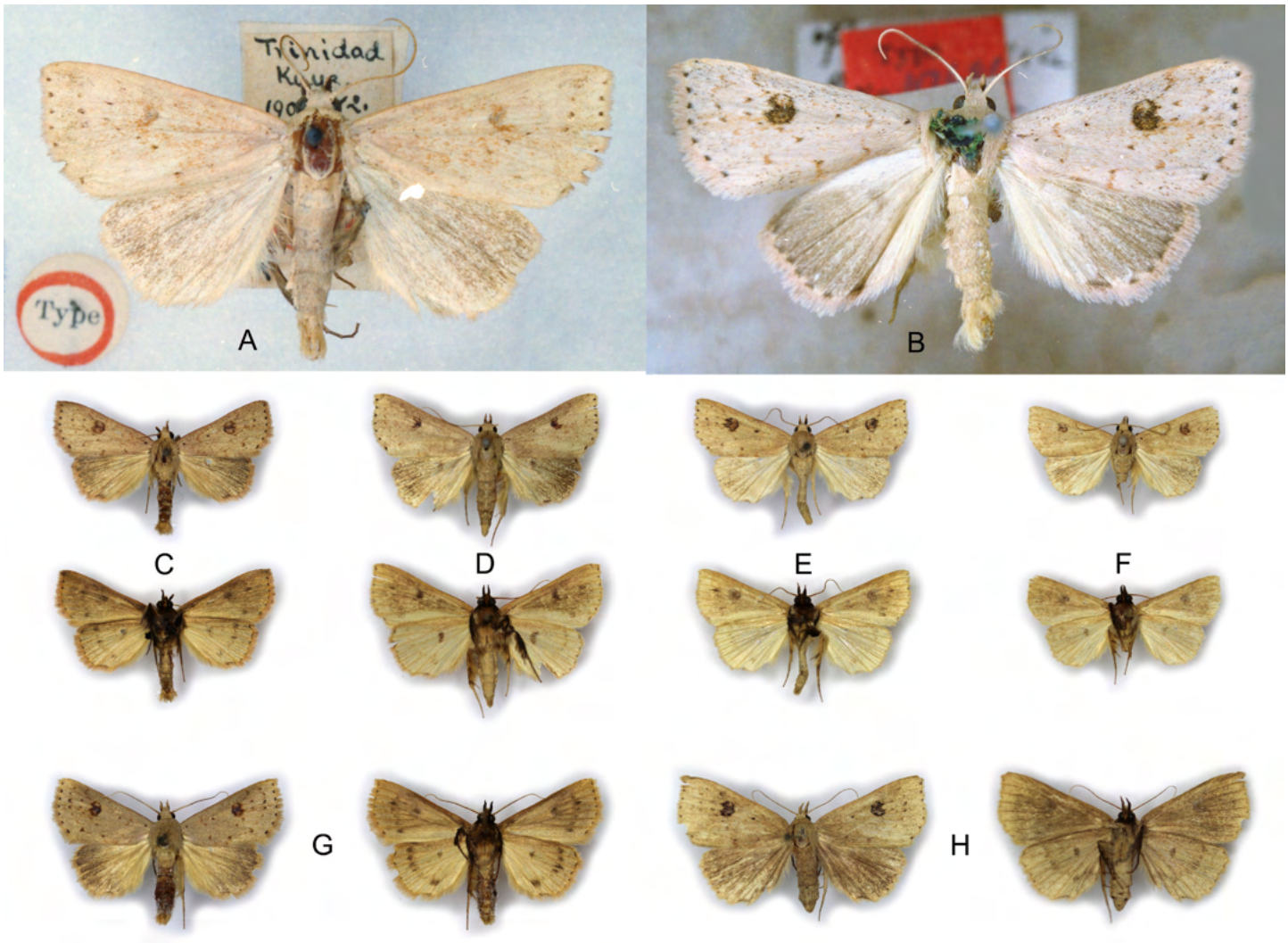

Fig. 37. *Scolecocampa* spp., **A–F**, *S. xanthipterygia* males: **A**, male holotype of *Herminodes xanthipterygia* Kaye, Trinidad, W.J. Kaye [NHMUK], ©, The Trustees of the Natural History Museum, London, made available under Creative Commons License 4.0 https://creativecommons.org/licenses/by/4.0/; **B**, male holotype of *Rhosologia pantina* Schaus, Trinidad [USNM]. **C**, Cumaca Road, 4.6 miles, MVL, 18 July 1981. **D**, Cumaca Road, 0.5 miles, MVL, 27 October 1980 [genitalia 1177]. **E**, Arima Valley, Simla, MVL, 12 February 1982. **F**, Valencia Forest, MVL, April 1980 [genitalia 1174]. **G**, Scolecocampa sp. male, Arima Valley, Simla, MVL, 6 August 1982 [genitalia 1175]. **H**, Scolecocampa sp. female. Arima Blanchisseuse Road, milestone 9 ¾, MVL, 9 November 1978. A–B enlarged, C–H life size.

by MK (Fig. 39), RND (Figs. 40, 42), AED (Fig. 43) and Mark Hulme (Bloody Bay, 22 December 2022, iNaturalist observation 145114911) newly available from Tobago suggest that four are of male *S. xanthipterygia* (Figs. 39–41), based on the relative width of the forewings, and the slightly concave costa, while the fifth is a female (Fig. 42) that could be of either species. Provisionally, we treat all five as *S. xanthipterygia*, and this is the first record of this complex from Tobago.

Fig. 38. Male genitalia of *Scolecocampa* spp. from Trinidad, dorsal, ventral and lateral views.

Fig. 39. Male *Scolecocampa xanthipterygia*, Englishman's Bay, 26 February 2022, M. Kelly (photo 2629); F 13–16 mm.

Fig. 40. Male *Scolecocampa xanthipterygia*, Arnos Vale, 11 June 2022, R. Deo (iNaturalist observation 121389303); F 13–16 mm.

Fig. 41. Male *Scolecocampa xanthipterygia*, Englishman's Bay, 8 December 2022, A. Deacon (iNaturalist observation 143929357); F 13–16 mm.

Fig. 42. Female *Scolecocampa* sp., Englishman's Bay, 3 December 2022, R. Deo (iNaturalist observation 143619584).

***Valvaminor jacerda* Cock & Laguerre 2022 (Arctiinae, Arctiini, Euchromiina)**

This species was recently described from Trinidad and reported from Tobago (Cock and Laguerre 2022; Cock and Laguerre 2023). This Tobago record was based on RND's photograph from Arnos Vale (Fig. 43). AED subsequently photographed a female above Englishman's Bay (30 November 2022, iNaturalist observation 143347036).

Fig. 43. Male *Valvaminor jacerda*, Arnos Vale, 11 June 2022, R. Deo (iNaturalist observation 121361203); F 10 mm.

EUTELIIDAE

***Eutelia abscondens* (Walker, 1858) (Euteliinae)**

Lamont and Callan (1950) first reported this species from Trinidad (♂, Golden Grove, 20 July 1923). MJWC identified a second Trinidad specimen (♂, Morne Bleu, Textel Installation, at light, 11 October 1978) by comparison with the NHMUK series. Recently, MG photographed a female at Englishman's Bay (Fig. 44).

GEOMETRIDAE

***Chloractis pulcherrima* (Butler, 1881) (Geometrinae)**

Kaye (1901), Kaye and Lamont (1927) and Pitkin (1996) have recorded this distinctive species from Trinidad, where it is an uncommon species in forest habitats. MJWC confirmed the identification of Trinidad material by comparison with the type (NHMUK, ♂ Amazons) and NHMUK series. MK photographed the first Tobago record at Englishman's Bay (Fig. 45).

Fig. 44. Female *Eutelia abscondens*, Englishman's Bay, at light, 2 July 2022, M. Gibson (iNaturalist observation 124324151); F 16 mm.

Fig. 45. *Chloractis pulcherrima*, Englishman's Bay, at light, 22 November 2022, M. Kelly; 11 mm.

***Dolichoneura nigrinotata* Warren, 1906 (Desmobathrinae)**

This species was recorded from Trinidad based on a specimen collected by F.W. Jackson and now in NHMUK (Kaye and Lamont 1927), which MJWC examined and confirmed. It is a rare species in Trinidad, the only other records being photographs from Brasso Seco (17 April 2022, M. Hulme) and Bush Bush (18 October 2014, K. Sookdeo). Hence, MK's photograph from Englishman's Bay (Fig. 46) was not anticipated.

Fig. 46. Male *Dolichoneura nigrinotata*, Englishman's Bay, at light, 17 November 2022, M. Kelly; F 19 mm.

***Eois marcearia* (Guenée, [1858]) (Larentiinae)**
Kaye and Lamont (1927) recorded this species from Trinidad under the name *Cambogia simplicearia* Walker, which is a synonym of *E. marcearia* (Scoble 1999). It is an occasional species in Trinidad, mostly recorded from suburban and disturbed situations. SMT photographed a female on a night walk near Charlotteville (Fig. 47).

Fig. 47. Female *Eois marcearia*, Charlotteville, by night, 13 November 2022, S.M. Tran (iNaturalist observation 142265615); F 9 mm.

***Erastria decrepitaria* (Hübner [1823]) (Ennominae)**
This is a common and widespread species in Trinidad (Kaye and Lamont 1927, authors' observations), which MJWC identified by comparison with the NHMUK series. Although it is found in suburban areas in Trinidad, it is most prevalent in forested areas, where it can be observed by day, flying and settling close to the ground. The first record from Tobago is a photo of a male taken by RND early in the morning near Arnos Vale (Fig. 48). The male is variable in colour from yellow to dull brown-green, and lacks the dark spots near the apex and tornus seen in the female (Fig. 49). In turn the female lacks the sharp defined discal line of the male, which is darker distally. MG subsequently photographed a female at light at Englishman's Bay (15 July 2022, iNaturalist observation 126414377), but we include here a clearer image from Trinidad (Fig. 49).

Fig. 48. Male *Erastria decrepitaria*, Arnos Vale, 12 June 2022, R. Deo (iNaturalist observation 121397062); F 17 mm.

Fig. 49. Female *Erastria decrepitaria*, Trinidad, Arima valley, Temple Village, at light, 16 September 2022, S.M. Tran (iNaturalist observation 135328287); F 20–22 mm.

***Euphyia strenuaria* (Walker, 1860) (Larentiinae)**
Two specimens from Parrylands (25 July 1981) in MJWC were identified by comparison with the type (NHMUK, ♂ Venezuela) and NHMUK series. These are the only records known from Trinidad, and MG's photo from Englishman's Bay (Fig. 50) is the only one for Tobago.

Fig. 50. Male(?) *Euphyia strenuaria*, Englishman's Bay, at light, 10 July 2022, M. Gibson (iNaturalist observation 125855060); F 18–21 mm.

***Macaria gambarina* (Stoll, 1781) (Ennominae)**
Kaye and Lamont (1927) recorded this species (as its synonym *Semiothisa agnitaria* (Hübner)) from Palmiste. As has been previously noted (Cock and Laguerre 2023), when Kaye and Lamont (1927) record a species from Palmiste without a

collection date, this usually means there is a specimen with no data label in NMS (or UWIZM), which would have been collected at Palmiste before 1915 when Lamont first labelled his specimens. In this case there is a specimen without data label in NMS, with a curation label as *Semiothisa agnitaria* Hüb., which is accepted as the specimen to which Kaye and Lamont referred. MJWC confirmed it as a female *M. gambarina*, based on a comparison with the NHMUK series of this species. In addition to the Palmiste record, *M. gambarina* has been occasionally recorded from the Arima Valley and Brasso Seco. AED and MK photographed this species at Englishman's Bay in December 2022 (Fig. 51).

Fig. 51. *Macaria gambarina*, Englishman's Bay, 3 December 2022, A. Deacon (iNaturalist observation 143615156); F 15 mm.

***Nepheloleuca politia* (Cramer, 1777) (Ennominae)**

Kaye and Lamont (1927) recorded this species from Trinidad, where it is an occasional species, widespread in diverse habitats. MJWC identified it from Trinidad by comparison with the NHMUK series. RND's photo of one attracted to house lights at Arnos Vale (Fig. 52) is the first record for Tobago. It is more heavily speckled than Trinidad specimens.

Fig. 52. *Nepheloleuca politia*, Arnos Vale, at light, 11 June 2022, R. Deo (iNaturalist observation 121387276); F 22–25 mm.

***Nepheloleuca semiplaga* Warren, 1894 (Ennominae)**

Lamont and Callan (1950) recorded a specimen from Trinidad (Palmiste, 20 January 1926, N. Lamont), which MJWC examined in NMS. Trinidad specimens are close to the type of *N. semiplaga* (NHMUK, Mexico), but this genus merits more work, so this should be considered a provisional identification. This is an uncommon species in Trinidad, with additional records from Curepe and Maracas Valley. It can be distinguished from *N. politia* as it is smaller, is a paler yellow and has a black spot within the hindwing tail. AW photographed one at Black Rock (Fig. 53), which is a darker yellow and more heavily marked than the material seen from Trinidad, but treated here as *N. semiplaga* because of the dark spot in the hindwing tails.

Fig. 53. *Nepheloleuca semiplaga*, Black Rock, 6 August 2022, A. Wheeler (iNaturalist observation 129695713); F 18 mm; ©.

***Perissopteryx trinidadicola* Krüger & Scoble, 1992 (Ennominae)**

This species was described from Trinidad (Krüger and Scoble 1992), and is not uncommon in forested areas of northern Trinidad. MG's photo of a female attracted to house lights above Englishman's Bay (Fig. 54) is the first record for Tobago.

Fig. 54. Female *Perissopteryx trinidadicola*, Englishman's Bay, at light, 4 July 2022, M. Gibson (iNaturalist observation 124817506); F 15 mm.

***Phrygionis privignaria* (Guenée, [1858]) (Ennominae)**
This is an occasional species in Trinidad (Kaye and Lamont 1927) mostly recorded in forested areas. Material from Trinidad was identified by comparison with the NHMUK series and from Scoble (1994). Photographs on the Main Ridge of Tobago by RND (Fig. 55) and SMT (3 December 2022, iNaturalist observation 143906878) are the first records from the island.

Fig. 55. *Phrygionis privignaria*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121320308); F 16 mm.

***Ptychamalia perlata perlata* (Warren, 1900)**
Warren (1900) described this species from Trinidad, where it is an occasional and widespread species. AW's photograph of a female at Black Rock (Fig. 56) is the first observation from Tobago. A female from Trinidad with heavier, clearer markings (Fig. 57) is shown to facilitate recognition. The male is usually more lightly marked, but the submarginal line running to close to the tornus is a distinctive feature.

***Semaeopus caecaria* Hübner, [1823]**
Kaye and Lamont (1927) recorded this species from Trinidad as *S. punctata* (Stoll) (TL Surinam). Stoll's name is an unavailable homonym, for which Hübner (1816–[1826]) provided the replacement name *S. caecaria*. We are not aware of any type material for Stoll's species, but his figure shows a strongly spotted individual rather like Fig 58, but lacking the discal circles. In contrast, Hübner (1816–[1826], Fig. 327) illustrated what is probably a different species with no spotting and wavy transverse discal lines. However, it is Stoll's definition that has precedence and must be applied to Hübner's name. Warren (1906) described *Heterophyla grisea* Warren from Trinidad: a grey-brown form with no dark spotting. Prout (1932–1938) considered *S. caecaria* to be a very variable species, found from Central America to Argentina, of which *grisea* is one of several forms. There do not seem to have been any alterations to Prout's interpretation since then, and so we follow his treatment here. This is an

Fig. 56. Female *Ptychamalia perlata*, Black Rock, 3 December 2022, A. Wheeler (iNaturalist observation 143613634, 143671555); F 9 mm.

Fig. 57. Female *Ptychamalia perlata*, Trinidad, Palo Seco, 25 June 2018, davisgunn (iNaturalist observation 36172252); F 9 mm. ©, under CC-BY-NC.

Fig. 58. Female(?) *Semaeopus caecaria*, Englishman's Bay, at light, 18 July 2022, M. Gibson (iNaturalist observation 126891679); F 14 mm.

occasional and widespread species in Trinidad (Arima Valley, Caparo, Curepe, Inniss Field, Maraval, Mt. Tamana, South Oropouche, in MJWC, NHMUK, iNaturalist). Based on limited material in MJWC, the relatively plain forms seem

to be males and the spotted forms females. MG's photo is the first from Tobago, and is of the form resembling Stoll's original concept, being quite heavily spotted.

LASIOCAMPIDAE

***Euglyphis melancholica* Butler, 1878 (Poecilocampinae)**

Ongoing studies suggest that it may be more accurate to refer to this species as *Euglyphis melancholica* complex pending revision of the group. However, since it was recorded from Trinidad by Kaye and Lamont (1927) as *melancholica*, we use this name on a provisional basis for Tobago. MJWC compared Lamont's specimens with those he collected and the holotype (NHMUK, ♂ Brazil, Amazon). This is an uncommon species from forested areas in Trinidad. MK photographed a male at Englishman's Bay (Fig. 59).

Fig. 59. Male *Euglyphis melancholica*, Englishman's Bay, at light, 25 November 2021, M. Kelly; F 16 mm.

LIMACODIDAE

***Natada* sp. nr. *pucara* (Dognin, 1893)**

The identity of this species is currently under study for a planned treatment of the Limacodidae for Trinidad and Tobago (M.J.W. Cock and M.E. Epstein, unpublished). It closely resembles *Natada pucara*, but we currently believe it is a separate species. The only known female from Trinidad is considerably larger than the males (F 23 mm vs. 13 mm). This is an occasional species in Trinidad in diverse habitats, but AED's photo (Fig. 60) is the first from Tobago.

MEGALOPYGIDAE

***Megalopyge xanthopasa* (Sepp, 1828)**

Cock (2017b) listed this species from Tobago under two different names: *Megalopyge pellita* (Felder) and *M. xanthopasa xanthopasa* (Sepp). The former was described from French Guiana and the latter from Suriname. Becker (1995) treats the two as distinct species. It appears that only one species occurs in Trinidad and Tobago, and although it seems possible that the two names are synonyms, that is not addressed here.The name M. *xanthopasa* is now used for Trinidad and Tobago material, based on a comparison with the NHMUK series, which includes material from Trinidad.

Fig. 60. Male *Natada* sp. nr. *pucara*, Englishman's Bay, at light, 29 November 2022, A. Deacon (iNaturalist observation 143320860); F 13 mm.

NOCTUIDAE

***Condica mobilis* (Walker, [1857]) (Condicinae)**

Kaye and Lamont (1927) did not report this species from Trinidad, although there are specimens in Lamont's collection in NMS and UWIZM. The latter are misidentified as *Perigea apameoides* Guenée, which is a synonym of *C. sutor* (Guenée) (Poole 1989), a species that Kaye and Lamont (1927) did report, referring to a correctly identified specimen now in NMS (Palmiste, 21 April 1921, N. Lamont). This is a common and widespread species in Trinidad, and its presence in Tobago is no surprise, although RND's image

Fig. 61. *Condica mobilis*, Arnos Vale, 11.206 -60.751, at light, 11 June 2022 R. Deo (iNaturalist observation 121453306); F 13 mm.

of a specimen in poor condition at Arnos Vale (Fig. 61) is the first we have seen from the island. An image of a fresher individual from Trinidad is included to facilitate

Fig. 62. *Condica mobilis*, South Oropouche, at light, 3 January 2022, T.P. Maharaj (iNaturalist observation 104320259); ©, under CC-BY-NC.

identification (Fig. 62).

***Elaphria hypophaea* (Hampson, 1920) (Noctuinae)**

This is a replacement name for *Monodes hyposcota* Hampson (Hampson 1909, 1920). Kaye and Lamont (1927) recorded a Trinidad specimen of this species from Caigual (22 August 1917, A. Lickfold); MJWC examined this specimen in OUMNH. Lamont and Callan (1950) then recorded it incorrectly as *A. grata* Hübner, a similar North American species, referring to a specimen from Palmiste (22 February 1938, N. Lamont); this specimen was examined in RSM. Both voucher specimens are considered to be *E. hypophaea*. This is a common species in disturbed and suburban areas of Trinidad. Since it also occurs in the Lesser Antilles (Hampson 1909), it was expected to occur in Tobago. RND photographed one at light on the Main Ridge (Fig. 63).

Fig. 63. *Elaphria hypophaea*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121326693); F 11 mm.

***Gonodes trapezoides* (Herrich-Schäffer, 1868) (Noctuinae)**

This species was first recorded from Trinidad as *Gonodes liquida* (Möschler) by Lamont and Callan (1950) based on a Lamont specimen from Palmiste (15 December 1933). MJWC examined this specimen in NMS, and identified it and others from Curepe and Parrylands as this species by comparison with the NHMUK series. However, Becker (2002) demonstrated that *G. liquida* is actually a synonym of *G. trapezoides*, so this name should now be used. Rachael Williams-Littzen photographed the first record for Tobago near Black Rock (Fig. 64), and AED photographed a further individual at Englishman's Bay, 3 December 2022 (iNaturalist observation 143615146).

Fig. 64. *Gonodes trapezoides*, Buccoo to Black Rock, 25 November 2022, R. Williams-Littzen (iNaturalist observation 142874571); F 12 mm; ©, under CC-BY-NC.

***Hemicephalis characteria* Stoll, 1790 (Condicinae)**

This species has not previously been reported from Trinidad or Tobago, but MJWC has a male from Curepe (4 January 1980), which he identified by comparison with the NHMUK series. RND found a dead specimen at Arnos Vale (Fig. 65).

Fig. 65. *Hemicephalis characteria*, Arnos Vale, 11 June 2022, R. Deo (iNaturalist observation 121327010); F 17 mm.

***Spodoptera cosmiodes* (Walker, 1858) (Noctuinae)**
[*Spodoptera latifascia* (Walker, 1856)]
Late last century, Silvain and Lalanne-Cassou (1997) showed that *C. cosmiodes* is a valid species rather than a synonym of *S. latifascia*, which until then was considered to be a single species found throughout most of the Americas. In his world review of *Spodoptera*, Pogue (2002) documented that *S. latifascia* occurs in North America south to Costa Rica, and through the Caribbean to Grenada, while *S. cosmiodes* occurs in South America, including Trinidad, and north to Costa Rica. Cock (2017b) overlooked this when compiling his preliminary checklist of moths of Tobago, and listed this species as *S. latifascia* based on the earlier interpretation. However, based on the known distribution of the two species, it is more likely that *S. cosmiodes* would be the species in Tobago, and this was confirmed by dissection of the genitalia of the male specimen that Cock (2017b) reported in MJWC. Thus, pending further observations, we consider that *S. cosmioides* is a Tobago species whereas *S. latifascia* is not.

***Tripudia ochrocraspis* (Hampson, 1910) (Cobubathinae)**
This species is here newly recorded from both Trinidad and Tobago. MJWC identified Trinidad specimens from Curepe (♀ 23–31 April 1982) and Arima Valley, Simla (♀ 28 January 1981; ♂ 28 March 1982) by comparison with the type (NHMUK, Mexico). Based on these, he identified ravensroost's photograph at Englishman's Bay (Fig. 66) as this species.

Fig. 66. *Tripudia ochrocraspis*, Englishman's Bay, 3 December 2022, ravensroost33 (iNaturalist observation 143604374); F mm; © under CC-BY-NC.

NOLIDAE
***Neostictoptera nigropuncta* Druce, 1900 (Collomeninae)**
This is a new record for both Trinidad and Tobago. MJWC identified a male specimen from Morne Bleu, Textel Installation (29 March 1979) by comparison with the type (NHMUK, ♀, Colombia) and NHMUK series. Based on this specimen he identified MG's photo from Englishman's Bay (Fig. 67).

Fig. 67. *Neostictoptera nigropuncta*, Englishman's Bay, at light, 3 July 2022, M. Gibson (iNaturalist observation 124669073); F 15 mm.

***Nola perluta* Draudt, 1918 (Nolinae)**
MJWC identified this species from Trinidad (♀ Arima Valley, Simla, MVL, 15 February 1981, ♀ 7 August 1981; ♂ Lalaja Ridge, MVL, 3 September 1982) by comparison with the NHMUK series. However, the type (♂, NHMUK, Colombia) lacks the distinctive forewing spot present in most of the NHMUK series and the Trinidad material, so this identification may need revision. The same species was photographed at Englishman's Bay by MG (Fig. 68).

Fig. 68. *Nola perluta*, Englishman's Bay, at light, 2 July 2022, M. Gibson photo (iNaturalist observation 124491350); F 6 mm.

***Nola cereella* (Bosc, [1800]) (Nolinae)**
This species was previously known as *Nola sorghiella* Riley, under which name it was reported as a minor pest of sorghum and other grasses in the USA (Reinhard 1937, Hobbs *et al*. 1979). However, Miller and Becker (1989) made *sorghiella* a synonym of *cereella*, which they placed

in the genus *Nola*. There have been no previous records of this species from Trinidad or Tobago. MJWC collected a Trinidad specimen at Curepe, 2 September 1978, which he identified by comparison with the NHMUK series, and AED

Fig. 69. *Nola cereella*, Englishman's Bay, 3 December 2022, A. Deacon (iNaturalist observation 143615149); F 6 mm.

photographed one at Englishman's Bay (Fig. 69).

NOTODONTIDAE

***Disphragis onerosa* (Schaus, 1905) (Heterocampinae)**

Cock (2021a) treats this species from Trinidad, but RND's photo of a male at light on the Tobago Main Ridge (Fig. 70) is the first record from the island.

Fig. 70. Male *Disphragis onerosa*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121325409); F 21–22 mm.

***Heorta consociata* (Schaus, 1905) (Heterocampinae)**

See Cock (2021a) regarding this species and its identification in Trinidad. RND's photograph from Tobago Main Ridge (Fig. 71) is the first Tobago record. It is more clearly marked than the specimens illustrated in Cock (2021a).

Fig. 71. Male *Heorta consociata*, Main Ridge, at light, 10 June 2022, R. Deo (iNaturalist observation 121326318); F 14 mm.

NYMPHALIDAE

***Colobura dirce dirce* (Linnaeus, 1758) (Nymphalinae)**

There have been unconfirmed reports of this species occurring in Tobago for several years, but the photograph by wildlife_tobago (Fig. 72) is the first confirmation that we have seen. This butterfly, known as the zebra, is common and widespread in Trinidad, and frequently observed at rest on tree trunks or feeding on fallen fruit. There is a second very similar species, *C. annulata* Willmott, Constantino & J. Hall also present in Trinidad, which has not yet been recorded from Tobago (Willmott *et al*. 2001, Cock 2005, Cock 2014). Both species feed on bois canot, *Cecropia peltata* L. (Urticaceae), as caterpillars (Willmott *et al*. 2001, Cock 2005).

Fig. 72. *Colobura dirce*, Mason Hall, Corbin Local Wildlife, 24 October 2022, wildlife_tobago (iNaturalist observation 139924618); F 31 mm; ©, under CC-BY-NC.

***Dynamine agacles* (Dalman, 1823) ssp. *core* Rober, 1915 (Biblidinae)**

John Morrall caught four specimens of this small butterfly at

Lowlands, Tobago on 28 June 2022 and saw several more. Voucher specimens are in his collection. This is a widespread, but occasional species in Trinidad.

PYRALIDAE

***Carthara abrupta* (Zeller, 1881) (Epipaschiinae)**

Lamont and Callan (1950) recorded this species from Trinidad (as *Stericta abrupta*). It is an occasional but widespread species in Trinidad, and specimens were identified by comparison with the NHMUK series. The first records from Tobago are MG's photos from Englishman's Bay on 14 and 22 July 2022 (Fig. 73).

Fig. 73. *Carthara abrupta*, Englishman's Bay, at light, 22 July 2022, M. Gibson (iNaturalist observation 127435997); F 14–16 mm.

***Incarcha aporalis* Dyar, 1910 (Epipaschiinae)**

Trinidad specimens from Curepe (♂ 2 February 1979) and Inniss Field (♀ 17 May 1999) were identified by comparison with the NHMUK series of *I. argentilinea* (Druce), a synonym of *I. aporalis* (TL French Guiana). They represent a new record for Trinidad, and MG's photograph from Tobago (Fig. 74) is the first for that island.

***Ramphidium pselaphialis* (Ragonot 1891)**

This species is known from Trinidad (Kaye and Lamont 1927), where it has been reared from stems of black sage, *Varronia curassavica* Jacq. (Cordiaceae) (Donald 1945, F.J. Simmonds unpublished observations, specimens in UWIZM).

Fig. 74. Male *Incarcha aporalis*, above Englishman's Bay, at light, 12 July 2021, M. Gibson (iNaturalist observation 126044693); F 9 mm.

Trinidad specimens were identified by comparison with the NHMUK and USNM series. A photo of a male at Cuffie River Nature Retreat by faraazabdool (Fig. 75) is the first record from Tobago. The female is slightly larger and green, as shown in RND's photograph from Trinidad (Fig. 76).

Fig. 75. Male *Ramphidium pselaphialis*, Cuffie River Nature Retreat, 19 September 2022, faraazabdool (iNaturalist observation 135738073); F 21–25 mm; ©, under CC-BY-NC.

Fig. 76. Female *Ramphidium pselaphialis*, Trinidad, Wa Samaki Ecosystems, 20 June 2021, R. Deo (iNaturalist observation 83776957); F 26–27 mm.

***Trachylepidia fructicassiella* Ragonot, 1887 (Galleriinae)**
This is an Old World species that is now widespread in the Americas. It was first described from Egypt (Cairo, from pods of *Cassia*), Lebanon (Beirut), and India/Pakistan (Punjab) (Ragonot 1887). It was subsequently described again as *Aganactesis indecora* Dyar from Trinidad based on a quarantine interception of *Cassia* pods in California (Dyar 1921), but later made a synonym of *T. fructicassiella* (Hodges *et al*. 1983). Last century this species was in use at the Commonwealth Institute of Biological Control (CIBC, Curepe, now CABI) and Caroni Research Station as a laboratory host for rearing parasitoids of sugar cane stem borers (*Diatraea* spp., Crambidae), since caterpillars were readily obtained from the fallen seed pods of exotic *Cassia* spp. (Fabaceae) such as *C. moschata* Benth., *C. javanica* L., *C. grandis* L. f. and *C. fistula* L. (Bennett and Simmonds 1966, Bennett 1969, Cock 1984). MJWC was therefore familiar with this species, which he originally identified by comparison with reference material in the CIBC collection (now in UWIZM). It has not previously been reported from Tobago, so AW's photo (Fig. 77) is the first record.

***Xantippe olivalis* Dyar, 1914 (Chrysauginae)**
Cock (2017c) recorded this species from the Five Islands and Trinidad, identified by comparison with the NHMUK series. It seems to be a local and uncommon species in Trinidad, but probably easily overlooked due to its small size. AED's photo from Englishman's Bay (Fig. 78) is the first Tobago record.

Fig. 77. Male *Trachylepidia fructicassiella*, Black Rock, 21 July 2022, A. Wheeler (iNaturalist observation 127233902); F 10 mm.

Fig. 78. *Xantippe olivalis*, Englishman's Bay, 9 December 2022, A. Deacon (iNaturalist observation 144046065); F 5.5 mm.

SPHINGIDAE

***Erinnyis oenotrus* (Cramer, 1780) (Macroglossinae)**
This is a fairly common species in Trinidad (Cock 2018), but not previously recorded from Tobago, and it does not seem to be present in the Lesser Antilles (Schreiber 1978). Photographs by AW at Black Rock (Fig. 79) and AED (Englishman's Bay, 30 November 2022, iNaturalist observation 143469849) are the first records from Tobago.

***Xylophanes loelia* (Druce, 1878) (Macroglossinae)**
This is an occasional species in Trinidad (Cock 2018), but has not been formally recorded from Tobago hitherto. However, Steve Nanz photographed one at Cuffie River Nature Resort, 27 March 2015 (Fig. 80), and Sheri L. Williamson photographed another at the same location, 9 December 2022 (iNaturalist observation 144014747).

Fig. 79. Female *Erinnyis oenotrus*, Mt Irvine Bay, 28 July 2022, A. Wheeler (iNaturalist observation 128465373); F 39 mm.

Fig. 80. *Xylophanes loelia*, Cuffie River Nature Resort, 27 March 2015, S. Nanz; F 32 mm; © with permission.

TORTRICIDAE

***Saphenista multistrigata* (Walsingham, 1914) (Tortricinae)**

This is the only species of *Saphenista* known from Trinidad, where under the name *Phalonidia multistrigata* the larvae are known to feed in the flower heads of various Asteraceae, including *Chromolaena odorata* (L.) R.M. King & H. Rob. (Cruttwell 1974), *Mikania micrantha* Kunth (Cock 1982), and *Neurolaena lobata* (L.) Cass. (MJWC unpublished). This material was identified by the late John D. Bradley (CABI) and confirmed by MJWC by comparison with the type (NHMUK, ♂ Mexico) and NHMUK series. Provisionally, we assume that Mark Hulme's photograph of a *Saphenista* sp. at light at Bloody Bay (Fig. 81) is also this species, but specimens are needed for confirmation, and given the type locality is Mexico, further research based on genitalia and DNA barcodes would be needed to confirm this identification for Trinidad and Tobago.

Fig. 81. *Saphenista multistrigata*, Bloody Bay, at light, 23 December 2022, M. Hulme (iNaturalist observation 145114909); F 3 mm; ©, under CC-BY-NC.

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REFERENCES

Barbut, J. 2009. Description de trois nouvelles espèces du genre *Epidromia* Guenée, 1852 (Lepidoptera, Noctuidae, Catocalinae). *Bulletin de la Société entomologique de France*, 114(2): 163-166.

Becker, V.O. 1995. 73. Megalopygidae. p. 118-122. In: **Heppner, J.B.,** ed. Checklist: Part 2 Hyblaeoidea – Pyraloidea – Tortricoidea. Atlas of Neotropical Lepidoptera. Gainesville, Florida: Scientific Publishers.

Becker, V.O. 2001. The identity of *Hemeroblemma lienaris* Hübner and a review of the Neotropical moths of the *pannosa*-complex of *Epidromia* Guenée. *Revista Brasiliera de Zoologia*, 18: 961-964.

Becker, V.O. 2002. The Noctuoidea (Lepidoptera) from Cuba described by Herrich-Schäffer and Gundlach in the Gundlach Collection, Havana. *Revista Brasiliera de Zoologia*, 19(2): 349-391.

Becker, V.O. 2022. A review of the Neotropical moths of the genus *Trosia* Hübner and allies (Megalopygidae: Trosiinae). *Tropical Lepidoptera Research*, 32(Supplement 2): 1-23.

Becker, V.O. and **Miller, S.E.** 2002. The large moths of Guana Island, British Virgin Islands: a survey of efficient colonizers (Sphingidae, Notodontidae, Noctuidae, Arctiidae, Geometridae, Hyblaeidae, Cossidae). *Journal of the Lepidopterists' Society*, 56, 9-44: 191-192.

Bennett, F.D. 1969. Tachinid flies as biological control agents for sugar cane moth borers. p. 117-148. In: **Williams, J.R., Metcalfe, J.R., Mungomery, R.W.** and **Mathes, R.,** eds. Pests of Sugar Cane. Amsterdam: Elsevier.

Bennett. F.D. and **Simmonds, F.J.** 1966. Alternative laboratory hosts for tachinid parasites of *Diatraea*. Proceedings of the 1966 meeting of British West Indies Sugar Technologists, Georgetown, Guyana, 17th-21st October, 1966. British West Indies Sugar Association (Incorporated)., Bridgetown, Barbados, Vol.1, pp. 311-313.

Cock, M.J.W. 1982. Potential biological control agents for *Mikania micrantha* HBK from the Neotropical Region. *Tropical Pest Management*, 28: 242-254.

Cock, M.J.W. 2003. On the number of species of moths (Lepidoptera) in Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2003: 49-58.

Cock, M.J.W. (Ed) [Contributors: **Bennett, F.D., Cock, M.J.W., Hughes, I.W., Simmonds, F.J.** and **Yaseen, M.**] 1985. A review of biological control of pests in the Commonwealth Caribbean and Bermuda up to 1982. Technical Communication No. 9, Commonwealth Institute of Biological Control. Farnham Royal, UK: Commonwealth Agricultural Bureaux, 218 p.

Cock, M.J.W. 2005. There are two species of zebra butterfly (*Colobura* spp. Nymphalidae) in Trinidad, but only one has striped caterpillars. *The Field Naturalist, Quarterly Bulletin of the Trinidad and Tobago Field Naturalists' Club*, 2005(1): 14-15.

Cock, M.J.W. 2014. An updated and annotated checklist of the larger butterflies (Papilionoidea) of Trinidad, West Indies: Papilionidae, Pieridae and Nymphalidae. *Insecta Mundi*, 0353: 1-41.

Cock, M.J.W. 2017a. The butterflies (Papilionoidea) of Tobago, West Indies: An updated and annotated checklist. *Insecta Mundi*, 0539: 1-38.

Cock, M.J.W. 2017b. A preliminary catalogue of the moths (Lepidoptera except Papilionoidea) of Tobago, West Indies. *Insecta Mundi*, 0585: 1-58.

Cock, M.J.W. 2017c. Moths (Lepidoptera) from the Five Islands, Trinidad and Tobago, including new country records. *Living World, Journal of the Trinidad & Tobago Field Naturalists' Club*, 2017: 21-25.

Cock, M.J.W. 2018. Hawk-moths (Sphingidae) of Trinidad, West Indies: an illustrated and annotated catalogue. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2018: 10-81.

Cock, M.J.W. 2021a. The prominent moths (Lepidoptera, Notodontidae) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2021: 1-102, Appendix 1-50.

Cock, M.J.W. 2021b. New records of butterflies and moths (Lepidoptera) from Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2021: 103-109.

Cock, M.J.W. and **Kelly, M.** 2020. Forty-five new records of moths (Lepidoptera) from Tobago, West Indies, increase the total species known to 400. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2020: 48-63.

Cock, M.J.W. and **Laguerre, M.** 2022. Taxonomic changes in the Neotropical wasp moths, Euchromiina and Ctenuchina (Lepidoptera, Erebidae, Arctiinae, Arctiini) relating to the fauna of Trinidad & Tobago, with descriptions of new species. *Zootaxa*, 5222(2): 101-132.

Cock, M.J.W. and **Laguerre, M.** 2023 Euchromiina wasp moths (Lepidoptera, Erebidae, Arctiinae, Arctiini) of Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2023: 1-83, Appendix 58 p.

Cock, M.J.W., Kelly, M., Deacon, A. and **Gibson, M.** 2022. New records and identifications of butterflies and moths (Lepidoptera) from Tobago, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2022: 12-29.

Cruttwell, R.E. 1974. Insects and mites attacking *Eupatorium odoratum* in the neotropics. 4. An annotated list of the insects and mites recorded from *Eupatorium odoratum* L., with a key to the types of damage found in Trinidad. *Technical Bulletin of the Commonwealth Institute of Biological Control*, 17: 98-125.

Deo, R.N., Ali, H. and Cock, M.J.W. 2020. Night walks generate unexpected new observations of moths (Lepidoptera) from Trinidad, West Indies. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2020: 72-79.

Dickel, T.S. 1991. New records of noctuid moths from Florida (Lepidoptera: Noctuidae). *Tropical Lepidoptera*, 2(1): 53-58.

Donald, R.G. 1945. The insects of "black sage" (*Cordia*

macrostachya) in Trinidad. Associateship of the Imperial College of Tropical Agriculture thesis, Imperial College of Tropical Agriculture, St. Augustine, Trinidad. 45 p., 3 pl.

Druce, H. 1881-1900. Insecta. Lepidoptera-Heterocera. Biologia Centrali-Americana. London: The Editors. Vol. I. (Text.) xxxii, 490 p.; Vol II. (Text), 622 p.; Vol III (Plates), 101 pl.

Dyar, H.G. 1921. New forms of American moths (Lepidoptera). *Insecutor Inscitiae Menstruus*, 9-10: 59-68.

Franclemont, J.G. 1949. A new moth on coconut from Cuba, with descriptions of new genera for related species (Lepidoptera, Phalaenidae). *Proceedings of the Entomological Society of Washington*, 51(6): 279-285.

Guenée, A. 1852. Noctuélites. Tome III. In Boisduval, [J.A.] & Guenée, [A.] Histoire naturelle des Insectes; Spécies général des Lépidoptères. Tome Septième. Paris: Roret. 514 p.

Hampson, G.F. 1909. Catalogue of the Lepidoptera Phalaenae in the British Museum. Vol VIII. Catalogue of the Noctuidae in the collection of the British Museum. London: Trustees of the British Museum. xiv, 583 p.

Hampson, G.H. 1913. Catalogue of the Noctuidae in the collection of the British Museum. London: British Museum (Natural History). 626 p.

Hampson, G.F. 1920. On new genera and species of Lepidoptera Phalaenae, with the characters of two new families. *Novitates Zoologicae*, 26(2): 253-282.

Hampson, G.H. 1926. Descriptions of new genera and species of Lepidoptera Phalaenae of the subfamily Noctuinae (Noctuidae) in the British Museum (Natural History). Volume XII. London: British Museum (Natural History). 641 p.

Hebert, P.D.N., Cywinska, A., Ball, S.L. and **deWaard, J.R.** 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society (London), Series B Biological Sciences*, 270: 313-321.

Hobbs, J.R., Teetes, G.L., Johnson, J.W. and **Wuensche, A.L.** 1979. Management tactics for the sorghum webworm in sorghum. *Journal of Economic Entomology*, 72(3): 362-366.

Hodges, R.W., Dominick, T., Davis, D.R., Ferguson, D.C., Franclemont, J.G., Munroe, E.G. and **Powell, J.A.** 1983. Check List of the Lepidoptera of America North of Mexico. London: E.W. Classey Ltd and The Wedge Entomological Research Foundation. xxiv, 284 p.

Hopp, W. 1934-1935. 16. Family: Megalopygidae. p. 1071-1101, pl. 160-164. In: Seitz, A., ed. 1913-1939. II. Division: The Macrolepidoptera of the American Region. 6. Volume The American Bombyces and Sphinges. Stuttgart: Alfred Kernan.

Hübner, J. 1816-[1826]. Anzeiger der im Verzeichnisse bekannter Schmetterlinge Angenommenen benennungen ihrer Horden, Rotten, Stämme, Familien, Vereine und Gattungen. J. Hübner, Augsburg, Germany, (1) 1-16 (1816); (2-8) 17-128 (1819); 72 pp. ([1826]).

Kaye, W.J. 1901. A preliminary catalogue of the Lepidoptera Heterocera of Trinidad. *Transactions of the Entomological Society of London*, 1901(2): 115-158, 2 pl.

Kaye, W.J. and **Lamont, N.** 1927. A catalogue of the Trinidad Lepidoptera Heterocera (moths). *Memoirs of the Department of Agriculture, Trinidad and Tobago*, 3: 144 p.

Krüger, M. and **Scoble, M.J.** 1992. Neotropical red-brown Ennominae in the genera Thysanopyga Herrich-Schäffer and Perissopteryx Warren (Lepidoptera: Geometridae). *Bulletin of The Natural History Museum, Entomology Series*, 61(2): 77-148.

Lafontaine, J.D. and **Dickel, T.S.** 2008. Review of the genus *Epidromia* in North America (Lepidoptera: Noctuidae: Catocalinae). *Lepidoptera Novae*, 1(3-4): 109-115.

Lamont, N. and **Callan, E.McC.** 1950. Moths new to Trinidad, B.W.I. *Zoologica*, 35: 197-207.

Landry, B., Bilat, J., Hayden, J., Solis, M.A., Lees, D.C., Alvarez, N., Léger, T. and **Gauthier, J.** 2023. The identity of *Argyria lacteella* (Fabricius, 1794) (Lepidoptera, Pyraloidea, Crambinae), synonyms, and related species using morphology and DNA capture in type specimens. *Zookeys*, 1146: 1-42.

Laurence, G.A. 1974. Insect pests of Trinidad forest trees. *Journal of the Agricultural Society of Trinidad and Tobago*, 74(2): 160-172.

Longstaff, G.B. 1912. Butterfly-hunting in many lands. Notes of a field naturalist. London: Longmans, Green & Co. 728 p.

Nakahara, L.M., Burkhart, R.M. and **Funasaki, G.Y.** 1992. Review and status of biological control of Clidemia in Hawai'i. p. 452-465. In: **Stone, C.P., Smith, C.W.** and **Tunison, J.T.,** eds. Alien plant invasions in native ecosystems of Hawaii: Management and research. Cooperative National Park Resource Study Unit. Honolulu: University of Hawai'i Press.

Pitkin, L.M. 1996. Neotropical emerald moths: a review of the genera (Lepidoptera: Geometridae, Geometrinae). *Zoological Journal of the Linnean Society*, 118: 309-440.

Pogue, M.G. 2002. A world revision of the genus *Spodoptera* Guenée (Lepidoptera: Noctuidae). *Memoirs of the American Entomological Society*, 43: 202 p.

Pogue, M.G. 2012. The Aventiinae, Boletobiinae, Eublemminae, Pangraptinae, Phytometrinae, and Scolecocampinae (Lepidoptera: Noctuoidea: Erebidae) of Great Smoky Mountains National Park, U.S.A. *Zootaxa*, 3153: 1-31.

Poole, R. W. 1989. Noctuidae. Lepidopterorum Catalogus. (New Series, edited by J.B. Heppner, Fasc. 118, 3 vols). Leiden, Netherlands: E.J. Brill. 1314 p.

Prout, L.B. 1932-1938. 3. Subfamily: Sterrhinae. p. 72-144, pl. 9-17. In: **Seitz, A.,** ed. 1931-1938. The Macrolepidoptera

of the World. A systematic description of the hitherto known Macrolepidoptera in collaboration with well-known specialists. Vol. 8 The American Geometridae [incomplete]. Stuttgart: Alfred Kernen.

Ragonot, E.-L. 1887. Diagnoses d'espèces nouvelles de Phycitidae d'Europe et des pays limitrophes. *Annales de la Société entomologique de France*, 6e series, 7(3): 225-260, pl. 10. [plate not seen]

Ratnasingham, S. and **Hebert, P.D.N.** 2013 A DNA-based registry for all animal species: the Barcode Index Number (BIN) System. *PLoS ONE* 8(8): e66213. doi:10.1371/journal.pone.0066213

Reinhard, H.J. 1937. Sorghum webworm studies in Texas. *Journal of Economic Entomology*, 30: 869-872.

Schaus, W. 1901. New species of Noctuidae from Tropical America. [Part.] *Annals and Magazine of Natural History*, Seventh Series, 8(44): 77-99.

Schreiber, H. 1978. Dispersal centres of Sphingidae (Lepidoptera). Biogeographica, Volume 10. The Hague, Dr W. Junk Publishers, 195 pp.

Scoble, M.J. 1994. A taxonomic revision of the genera *Phrygionis* Hübner and *Pityeja* Walker (Geometridae: Ennominae, Palyadini). *Zoological Journal of the Linnean Society*, 111: 99-160.

Scoble, M.J. 1999. Geometrid moths of the world a catalogue (Lepidoptera, Geometridae). Collingwood, Australia: CSIRO Publishing, and Stenstrup, Denmark: Apollo Books. xxv + 1016 p., index 129 p.

Silvain, J.-F. and **Lalanne-Cassou, B.** 1997. Distinction entre *Spodoptera latifascia* (Walker) et *Spodoptera cosmioides* (Walker), bona species (Lepidoptera, Noctuidae). *Revue Française d'Entomologie* (Nouvelle série), 19: 95-97.

Starr, C.K. 2009. Trinidad and Tobago. p. 926-929. In: **Gillespie, R.** and **Clague, D.**, eds. The Encyclopedia of Islands. Berkeley, California: University of California Press.

Todd, E.L. 1959. The fruit-piercing moths of the genus Gonodonta Hübner (Lepidoptera, Noctuidae). *Technical Bulletin, United States Department of Agriculture*, 1201: 52 p, 12 plates.

Warren, W. 1900. New genera and species of American Drepanulidae, Thyrididae, Epiplemidae and Geometridae. *Novitates Zoologicae*, 7(2): 117-225.

Warren, W. 1906. Descriptions of new genera and species of South American geometrid moths. *Proceedings of the United States National Museum*, 30(1456): 399-557.

Willmott, K.R., Constantino, L.M. and **Hall, J.P.W.** 2001. A review of *Colobura* (Lepidoptera: Nymphalidae) with comments on larval and adult ecology and description of a sibling species. *Annals of the Entomological Society of America*, 94: 185-196.

Utilization of two DNA barcoding techniques, alongside morphological characters, confirms the presence of zoantharian morphotypes (Cnidaria: Hexacorallia: Zoantharia) along the coast of Toco, Trinidad

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ABSTRACT

Many marine invertebrates on coral reefs have cryptic morphological features making them challenging to accurately identify. One such group are the zoantharians, benthic anemone-like organisms found globally and throughout coral reefs in the Caribbean Sea. In past studies, zoantharians surveyed on reefs at Toco, Trinidad, have been visually identified as belonging to genus *Palythoa* and *Zoanthus* spp. This study explored the use of morphology and two DNA barcoding approaches to further classify Toco's zoantharians. Morphological polyp characteristics, including oral disk diameter, tentacle counts, colours, and coenenchyma development were recorded *in situ*. Additionally, mitochondrial 16S ribosomal DNA (mt 16S rDNA) and the mitochondrial cytochrome oxidase subunit I (mt COI) genes of these same zoantharians were amplified using polymerase chain reaction (PCR), then sequenced. Results from mt 16S rDNA and mt COI gene sequences identified four zoantharians: *Z. pulchellus*, *Z. sociatus*, *P. grandiflora*, and for the first time *Z.* aff. *pulchellus*. All new sequences were deposited online at the National Center for Biotechnology Information (NCBI), and GenBank accession numbers were assigned to specimens. Oral disk diameters were smaller (4-10 mm) for *Z. sociatus* than *Z. pulchellus* (4-12 mm), with tentacle counts also following a similar pattern. Oral disk and tentacle colours were variable from blue, green, brown, pink, and orange. Oral disk diameter and tentacle count for *P. grandiflora* were larger and numerous than observed in *P. caribaeorum.* Additionally, coenenchyme growth form easily distinguished these two species. The comparison between morphological features, including oral disk diameter, tentacle count, and coenenchyme development, together with molecular identification using the barcoding technique, characterised zoantharian diversity more accurately than past studies at these sites, and underlines the urgent need for continued work on marine invertebrate species identification in this region.

Key words: barcoding, coral reefs, Palythoa, Zoantharia, Zoantharian, Zoanthus.

INTRODUCTION

Zoantharians (Anthozoa: Hexacorallia: Zoantharia) are found in most marine environments globally, ranging from temperate to tropical areas, and distributed from intertidal zones to the deep sea (Ryland & Lancaster 2003). Zooxanthellate zoantharian species are common colonial cnidarians found in most intertidal tropical and sub-tropical rocky shores, forming dense mats, and sometimes covering rocky substrates throughout the benthic zones of coral reefs (Karlson 1980; Bastidas & Bone 1996; Belford & Phillip 2011; 2012; Belford 2021). These colonial anthozoans are ecologically important as they provide benthic shelter to a variety of invertebrates, such as crustaceans, molluscs, polychaetes, and nudibranchs on reefs (Pérez *et al*. 2005).

Zoantharians frequently cover extensive areas on coral reefs and rocky shorelines (Bastidas and Bone 1996). For instance, López *et al*. (2018) reported a "zoanthid zone" located at Cabo Verde, central eastern Atlantic. In the Caribbean, past research recorded extensive coverage of zoantharians, such as *Palythoa* and *Zoanthus* spp. on coral reefs in Jamaica, Trinidad, Curaçao, and further south in Brazil (Karlson 1981; Belford & Phillip 2011; 2012; Rabelo *et al*. 2015; Reimer *et al*. 2018; Belford 2021). While zoantharians have a wide distribution across the Atlantic and Indo-Pacific regions, they display high intraspecific variation in morphology, thus making them difficult to identify to species level *in situ* (Burnett *et al*. 1997). However, molecular analyses using biomarkers are increasingly being used to clarify taxonomic issues with zoantharians (Reimer *et al.* 2004; Reimer *et al*. 2012; Jaramillo *et al*. 2018

The northeastern coast of Trinidad from the Toco Fishing Depot at Grande L'Anse (10°50.107′N, 60°56.772′W) to the Toco Lighthouse (10°29.37′N, 61°04.14′W) has a rich marine biodiversity. Belford *et al*. (2019) recorded approximately 257 marine species belonging to 134 families, 23 classes, and 11 phyla. Forty-three species of Cnidaria belonging to 9 families were identified in these surveys: Milleporidae, Stomolophidae, Actiniidae, Stichodactylidae, Mussidae, Poritidae, Siderastreidae, Sphenopidae, and Zoanthidae (Belford & Phillip 2011; Belford *et al*. 2019; Belford 2020). They are common, found in variable abundance, and occupy intertidal benthic marine communities along the northeastern coast of Toco, Trinidad. A few of these species

are challenging to identify visually and may benefit from the application of molecular techniques.

From visual observations, Toco's zoantharians were initially identified as belonging to two genera: *Palythoa* and *Zoanthus* spp. However, molecular analyses are required to identify some zoantharians to species level. Belford and Phillip (2011; 2012) further visually recorded two species: *Palythoa caribaeorum* (Duchassaing and Michelotti, 1860) and *Zoanthus sociatus* (Ellis, 1768), during surveys for reefs at Toco, but until recently no information was available for the presence or abundance of other zoantharian species, such as *Palythoa grandiflora* (Verrill, 1900), or *Zoanthus pulchellus* (Duchassaing and Michelotti, 1860), which are challenging to identify yet might be expected to be present.

DNA barcoding has been highly publicized as a method for species identification in biodiversity studies. This technique uses standardized molecular markers that offer a way to use genetic information where morphological analysis is insufficient (Herbert *et al*. 2003; Ngwakum *et al*. 2021). The use of molecular markers has only recently begun to be applied to zoantharians in Trinidad (Belford 2021). Although mitochondrial cytochrome oxidase subunit I (mt COI) gene sequences can be used to identify species, it is impossible to use the COI gene marker alone to identify anthozoans (Shearer & Coffroth 2008). However, when combined with the large mitochondrial ribosomal subunit (16S rDNA) gene marker, different zoantharians may be identifiable (Sinniger *et al*. 2008).

Although initial mt COI data from Belford (2021) successfully identified *Zoanthus pulchellus* and *Zoanthus sociatus*, more specimens with variable morphological characteristics have since been observed *in situ*. This suggests the need to continue using both morphological characteristics and molecular markers for zoantharian identification in understudied regions (Koupaei *et al*. 2018; Reimer *et al*. 2018) including the southern-most region of the Caribbean Sea and NE Trinidad.

The aim of this study is to accurately identify zoantharians in the reefs of NE Trindad using two different molecular approaches, and to match these identifications with morphological data from photographs *in situ*, with the goal of expanding our understanding of local zoantharian diversity.

METHODS

Sample collection and analysis

Polyps were collected from a total of 30 zoantharian colonies at sites along the north-eastern coast of Trinidad: from the Toco Fishing Depot at Grande L'Anse (10°50.107′N, 60°56.772′W) to the Toco Lighthouse (10°29.37′N, 61°04.14′W) from January 2022 to February 2023.

The specific sites sampled were Grande L'Anse (GA) (19 colonies), and Salybia Bay (SB) (2 colonies), Pequelle Bay (ESB) (4 colonies), and the western end of Salybia Bay (WSB) (5 colonies) (see Fig. 1) during extreme low tide (dry tide: < 0.3 metres).

Oral disk diameter (mm), tentacle count, oral disk colour, tentacle colour and coencenchyme development (yes/no) were recorded for each colony. A total of 3-5 polyps per colony were excised using a hand-held scapula for genetic analyses: mitochondrial cytochrome oxidase subunit I (mt COI) and mitochondrial large ribosomal subunit (mt 16S) (3 polyps). Specimens were placed in 1.5 ml vials containing 95% ethanol, then stored in a freezer at -20°C. Hand-held calipers measured oral disk diameter. Polyps were photographed using a digital camera (Nikon Coolpix S5200) with underwater housing, then later re-examined for comparison with the results from molecular analyses.

DNA extraction, PCR amplification and Sequencing

For molecular analyses, DNA was extracted from 1-2 polyps using an E.Z.N.A. tissue extraction kit (Omega-BioTek Model no. D 3396-01 Norcross, GA, USA) following the manufacturer's protocol. The mitochondrial (mt) 16S rDNA was amplified using primers:16Sant 1a 5′-GCC ATG AGT ATA GAC GCA CA 3′, 16Sbm0H 5′-CGA ACA GCC AAC CCT TGG 3′ (see Sinniger *et al*. 2005) and the cytochrome oxidase subunit I (COI) primers: LCOant 5′-TTT TCY ACT AAT CAT AAA GAT AT 3′, COIantr 5′-GCC CAC ACA ATA AAG CCC AAT AYY CCA AT 3′ (Folmer *et al*. 1994). Polymerase chain reaction (PCR) amplifications for 16S rDNA were performed under the following thermal cycler (T-100, Bio-Rad) conditions: 2 min at 94°C; 30 sec at 94°C, 1 min at 52C, 90 sec at 72°C (35 cycles); followed by a final extension for 7 min at 72°C (Koupaei *et al*. 2018). Thermal cycler protocol for COI was 3 min at 94°C; 30 sec at 94°C, 1 min at 52°C, 2 min at 72C (40 cycles); followed by a final extension for 5 min at 72C. PCR were performed in volumes of 10 µl containing 5.0 µl DreamTaq master mix (includes DNA polymerase, dNTPs, KCl, $MgCl_2$, Thermo Scientific), 2.0 µl nuclease-free water (Thermo Scientific), 1.0 µl of each primer (Invitrogen), and 1.0 µl DNA template. A total of 3.0 µl PCR aliquot was mixed with 1.0 µl loading dye (Bio-Rad), and the quality of amplicons were analyzed by gel electrophoresis in 1.0% agarose gel. Run time for gel electrophoresis was 30 mins. at 100 Volts. Visual bands were checked using a gel imaging system (Azure c200, Azure Biosystems), and only bright bands were enzymatically purified with ExoSap-IT (ThermoFisher Scientific, Santa Clara, CA, USA) using 1.0 µl Exosap-IT per 2.5 µl PCR aliquot, then sent for sequencing at Eurofins Genomics (Kentucky, USA). Samples were sequenced in both directions using Sanger sequencing technology on an ABI 3730 analyzer.

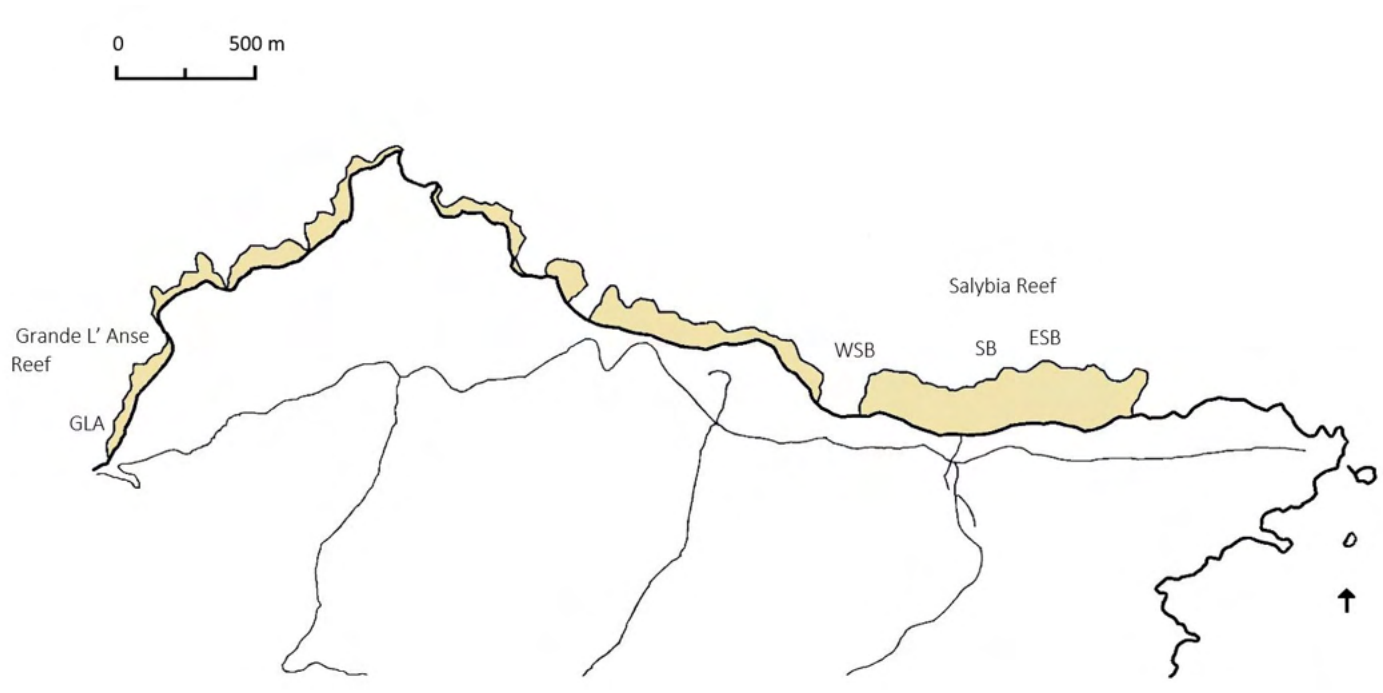

Fig. 1. Location of sample sites at reefs along the north eastern coast of Toco, Trinidad. Key: Salybia Bay (SB), Pequelle Bay (ESB), western Salybia Bay (WSB), and Grande L'Anse (GLA). Map adapted from Belford *et al*. 2019.

Chromatograms were inspected by eye for the presence of multiple "messy" peaks indicative of poor sequence quality using Molecular Evolutionary Genetics Analysis (MEGA X, version 7.0) (Kumar *et al*. 2018). Primer sequences were removed from each end of sample sequences. Basic Local Alignment Search Tool (BLAST) compared sequences with parameters: query cover 99-100%, E value ≤ 0.01, identity ≥ 98%. Both forward and reverse sequences were separately aligned in MEGA X software using ClustalW for phylogenetic analysis. Sequences for mt 16S and COI genes used in this study were blasted against NCBI Genbank collections for comparison and identification, then deposited in GenBank with associated accession numbers allocated to each specimen (Table 1).

RESULTS

PCR and phylogenetic analyses.

DNA was successfully amplified for all 36 samples at both loci. Sequences were obtained for 36 mt COI and 34 mt 16S PCR amplicons. Analyses of carefully inspected high quality amplicons confirmed mt COI (774-800 bp) and mt 16S (722-925 bp) gene sequence lengths, with no chromatograms showing multiple peaks, or unclear sequences. The Basic Local Alignment Search Tool (BLAST) was used to compare sequences from this study to sequences from known species with identities accepted >98%. Results from blasting these sequences identified three *Zoanthus* spp: *Zoanthus pulchellus*, *Zoanthus sociatus* and *Zoanthus* aff. *pulchellus* (Table 1). Maximum likelihood tree for mt COI sequences separated *Z. sociatus* and *Z. pulchellus* (Fig. 2) into two genus level clades for family Zoanthidae. *Z. pulchellus* was moderately supported by phylogenetic analyses (ML: MP >64%), whereas *Z. sociatus* was well supported (ML: MP >98%).

Sequences matched >98% with samples of *Z. sociatus* from Florida (Accession number: JX119154, see Reimer *et al*. 2012), with past studies from specimens at similar sites (SB and WSB), from different sites such as Straight Bay and Toco Lighthouse (see Belford 2021) (Accession numbers: MZ150807, MZ180806, MZ147096, MZ147095), and for *Z. pulchellus* (Accession numbers: MZ150805, MZ147093, MZ147094, OL310195). For mt COI, *Z. pulchellus* (n = 16) and *Z. sociatus* (n = 13) differed by 7 bp using sequences of 793 bp lengths, while *Z.* aff. *pulchellus* (n = 5) differed by 1 bp from *Z. pulchellus*. For mt COI, only *Palythoa grandiflora* (n = 2) was matched with a specimen from Florida (Accession number: JX119165, see Reimer *et al*. 2012). *Palythoa caribaeorum* was only identified using morphological characteristics, and molecular analyses proved to be unsuccessful with the primers used in this study.

For the 34 mt 16S gene marker, 16 sequences identified as *Z. pulchellus*, 13 as *Z. sociatus*, 5 as *Z.* aff. *pulchellus*, and 2 specimens as *P. grandiflora* (Table 1). Blasting results showed four clades well supported by phylogenetic analysis (ML >78%; MP >85%). As shown in Fig. 3, *Z.* aff. *pulchellus* is also well supported (ML:MP 100%).

Table 1. Sample sites (WSB-Western Salybia Bay, ESB- Eastern Salybia Bay, GLA- Grande L'Anse), morphological characteristics (oral disk and tentacle colours), assigned GenBank accession numbers, and molecular identification of each specimen.

Specimen	Oral Disk/Tentacle Colour	COI accession No.	mt 16SrDNA accession No.	Molecular ID
Z44-brgr-WSB	bright green/green	OM982833	OR346866	*Zoanthus pulchellus*
Z50-blu-WSB	blue-green/green	OM982834	OR346867	*Zoanthus sociatus*
Z51-blu-WSB	blue-green/green	OM982835	OR346868	*Zoanthus sociatus*
Z53-gr-WSB	green/green	OM982836	OR346869	*Zoanthus pulchellus*
Z58-blu-WSB	blue-green/green	OM982837	OR351948	*Zoanthus sociatus*
Z61-brgr-ESB	bright green/green	OR346698	OP538560	*Zoanthus pulchellus*
Z65-gr-ESB	green/green	OQ349512	OP538562	*Zoanthus pulchellus*
Z77-gr-SB	bright blue/green	OR346699	OP538557	*Zoanthus* aff. *pulchellus*
Z78-blu-SB	bright blue/green	OR346700	OP538561	*Zoanthus sociatus*
Z84-blgr-GLA	blue-green/green	ON773133	OR351949	*Zoanthus sociatus*
Z85-gr-GLA	green/green	ON773134	ON841655	*Zoanthus* aff. *pulchellus*
Z88-gr-GLA	green/green	OR346702	OP538559	*Zoanthus* aff. *pulchellus*
Z88-br-GLA	brown/brown	OR346701	OP538558	*Zoanthus pulchellus*
Z89-bro-GLA	brown/brown	ON773135	OQ629087	*Zoanthus pulchellus*
Z91-brgr-GLA	bright green/green	ON773136	ON841654	*Zoanthus pulchellus*
Z95-org-GLA	orange/orange	ON773137	OR34670	*Zoanthus pulchellus*
Z96-gr-GLA	green/green	ON773138	ON841656	*Zoanthus sociatus*
Z97-org-GLA	brown/orange	ON773139	OQ629088	*Zoanthus pulchellus*
Z98-gr-GLA	apple-green/green	OR364699	OP538563	*Zoanthus sociatus*
Z100-brgr-GLA	bright green/green	ON773140	OR351950	*Zoanthus pulchellus*
Z102-pink-GLA	pink/green	OR346703	OP484712	*Zoanthus sociatus*
Z105-br-GLA	brown/brown	OP471619	OP484713	*Zoanthus pulchellus*
Z108-brgr-GLA	bright green/green	OP471620	OP484714	*Zoanthus pulchellus*
Z109-brgr-GLA	bright green/green	OP471621	OP484715	*Zoanthus pulchellus*
Z114-blu-GLA	blue-green/green	OP471622	OP484716	*Zoanthus sociatus*
Z115-blu-GLA	blue-green/green	OP471623	OP484717	*Zoanthus sociatus*
Z117-grbr-GLA	green/brown	OQ349511	OP484718	*Zoanthus pulchellus*
Z128-grst-GLA	blue-green/green	OP471624	OP484719	*Zoanthus sociatus*
Z129-grst-GLA	blue-green/green	OP471625	OP484720	*Zoanthus sociatus*
Z130-br-GLA	brown/brown	OR346704	OQ603386	*Zoanthus pulchellus*
Z131-br-GLA	brown/brown	OR346705	OQ603387	*Zoanthus pulchellus*
Z140-grbr-ESB	green/brown	OQ589713	OQ629089	*Zoanthus* aff. *pulchellus*
Z142-grbr-ESB	green/brown	OQ589715	OQ629090	*Zoanthus* aff. *pulchellus*
Z145-apple-SB	apple-green/green	OQ589715	OR351951	*Zoanthus sociatus*
Pa30-gr-GLA	green/brown	OR364697	OR391931	*Palythoa grandiflora*
Pa39-grbr-SB	green/brown	OR364698	OR391934	*Palythoa grandiflora*

Morphological analysis

Preliminary morphological identifications regarding families Zoanthidae (*Zoanthus* spp.) and Sphenopidae (*Palythoa* spp.) were identified using the field guide by Humann *et al*. (2013). These observations showed the presence of *Zoanthus* spp. at all four sites with wide variation in colour (Fig. 4), specifically in oral disk and tentacle colour (Table 1). *Palythoa* spp. were observed at two sites: GLA and SB.

Zoanthus pulchellus and *Z. sociatus* were partly distinguished by their oral disk and tentacle counts. For instance, *Z. pulchellus* (n = 19) had larger oral disk diameter and higher tentacle counts ranging from 4-12 mm and 40-60 respectively, compared to *Z. sociatus* (n = 14) with oral disks ranging from 4-10 mm and tentacle counts between 40-50 (Table 2). Further, *Z. sociatus'* smaller oral disk diameter with fluorescent green middle surrounded by either blue or green colours separated this species from *Z. pulchellus* (Fig. 4). Both *Z. pulchellus* and *Z. sociatus* had polyps clear and free from a developed coenenchyme, however *Z.* aff. *pulchellus* (n = 4) had polyps embedded in a well-developed coenenchyme, hence separating this morphotype from the others. *Z. pulchellus* had the most variable oral disk colours ranging from green, brown, orange, and grey at all sites. *Palythoa caribaeorum* was identified by its characteristic brown oral disks and tentacles. Oral disk diameter ranged between 8-11 mm with tentacle counts between 26-36, embedded in a well-developed coenenchyma. *P. grandiflora* was identified by its larger oral disk diameter, which ranged between 11-13 mm with green oral disk colour and brown tentacles (40-46). Coenenchyma growth form was absent.

DISCUSSION

This study sought to build on the findings of a previous study to confirm the presence of different species of zoantharian in the genera *Zoanthus* and *Palythoa* spp. along Trinidad's north-east coast using a combination of morphological characters and molecular techniques. While the diversity of these taxonomically challenging genus has been previously explored using morphology and mt COI (Reimer *et al*. 2006b; Belford 2021), with two species detected (*Z. sociatus* and *Z. puchellus*), by combining these approaches with 16S markers for the first time, the additional presence of a third morphotype, *Z.* aff. *pulchellus,* is revealed at three of the four locations surveyed. Additionally, *Palythoa grandiflora* and *P. caribaeorum* identification is confirmed for 2 sites: GLA and SB. Both morphological and molecular analyses played crucial roles in confidently identifying zoantharians down to the species level along the coastline of northeast Trinidad, thus laying the groundwork for future studies on zoantharian biodiversity in this area.

Molecular Techniques

This is the first report on zoantharian molecular identification using the mitochondrial 16S rDNA gene marker in conjunction with mitochondrial cytochrome oxidase subunit (mt COI) gene for this region, which now confirms *Z.* aff. *pulchellus* as an additional zoantharian found along the benthic marine habitat of the north eastern coast of Trinidad. This is important in documenting accurate diversity and distribution of these marine colonial anthozoans, which are widespread and provide vital benthic habitat for other reef species. Together, the mt COI and 16S markers appear to be sufficient to identify zoantharians to the species level (Reimer *et al*. 2006b), hence their combined use is recommended for future genetic analyses of samples in this area. Results from these analyses will be used to conduct future surveys to accurately document zoantharian species abundance and distribution along the northeastern coast of Trinidad. While the mt COI is useful on its own, since the mt 16S gene marker gives more variable sequences, it provides additional information for this problematic taxon (Sinniger *et al*. 2008; Reimer *et al*. 2012).

Morphological Characters

Based on morphological characteristics, five zoantharian morphotypes were successfully separated using oral disk diameter and colour, tentacle count, and the presence or absence of a well-developed coenenchyme.

Although some zoantharians are difficult to accurately identify due to large amounts of phenotypic plasticity (Reimer *et al*. 2004; Ong *et al*. 2013), López *et al*. (2018) used morphological characteristics to separate *Palythoa* and *Zoanthus* spp. in the Atlantic Ocean. In fact, Lopez

Table 2. Summary of zoantharian species morphological characteristics.

Species	Oral disk diameter (mm)	Tentacle count	Locations	Well-developed coenenchyme
Zoanthus sociatus	4-10	40-50	GLA ESB SB WSB	No
Z. pulchellus	4-12	40-60	GLA ESB SB WSB	No
Z. aff. *Pulchellus*	4-12	40-60	GLA ESB SB	Yes
Palythoa caribaeorum	8-11	26-36	GLA SB	Yes
P. grandiflora	11-13	40-46	GLA SB	No

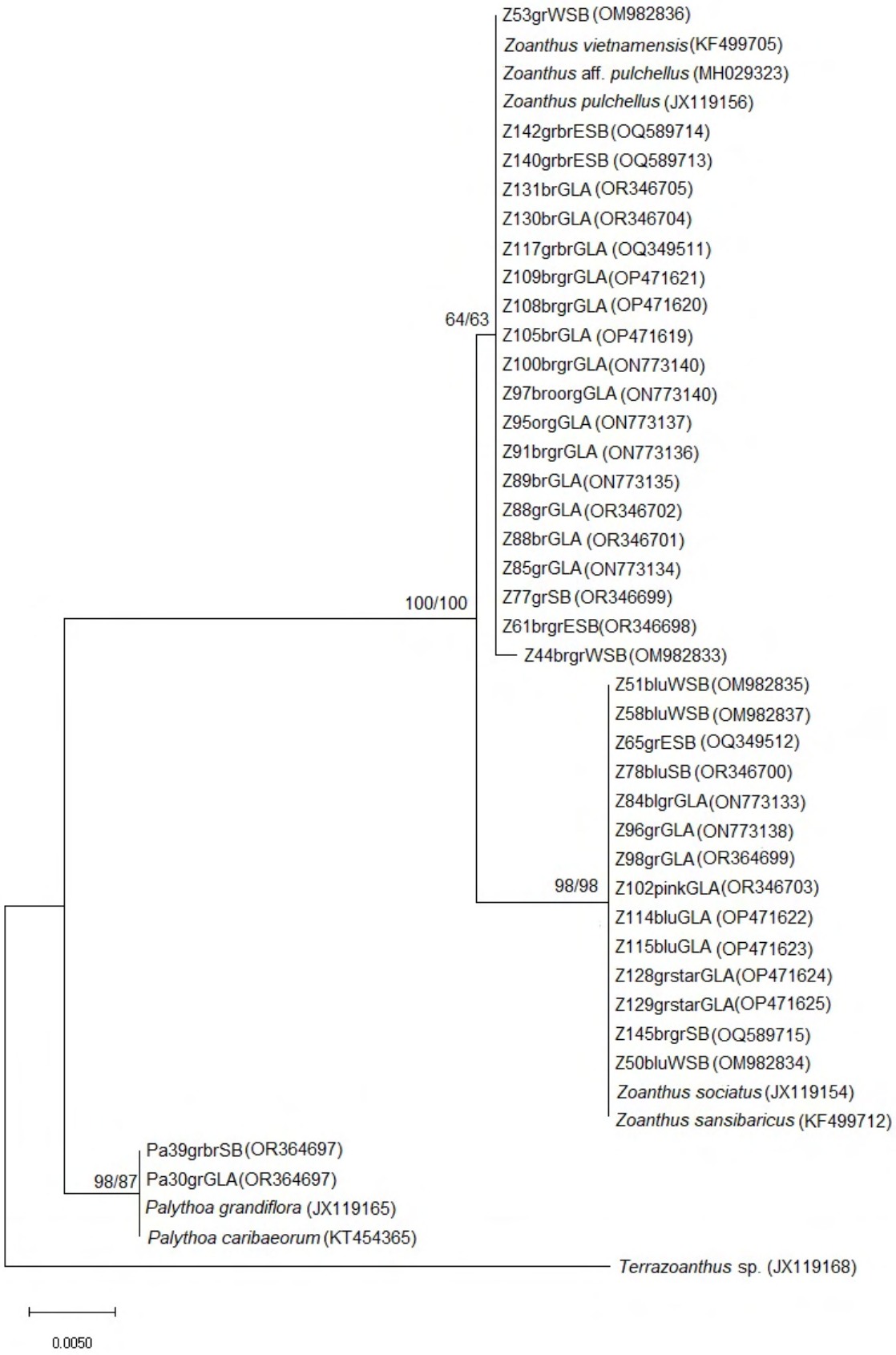

Fig. 2. Maximum-likelihood (ML) tree based on an alignment (793-800 bp long) of mitochondrial cytochrome oxidase subunit I sequences. Numbers above branches represent maximum likelihood and maximum parsimony bootstraps respectively. Specimen identification with GenBank accession numbers (in parentheses) are included. Scale shows substitution per site.

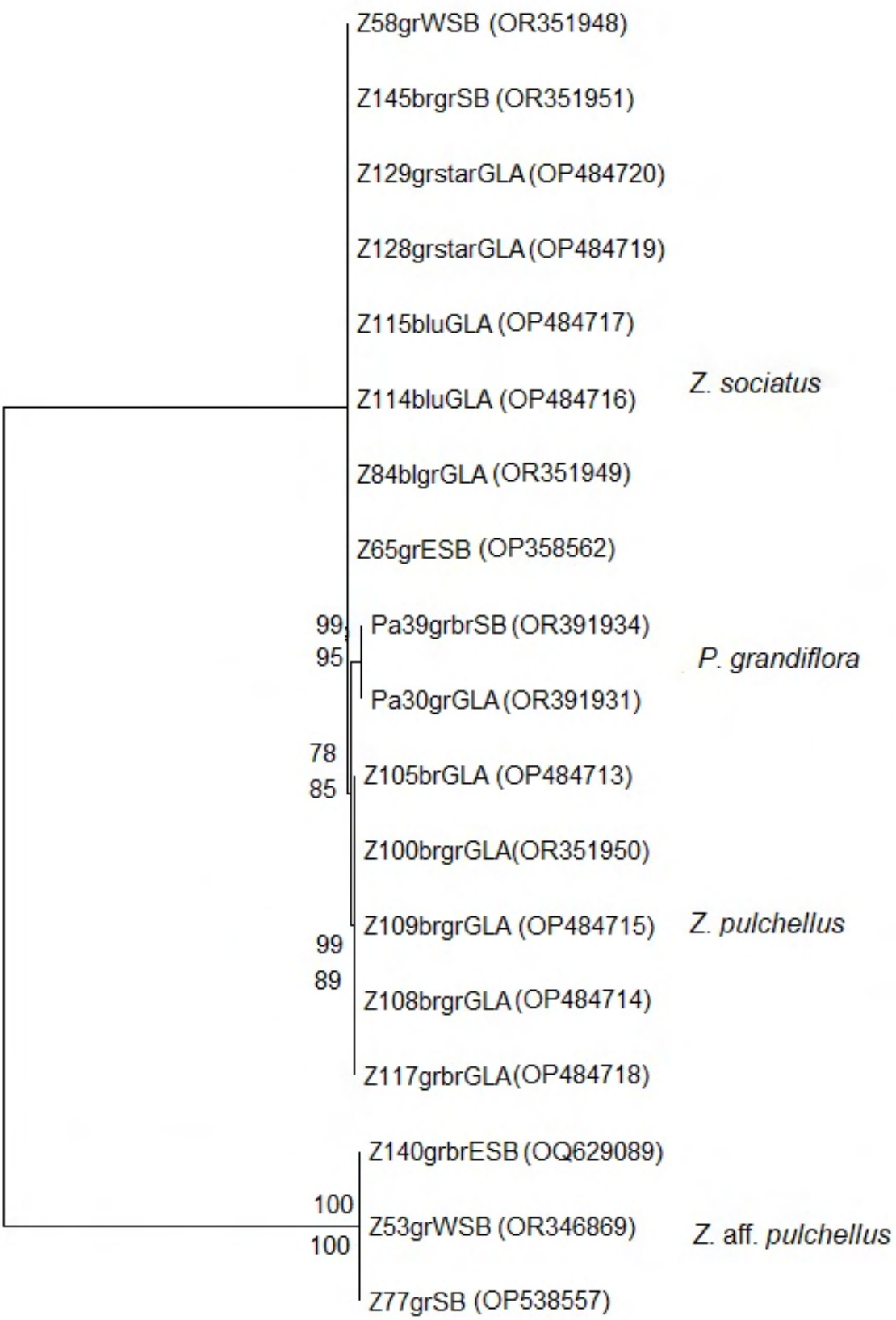

Fig. 3. Maximum-likelihood (ML) tree based on an alignment (884-923 bp long) of mitochondrial 16S rDNA sequences. Values at branches represent maximum likelihood and maximum parsimony bootstrap percentages from 1000 trees respectively. Specimen identification with GenBank accession numbers in parentheses are included.

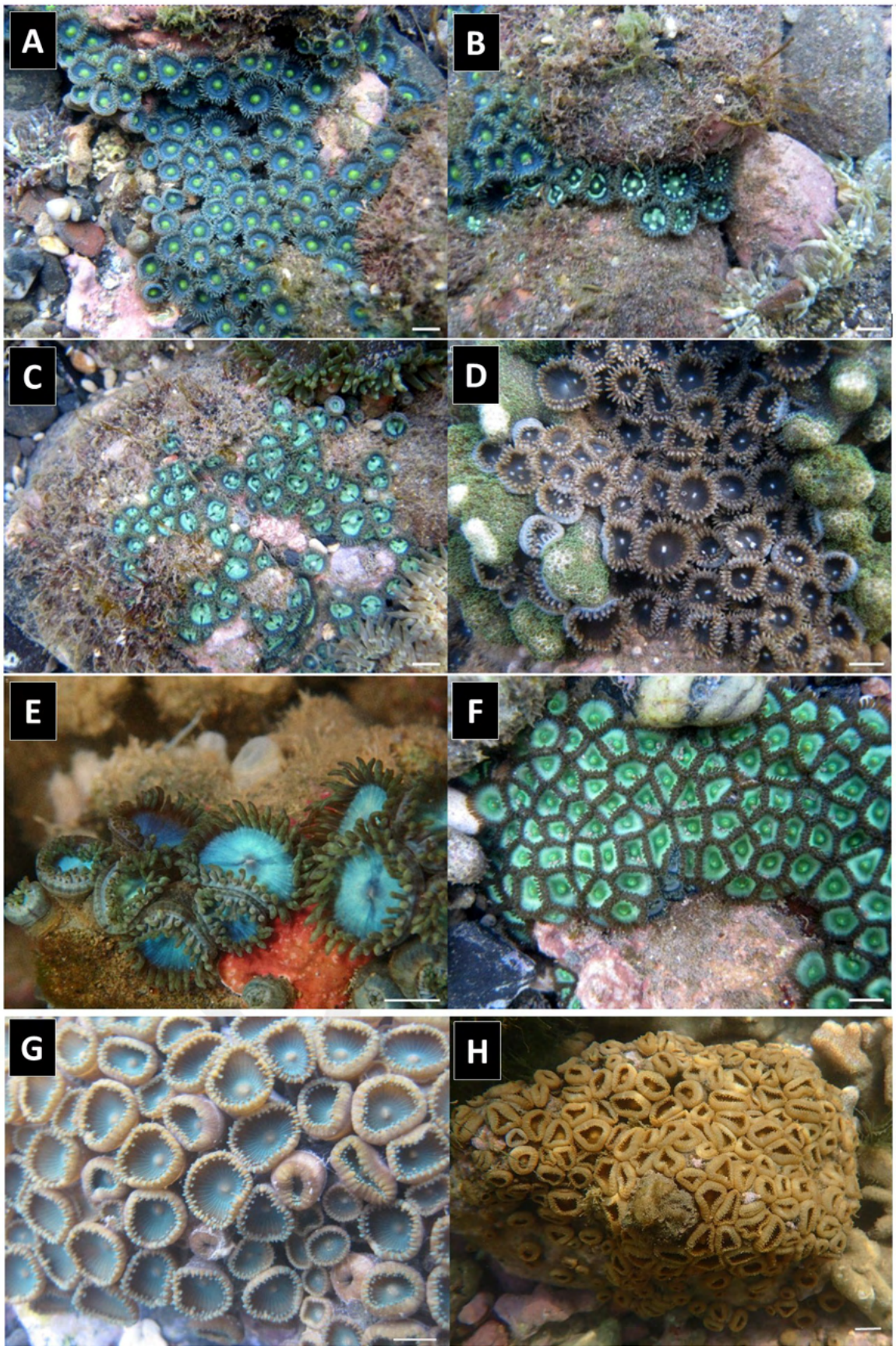

Fig. 4. *In situ* images showing zoantharian biodiversity from marine habitats at Toco, Trinidad showing variation in morphological characteristics. (A) *Zoanthus sociatus* blue colour morph (Z114-blu-GLA); (B) *Zoanthus sociatus* green-star (Z128-gr-star-GLA); (C) *Z.* aff. *pulchellus* bright-green (Z85-gr-GLA); (D) *Z. pulchellus* brown (Z88-br-GLA); (E) *Z. sociatus* blue morph (Z78-blu-SB); (F) *Z.* aff. *pulchellus* green morph (Z140-grbr-GLA); (G) *Palythoa grandiflora*; (H) *P. caribaeorum.* White bar scale = 1 cm.

et al. (2018) identified both *Z. pulchellus*, and *Z. sociatus*, which had polyps free from the coenenchyme, as '*liberae*' (Pax 1910). These were separated morphologically from *Z.* aff. *pulchellus*, which displayed polyps connected to a well-developed coenenchyma (Reimer *et al*. 2010), as observed in this study, and noted as 'immersae' (Pax 1910). In fact, although phylogenetically similar to each other, *Z. pulchellus* and *Z.* aff. *pulchellus* are morphologically well-distinguished, which is also seen with their Indo-Pacific sister species *Z. kuroshio* and *Z. vietnamensis* (Reimer *et al*. 2006a). In this study, two morphotypes were clearly distinguished by polyp size, i.e. oral disk diameter, with *Z. pulchellus* and *Z.* aff. *pulchellus* recording larger oral disk sizes than *Z. sociatus*. Similar polyp sizes for *Z. sociatus* have been reported in other parts of the Caribbean Sea (Reimer *et al*. 2012). Additionally, the larger oral disk of *Z. pulchellus* and *Z.* aff. *pulchellus* displayed a white stripe vertical marking, which can be prominent on polyps. *Z. sociatus* displayed a circular fluorescent green colour surrounded by blue or green outer parts of the disk. Overall, oral disk polyp sizes and tentacle counts for these *Zoanthus* spp. match other studies from the Caribbean and sites in this area (Reimer *et al*. 2012; López *et al*. 2018; Belford 2021).

Two zoantharians from the family Sphenopidae were morphologically identifiable: *Palythoa grandiflora* and *Palythoa caribaeorum*. *P. grandiflora* is easily distinguished from *P. caribaeorum* by a larger oral disk diameter, higher tentacle count, and green morphotype. The main visual differences were a green oral disk and *liberae* growth form in *P. grandiflora*, compared to a brown oral disk and *immersae* growth form in *P. caribaeorum*.

CONCLUSIONS

This study applies new morphological and genetic approaches to invertebrate species identification in Caribbean waters, and in doing so has added to our knowledge of local and regional marine benthic biodiversity. The molecular results matched with the morphological traits means that ecologists can now have better confidence in their species identifications when surveying these valuable reef habitats, and future research can build upon these findings to add to our understanding of the diversity and distributions of the different zoantharian species in shallow Caribbean coral reefs.

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REFERENCES

Bastidas, C. and **Bone, D.** 1996. Competitive strategies between *Palythoa caribaeorum* and *Zoanthus sociatus* (Cnidaria: Anthozoa) at a reef flat environmental in Venezuela. *Bulletin of Marine Science*, 59: 543-555.

Belford, S.G. and **Phillip, D.A.T.** 2011. Rapid assessment of a coral reef community in a marginal habitat in the southern Caribbean: s simple way to know what's out there. *Asian Journal of Biological Sciences*, 4(7): 520-531.

Belford, S.G. and **Phillip, D.A.T.** 2012. Intertidal distribution patterns of zoanthids compared to their scleractinian counterparts in the southern Caribbean. *International Journal of Oceanography and Marine Ecolological Systems 1,* 2(3): 67-75.

Belford, S.G., Phillip, D.A.T., Rutherford, M.G., Schmidt, R.S. and **Duncan, E.J.** 2019. Biodiversity of coral reef communities in marginal environments along the north-eastern coast of Trinidad, southern Caribbean. *Progress in Aqua Farming and Marine Biology*, 2(1): 1-23.

Belford, S.G. 2020. Spatial abundance and colour morphotype densities of the rock-boring sea urchin (*Echinometra lucunter*) at two different habitats. *Thalassas: An International Journal of Marine Sciences*, 36(1): 157-164.

Belford, S.G. 2021. Shallow-water species diversity of common intertidal zoantharians (Cnidaria: Hexacorallia: Zoantharia) along the northeastern coast of Trinidad, southern Caribbean. *Oceans*, 2: 477-488.

Burnett, W.J., Benzie, J.A.H., Beardmore, J.A. and **Ryland, J.S.** 1997. Zoanthids (Anthozoa, Hexacorallia) from the Great Barrier Reef and Torres Straights, Australia: Systematics, evolution and a key to species. *Coral Reefs*, 16: 55-68.

Dehghani, H. 2018. Molecular identification of zoantharians from around Hormuz, Qeshm and Kish islands, the Persian Gulf. *Regional Studies in Marine Science*, 18: 20-26.

Folmer, O., Black, M.B., Hoeh, W., Lutz, R., and **Vrijenhoek, R.C.** 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology*, 3: 294-299.

Humann, P. Deloach, N. and **Wilk, L**. 2013. Reef Creature Identification 3rd edition. New World Publications.

Jaramillo, K.B., Reverter, M., Guillen, P.O., McCormack, G., Rodriguez, J., Sinniger, F., and **Thomas, O.P.** 2018. Assessing the zoantharian diversity of the tropical eastern Pacific through integrative approach. *Scientific Reports*, 8: 7138.

Karlson, R.H. 1980. Alternate competitive strategies in a periodically disturbed habitat. *Bulletin of Marine Science*, 30: 894-900.

Karlson R.H. 1981. Reproduction patterns on *Zoanthus* spp.

from Discovery Bay, Jamaica. Proceedings 4th International Coral reef Symposium. Manilla, 2: 699-704.

Koupaei, A.N., Mostafavi, P.G., Mehrabadi, J.F., Fatemi, S.M.R., Mashini, A.G. and **Dehghani, H.** 2018. Molecular identification of zoantharians from around Hormuz, Qeshm and Kish Islands, the Persian Gulf. *Regional Studies in Marine Science*, 18: 20-26.

Hebert, P.D.N, Cywinsky, A., Ball, S.L., and **deWaaard, J.R.** 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London B*, 270: 313-322.

López, C, Freitas, R., Magileviciute, E., Ratão, S.S., Brehmer, P., and **Reimer, J.D.** 2018. Report of a *Zoanthus* zone from Cabo Verde islands (Central Eastern Atlantic). *Thalassas: An International Journal of Marine Sciences*, 34:409-413.

Ngwakum, B.B., Payne, R.P., Teske, P.R., Janson, L., Kerwath, S.E., and **Samaai, T.** 2021. Hundreds of new DNA barcodes for South African sponges. *Systematics and Biodiversity*, 0(0): 1-23.

Pax, F. 1910. Studien an westindischen Actinien. *Zoologische Jahrbücher Supplement*, 11: 157-330.

Pérez, C.D., Vila-Nova, D.A., and **Santos, A.M. 2005.** Associated community with the zoanthid *Palythoa* (Duchassaing & Michelotti, 1860) (Cnidaria: Anthozoa) from littoral of Pernambuco, Brazil. *Hydrobiologia* 548: 207-215.

Ong, C.W., Reimer, J.D., and **Todd, P.A.** 2013. Morphologically plastic responses to shading in the zoanthids *Zoanthus sansibaricus* and *Palythoa tuberculosa*. *Marine Bioliogy*, 160: 1053-1064.

Rabelo, E.F., Soares, M.D., Bezerra, L.E. and **Matthews-Cascon, H.** 2015. Distribution patterns of zoanthids (Cnidaria: Zoantharia) on a tropical reef. *Marine Biology Research*, 11(6): 1-9.

Reimer, J.D., Ono, S., Fujiwara, Y., Takishita, K. and **Tsukahara J.** 2004. Reconsidering *Zoanthus* spp. diversity: molecular evidence of conspecificity within four previously presumed species. *Zoological Science*, 21: 517-525.

Reimer J.D., Ono, S., Iwana, A., Tsukahara, J., and **Maruyama, T.** 2006a. High levels of morphological variations despite close genetic relatedness between *Z.* aff. *vietnamensis* and *Zoanthus kuroshio* (Anthozoa: Hexacorallia). *Zoological Science*, 23:755-761.

Reimer, J.D., Shusuke, O., Takishita, K., Tsukahara, J., and **Maruyama, T.** 2006b. Molecular evidence suggesting species in the zoanthid genera *Palythoa* and *Protopalythoa* (Anthozoa: Hexacorallia) are congeneric. *Zoological Science*, 23, 87–94.

Reimer, J.D., Hirose, M., and **Wirtz. P**. 2010. Zoanthids of Cape Verde Islands and their symbionts: previously unexamined diversity in the northeastern Atlantic. *Contributions to Zoology*, 79: 147-163.

Reimer, J.D., Foord, C., and **Irei, Y.** 2012. Species diversity of shallow water zoanthids (Cnidaria: Anthozoa: Hexacorallia) in Florida. *Hindawi Publications Corporation Journal of Marine Sciences*, 1–14.

Reimer, J.D., Wee, H.B., García-Hernández, J.E. and **Hoeksema, B.W.** 2018. Zoantharia (Anthozoa: Hexacorallia) abundance and associations with Porifera and Hydrozoa across a depth gradient on the west coast of Curaçao. *Systematics and Biodiversity*, 0(0): 1-11.

Shearer, T.L. and **Coffroth, M.A.** 2008. DNA barcoding: Barcoding corals: limited by interspecific divergence, not intraspecific variation. *Molecular Ecology Resources,* 8:247-255.

Sinniger, F.; Montoya-Burgos, J.I.; Chevaldonné, P.; and **Pawlowski, J.** 2005. Phylogeny of the order Zoantharia (Anthozoa, Hexacorallia) based on the mitochondrial ribosomal genes. *Marine Biology*, 147: 1121-1128.

Sinniger, F, Reimer, J.D., and **Pawlowski, J.** 2008. Potential of DNA sequences to identify zoanthids (Cnidaria: Zoantharia). *Zoological Science*, 25: 1253-1260.

Trivedi J.N. and **Vachhrajani K.D.** 2014. Intertidal distribution of zooxanthellate zoanthids (Cnidaria: Hexacorallia) along the coastal Saurashtra, Gujarat, India. *European Journal of Zoological Research*, 3: 1-8.

A remarkable cohort of arboreal termite (Blattaria: Termitidae: *Microcerotermes arboreus*) colonies

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ABSTRACT

In a line of 22 coconut palms, 18 each had a single active colony of *Microcerotermes arboreus* nested on the trunk. While the nests varied considerably in their height above the ground, they showed marked unity in their compass-point positions. Fifteen of the 18 were situated between west and southwest on their respective palms. This placed them on the leeward side, as the prevailing winds are from the east. A heavy rainstorm during our study period left only one of the nests wetted.

Keywords: Nest site, Trinidad & Tobago

INTRODUCTION

Arboreal termites typically build their nests on trunks and branches of trees and tree-like plants, including palms. While nest height above ground for a particular species is far from uniform, even at a given locality and habitat, it typically falls within a moderate range with a fairly distinct mode (e.g. Merritt and Starr 2010). We have little knowledge of what influences the position of the nest or even whether it is typically set when the founding pair first settles after the mating flight or if there is commonly migration of the colony as a whole at a later stage.

Our purpose here is to describe a peculiar set of nests of one particular species that may throw some light on the question of why it is better to situate the nest in one place rather than another.

METHODS

Microcerotermes arboreus is widespread in the northern Neotropics (Scheffrahn *et al*. 1994). It is abundant throughout the island of Trinidad, West Indies (Merritt and Starr 2010, Scheffrahn et al. 2003), where its grey-brown nests are easily distinguishable from those of all other species. Active *M. arboreus* nests, unlike old abandoned nests, have a relative smooth surface and are served by unbroken galleries on the surrounding substrate.

At Kernaham (or Kernahan) Village (10°22'N 61°02'W) on the eastern side of Trinidad we found this termite nesting on the trunks of a row of coconut palms. Most trunks leaned very slightly toward the south. What was immediately striking was that most nests appeared to be on the same side of their respective trunks. The prevailing wind is from the east, often blowing hard from the sea about 1.5 km to the east-northeast. We studied this group of colonies during July 2023 near the start of the rainy season.

We estimated the height of the trunks from the ground to the base of the first frond by comparison with our own heights. The space between each adjacent pair of palms was estimated by pacing. We measured nest height from the ground to the middle part of the nest. We used an ordinary compass to record the orientation of each nest's position on its trunk.

RESULTS

The 22 coconut palms appeared to represent a single planting. The height of the crown was around two metres, in some cases almost three metres. The palms were arrayed in approximately a straight east-west line, with close to consistent spacing within each adjacent pair at between three and four metres. None of the palms was sheltered on any side (Fig. 1). Eighteen palms each had one nest on the trunk, and none had more than one. All nests appeared to be active, to judge from their condition (Fig. 2). Average nest height (mean$\pm$SD) was 66.6$\pm$35.5 cm. None was near the crown, so that position on the trunk was not constrained at the palms' current sizes.

As seen in Fig. 3, all but three of the 18 termite nests were located between west and southwest on their respective palms, with a distinct mode at west-southwest.

During the first of our two study days there was heavy rain in the morning. The rain wetted the palm trunks on one side only, with its centre at east-southeast (Fig. 4).

DISCUSSION

Our results are consistent with the hypothesis that, when *M. arboreus* nests on a trunk that is exposed on all sides, the nest tends to be situated on the lee side of the prevailing wind, thus minimizing wetting by rain. It is our working

Fig. 1. Northeast-facing view of part of the row of coconut palms. *Microcerotermes arboreus* nests are plainly visible on the four closest palm trunks.

Fig. 2. The foreground nest from Fig. 1.

hypothesis that this positioning arises from orientation by the termites, rather than by differential survival of variously situated colonies. This is more likely if the colony is initiated in the soil by the queen and king, with the entire colony later moving to an above-ground site, as is known from some arboreal *Nasutitermes* species. What is not definitely

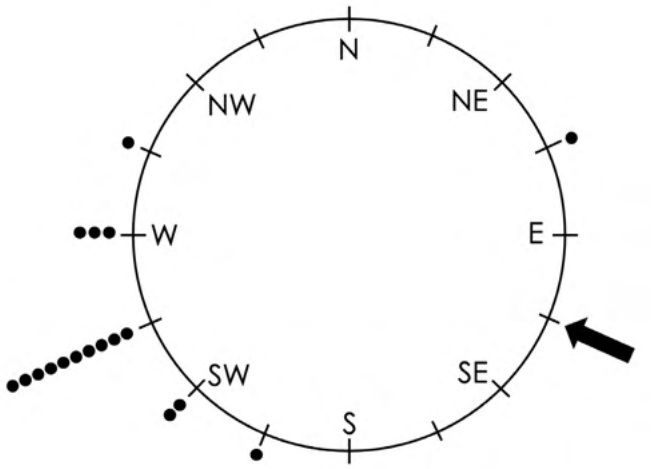

Fig. 3. Compass-point orientation of 18 *Microcerotermes arboreus* nests on a row of coconut trunks. The arrow represents the main direction of a heavy rain storm during the study period. Diagram by Nova Y. Starr.

Fig. 4. South side of one coconut trunk shortly after heavy rain to show wetting of the east-southeast side and an unaffected *Microcerotermes arboreus* nest on the west-southwest side.

known is that such wetting is damaging to the nest. It seems unlikely that even heavy, prolonged rain could significantly erode the nest's structure. However, any wetting below a surface film could promote fungal growth and/or require work to remove it. This hypothesis is open to experimental test with this or other arboreal termites.

It is not out of the question that nest site is also influenced by sunlight. Leponce et al. (1995) reported that *M. biroi* nesting on coconut in a similarly exposed situation is adversely affected by harsh midday sunlight (from the south in our study).

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REFERENCES

Leponce, M., **Roisin, Y.** and **Pasteels, J.M.** 1995. Environmental influences on the arboreal nesting termite community in New Guinean coconut plantations. Environmental Entomology 24:1442–1452.

Merritt, N.R.C. and **Starr, C.K.** 2010. Comparative nesting habits and colony composition of three arboreal termites (Isoptera: Termitidae) in Trinidad & Tobago, West Indies. *Sociobiology* 56:611-22.

Scheffrahn, R.H., **Darlington, J.P.E.C.**, **Collins, M.S.**, **Kreček, J.** and **Su, N.-Y.** 1994. Termites (Isoptera: Kalotermitidae, Rhinotermitidae, Termitidae) of the West Indies. *Sociobiology* 24:213-238.

Scheffrahn, R.H., **Kreček, J.**, **Maharajh, B.**, **Chase, J.A.**, **Mangold, J.R.** and **Starr, C.K.** 2003. Termite fauna (Isoptera) of Trinidad & Tobago, West Indies. *Occasional Papers of the Department of Life Sciences, University of the West Indies* (12):33-38.

The Jamaican Naturalist William Thomas March (1804-1872): a preliminary review of his zoological and botanical collections

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ABSTRACT

William Thomas March (1804-1872) was responsible for extensive zoological and botanical collections, including one of the syntype specimens of *Mimus gundlachii hillii* March 1874. The specimen is held at World Museum, National Museums Liverpool. March was a Jamaican naturalist and collector. He was of black and white ancestry and worked with well-known collectors of his time. He was highly regarded amongst his peers. Many institutions worldwide house March's botanical and zoological specimens but some have been misattributed as his name has been documented inconsistently. There is little doubt that more of his collections have yet to be found, located and documented. One of the main findings of this paper is that Spencer Fullerton Baird (1823-1882), first curator of the National Museum at the Smithsonian, honoured March's work by naming the Black Faced Grassquit *Melanospiza bicolor marchii* after him as he said March had "done so much towards extending our knowledge of the natural history of his island." The objective of this paper is to highlight the breadth of distribution of March's Jamaican specimens around the world and to summarise his achievements and background for museums and institutions that house his specimens. This is especially important at this time when museums are looking to diversify their audience and improve their collection interpretations.

Keywords: Black collector, Spanish Town, Hooker, P.H. Gosse, Spencer Fullerton Baird, Natural History, Caribbean, W.W. Marsh.

INTRODUCTION

The Jamaican collector and naturalist William Thomas March (1804-1872) has been an under-recognised and uncelebrated figure within our institutions – yet his contribution to museums worldwide is remarkable. March worked and corresponded with some major figures of his time including: Sir William Jackson Hooker (1785-1865) first director of the Royal Botanic Gardens, Kew; Charles Darwin (1809-1882) the English naturalist, biologist and geologist well-known for his theory of evolution which changed the way we see all organisms (Desmond, Moore & Browne 2004); Phillip Henry Gosse (1810-1888) an English naturalist, pioneer of marine biology and populariser of natural science; Richard Hill (1795-1872) a Jamaican naturalist, lawyer and leader of the free people of colour during the campaign for equal rights (Campbell 1976); and Spencer Fullerton Baird (1823-1882) first curator of the National Museum at the Smithsonian. March's knowledge of local and regional flora and fauna was instrumental in helping these 'big names' to catalogue Jamaica's biodiversity. William Thomas March should be acknowledged for his achievements and contributions to progressing our understanding of Jamaican botany and zoology given that he sourced specimens for these notable collectors. I am researching the collector and Jamaican naturalist William Thomas March (1804-1872) for my Associateship of the Museum Association (AMA). My research is founded in the histories of the Vertebrate Zoology collections at World Museum which includes collections from March. Initially my project involved creating a new dataset titled 'Bird skins from Jamaica in the collections of World Museums Liverpool.' This dataset is now published and available on the Global Biodiversity Information Facility (GBIF) and contains specimens from William Thomas March. My research takes March out of the shadows, profiles his contribution and in doing so provides a better understanding of Jamaica's biodiversity. This article aims to begin the documentation of the worldwide reach of specimens collected by March and sent abroad to notable collectors and institutions.

METHOD

Using the World Museum database I began screening the original data we had for bird specimens from Jamaica in order to publish on GBIF. At this time, I also ran a background search on the collectors of these specimens. I had attended various conferences online where topics for discussion included decolonising museum collections and repatriating specimens. With this in mind, using the World Museum database I researched the collector's names to see if any of them were people of colour. March's name gave no indication of his colour but my research showed he was born in Jamaica. I found that Catherine Levy, former president of BirdLife Jamaica, had written two papers about March's life (Levy 2008, 2013). On this basis, I decided to carry out further research into March's background and his Jamaican bird specimens which are housed in the Vertebrate Zoology collection at World Museum Liverpool (Fig. 1).

I searched the online catalogues of museums which I

suspected held his specimens, including the Smithsonian National Museum of Natural History. The Jamaican specimens at World Museum Liverpool had originated from there. Further searches using GBIF revealed hundreds more Jamaican specimens and the institutions housing them. Most of the available online catalogues presented specimens not mentioned on GBIF.

In addition, I put out a call to the Natural Sciences Collections Association's (NatSCA) mailing list to ask for any information on specimens collected by William Thomas March or any of the misspelled names I had identified as associated with him and his specimens.

BIOGRAPHY

So, who exactly was William Thomas March? He was born a 'free man of colour', who lived and died in St. Catherine, Spanish Town, Jamaica. In today's terms a 'coloured' person refers to a black person. March was

Fig. 1. The Jamaican bird skin specimens collected by William Thomas March stored in the Vertebrate Zoology collection at World Museum, National Museums, Liverpool © National Museums Liverpool (World Museum: NML-VZ T1134, NML-VZ T760, NML-VZ T5652, NML-VZ 1989.66.1279, NML-VZ T19525, NML-VZ T12817, NML-VZ T9981, NML-VZ T1128, NML-VZ T14037, NML-VZ T14031/ Olivia Beavers).

a child of a 'free coloured' couple – Foster March and Mary Luisa Willis Thomas Matthews who had 10 children including William (FamilySearch 2022; UCL Department of History 2023). His mother was described as 'Mestee', meaning 'a person who is one quarter black' and his paternal grandmother Elizabeth Rogers, was described as a 'Free Mulatto' meaning a person with one black and one white parent (UCL Department of History 2023). These terms are classified as 'old mixed-heritage groups' (Wilkinson 2020).

W. T. March had brown skin (as referenced by Levy 2013) and came from a mixed heritage of black and privileged white family members (Fig. 2). In 1748, his paternal grandfather passed 'An Act to entitle his children [birthed] by Elizabeth Rogers, a free Mulatto, to the same rights and privileges with English subjects born of white parents' (UCL Department of History 2023). This Act almost certainly helped William Thomas March's life and status as a free man of colour compared to other less privileged Jamaicans with black ancestry who were discriminated against during this time. The history of such arrangements is well documented by Daniel Livesay in his Inheritance, Family, and Mixed-Race Jamaicans, 1700-1761 (Livesay 2018).

William Thomas March was a privileged free person of colour: he was an attorney at law, an elected member of the House of Assembly for St. Catherine in 1837, a Treasurer of Beckford's Free School in 1841, a Trustee of the Spanish Town Savings Bank, a Vestryman in St. Catherine between 1839 and 1854 and went on to become the Deputy Clerk and then a Clerk of the Supreme Court. March was the Island Secretary/Secretary to the Governor of Jamaica from 1868 to 1872 and a member of the Council of the Royal Society of Arts in Jamaica.

One of his closest scientific collaborations was with Spencer Fullerton Baird who was the first curator of the National Museum at the Smithsonian in 1850 and later the second Smithsonian Secretary from 1878-1887. Baird asked March to send Jamaican bird skins for the new collections. In several letters Baird corresponded with March to gain his knowledge of Jamaican flora and fauna (Levy 2013). Baird dedicated the subspecies *Melanospiza bicolor marchii* (Baird, S.F. 1863) to March (Fig. 3). Baird noted: " If, as I think most probable, the Jamaican species is thus without a name, to no one could it with more propriety be dedicated than to Mr. March, who has done so much towards extending our knowledge of the natural history of his island." – S. F. Baird, (March 1863). This shows how highly regarded March was as a Jamaican naturalist among contemporary scientists.

In 1863 and 1864, March published his 'Notes on the birds of Jamaica' Part i and ii, in Proceedings of the Academy of Natural Sciences of Philadelphia. These notes list migrant, resident and endemic species with detailed descriptions accompanied by footnotes from Baird and Richard Hill (March 1863; March 1864, Levy 2013).

Fig. 2. William Thomas March photograph (0658). Courtesy of the Archives of the Gray Herbarium, Harvard University.

As detailed by Catherine Levy's (2013) biographical paper and on the Jamaica Almanacs website, March accomplished many significant milestones. He had a long career in both political and civic roles and was a member of the Council of the Royal Society of Arts in Jamaica whose 'principal objects were to encourage the development of the productive and industrial resources of the colony, and to endeavour to turn them to substantial account in the great marts of the world's commerce' (Levy 2013).

Zoological Specimens

March collected both Jamaican mammal and bird skins which are housed in museums across the globe. The number of Jamaican bird skins collected outweighs the mammals, probably because Jamaica has few endemic mammals compared to endemic birds. March's handful of Jamaican mammal skins (as located in museums thus far) comprise of various bat species, *Rattus rattus* and a now extinct Jamaican Rice Rat originally labelled as *Oryzomys couesi antillarum*. He also collected the type specimens of *Eumops glaucinus glaucinus* (Wagner 1843) and *Macrotus waterhousii jamaicensis* Rehn 1904.

Often on specimen labels William Thomas March's name is mislabelled as W.J. Marsh, W. (T.) Marsh, W. E. Marsh, W. L. Marsh or W.W. Marsh. To the best of my knowledge, all letters, notes and Jamaican specimens where his name is mislabelled, reference the exact places where W.T. March

Fig. 3. A *Melanospiza bicolor marchii* (Baird, S.F. 1863) specimen named in William Thomas March's honour by Spencer Fullerton Baird (World Museum: NML-VZ T10453/ Olivia Beavers).

was collecting at that specific time and within those locations. The JSTOR website also notes the same errors in his name in museum records. To date, I have located William Thomas March's specimens in the institutions summarised in Table 1.

There are still more locations to be discovered, including a specimen labelled No. 24352 in the Smithsonian Institution's U.S. National Museum Bulletin 221, Type Bird Specimens, which in 1877 was sent to the Mombusho Museum, Tokyo, and 'has long since disappeared' (Deignan 1961, p. 532). In some cases, I retrieved additional specimen numbers to the GBIF dataset via online catalogues from individual museums. Both specimens from the cited GBIF dataset as well as data from the online catalogues make up the specimen numbers in Table 1.

In addition to the 517 zoological specimens I located using the online Smithsonian online catalogue, Banks and Hole Jr., noted that there were 982 specimens of 153 species, eggs of 47 species, some partial skeletons and missing specimens all unreported from March's later specimen donations. Consequently, it is not clear how many specimens there might be in total at the Smithsonian (Banks and Hole 1993).

World Museum Specimens

One of March's birds, the Bahama Mockingbird, was listed as a "co-type" (now syntype) from the Smithsonian Institution's collection, based on its original label and publication reference (March 1863). Three of the syntypes are held at the Smithsonian NMNH and one (Fig. 4) was re-located to World Museum as a gift presented to Canon Henry Baker Tristram (1822-1906) – whose collection was sold in 1896 to Liverpool Museum, the predecessor of World Museum. The Smithsonian Institution 'sent [the bird] to Henry B. Tristram on June 9, 1870' according to Deignan (1961, p. 415).

Some of March's bird skins, within World Museum, were originally in the Smithsonian NMNH collection and have retained their original Smithsonian labels. Some were bought and others were gifted to Henry Baker Tristram in the 1800s. The skins were then bought from Tristram by Liverpool Museum (now World Museum) and became part of its founding collections. World Museum has 10 bird specimens collected by March (see Appendix Figs. A-J).

Table 1. William Thomas March's specimens distribution and total numbers calculated from individual institutions' online catalogues and GBIF.org (22 June 2023) GBIF Occurrence Download https://doi.org/10.15468/dl.syf6pa

Recent Institution	Number	Internationally Standardised Acronyms
Botanical Specimens		
Centro Internacional de Agricultura Tropical, CIAT	2	CIAT
Harvard University Herbaria	25	A, AMES, ECON, FH,GH, NEBC
Meise Botanic Garden (formerly National Botanic Garden of Belgium)	21	BR
Missouri Botanical Gardens	17	MO
National Museum of Natural History, Paris	1	P, PC
Naturalis Biodiversity Centre (NL)	1	AMD, L, U, WAG
Royal Botanic Gardens National Herbarium of Victoria	33	MEL
Royal Botanic Gardens, Kew	78	K
Staatliche Naturwissenschaftliche Sammlungen Bayerns	81	M
The Field Museum of Natural History	15	F
The New York Botanical Garden Herbarium	48	NY
Type Herbarium, Gottingen	64	GOET
Zoological Specimens		
American Natural History Museum	200	
Florida Museum of Natural History	2	
Manchester Museum	2	
Museum of Comparative Zoology, Harvard University	43	
National Museum of Ireland	166	
National Museums, Scotland	1	
Natural History Museum Denmark	1	
Natural History Museum, Tring	62	
Naturalis Biodiversity Centre (NL)	4	
Ohio State University Tetrapod Division – Bird Collection; Museum of Biological Diversity, Ohio State	8	
Smithsonian Natural History Museum	517	
University of Michigan Museum of Zoology	43	
World Museum, National Museums Liverpool	10	
TOTAL	**1445**	

Zoological and Botanical Type Specimens

Two specimens labelled as type and co-type, collected by March, were sent to the Royal Dublin Society (now possibly housed in the National Museum of Ireland); described by Dr. Alexander Carte (1805–1881) and illustrated by Joseph Smit in Proceedings of the Zoological Society of London (Carte 1866; Levy 2013). These specimens were of the Blue Mountain Duck or Jamaican Petrel *Pterodroma caribbea* - an endemic seabird now thought to be extinct. March wrote to Baird in 1861 saying: 'The burrowing duck mentioned by Mr. Hill is *Prion caribea* I think, they are difficult to be got, being only found in the Blue Mountains but I will try for a pair for you – I sent a pair to Dublin some time ago

Fig. 4. A syntype of *Mimus gundlachii hillii* (Bahama Mockingbird), one of four syntype specimens collected by William Thomas March. The specimens of this subspecies were described by March in *Proceedings of the Academy of Natural Sciences of Philadelphia* in 1863 (World Museum: NML-VZ T5625/ Olivia Beavers).

to be identified, but I have not yet heard if I am correct in the name...' (Levy 2013).

I corresponded with Paolo Viscardi, Keeper of Natural History at the National Museum of Ireland, and he confirmed there are many more of March's specimens in their collections (personal e-mail correspondence, Olivia Beavers to Paolo Viscardi, January 2023). It is unclear however, whether the birds in Figures 5a, 5b and 6 are the original specimens collected by William Thomas March or different specimens associated with Admiral Leopold McClintock (1819–1907). Without doubt, the original type specimens were collected by William Thomas March. Whether these specimens now labelled as the type and co-type in the collections are the original specimens, is yet to be confirmed. As Paolo Viscardi communicated:

'All labels now with the specimens are post-1877 so original labels that would identify these as March or McClintock acquisitions are absent. As there are only two birds in the collection and not four as indicated from the publication by Carte combined with the register entry from 1869 – the possibility that the two birds are entered twice in the system must be considered.

"It is worth noting that the specimens described by Carte in 1866 were the ones sent by March to the Royal Dublin Society, which rather coincidentally McClintock (who was Commodore of the Jamaica Division at the time) was elected to in 1865. It is possible that although the specimens have an entry for September 9th in the 1869 donation book they may have been the same specimens that were sent by March via McClintock and there was simply a delay in formally registering the donation (although it is also possible that the original specimens were destroyed and McClintock acquired replacements)'" (personal e-mail correspondence, Paolo Viscardi to Olivia Beavers, January 2023)

To date, using online databases and museum catalogues, I have found that March collected 114 type specimens of birds, mammals and botanical specimens, presented in Table 2. It should be noted that there could be additional specimens that are yet to be re-discovered due to William Thomas March not being clearly documented as the source.

Five of the 12 type specimens at the Smithsonian were described by Robert Ridgway (1850–1929), the first full-time curator of the Department of Birds at the Smithsonian at the time of the donations from March. Ridgway used many of March's birds (Fig. 7) to prepare his 'Birds of North and Middle America' but rarely mentioned the individual specimens used and therefore, outside of the Smithsonian, ornithologists were not aware of this unworked collection (Banks and Hole 1993).

Through correspondence between Richard Hill and Charles Darwin (Fig. 8), March was credited in supplying insect specimens to Darwin: "*Mr March, a naturalist very well known to Sir William Hooker, — from whom I procured these specimens, promises me a complete suite from the Queen downwards. He has been searching over his Farm in the Salt pond plain for our Meliponas, but without success. He intends to supply me with a joint of a tree containing the Sacklets, — when he finds a hive.*" March has been described as 'one of Jamaica's leading botanists' (Levy 2013). His first true passion was botany and he sent botanical samples to Sir William Jackson Hooker (Director of Kew Gardens 1841–1865).

Botanical Specimens

While searching for zoological specimens collected by William Thomas March, I also came across a series of botanical specimens in various institutions across the world noted in Tables 1 and 2. Again, confusion over his name has led to some herbarium sheets being recorded as collected by M. March, Mr. March or simply just 'collected by March' (Figs. 9 and 10).

Letters between William Thomas March and Sir William Jackson Hooker document that plant specimens were exchanged between the two, and that March originally sent around 2000 botanical specimens to Hooker.

On a recent research visit to the Economic Botany Collection at the Royal Botanic Gardens, Kew, the curatorial team was able to show me a selection of wood specimens (Appendix K and L) that March collected, including a sample of gum. There are also records of fruit samples preserved in spirit which I hope to see on another visit.

March proposed the idea of launching his own botanical magazine in England, complete with coloured plates created by a Jamaican lithographer, Miss Catherine Eloise Dubuisson, who visited Hooker and RBG Kew in 1857. Another project, which Sir William Jackson Hooker agreed to offer his assistance on, was March's handbook of [Jamaican] ferns. March was encouraged by his friends to publish the latter, as detailed in letters from February 1861 and April 1861. It is unclear whether these projects were fulfilled.

CONCLUSION

Writing about March, Levy (2013) has described him as 'much-neglected'. I must agree with that summation given that March's contributions to Jamaican zoology and botany have gone relativly un-noticed in recent times – despite working with and helping to propel the careers of some of the most highly praised naturalists of his time. He was a pioneer in providing some of the first biological data available for the Caribbean with his exceptional knowledge as a local resident naturalist. His collection of type specimens and

Figs. 5a. & 5b. Blue Mountain Duck or Jamaican Petrel co-type specimen. The original co-type bird specimen was collected by William Thomas March but the specimen's label says that they came from Admiral Leopold McClintock in 1869. '*Original labels that would identify these as March or McClintock acquisitions are absent*.' (Image courtesy of the National Museum of Ireland – Natural History).

now extinct specimens will have helped researchers who focussed on Caribbean biodiversity, and continues to provide historical data for current scientists.

As I have documented in this article, much of March's lifetime contribution is housed internationally under different names. With further research, I hope to locate more of his specimens to document a more complete history of William Thomas March's collections and their whereabouts, and to create a catalogue of his specimens to celebrate his work.

Another important outcome of this project is the work continuing to make the Vertebrate Zoology collections at World Museum Liverpool accessible to all and especially to those in the Caribbean – from where the majority of March's specimens originate.

ACKNOWLEDGEMENTS

I would like to thank Catherine Levy whose papers about William Thomas March were fundamental in starting my research. I would also like to thank Paolo Viscardi, Keeper of Natural History at the National Museum of Ireland, for providing further historical information on William Thomas March's specimens in Dublin and the images of

Fig. 6. Blue Mountain Duck or Jamaican Petrel type specimen. The original type bird specimen was collected by William Thomas March but the specimen's label says that they came from Admiral Leopold McClintock in 1869. '*Original labels that would identify these as March or McClintock acquisitions are absent*. Image courtesy of the National Museum of Ireland – Natural History.

Table 2 Type specimens collected by March and the institutions that currently store them

Institution	Number of Type Specimens	Type of Material
Harvard University Herbaria	11	Botanical
Meise Botanic Garden	1	Botanical
Missouri Botanical Gardens	5	Botanical
Royal Botanic Gardens: Kew	9	Botanical
The New York Botanical Garden Herbarium	8	Botanical
Type Herbarium: Gottingen (GOET)	64	Botanical
National Museum of Ireland	2	Zoological
Smithsonian Natural History Museum	12	Zoological
The Field Museum of Natural History	1	Zoological
World Museum: National Museums Liverpool	1	Zoological
TOTAL	**114**	

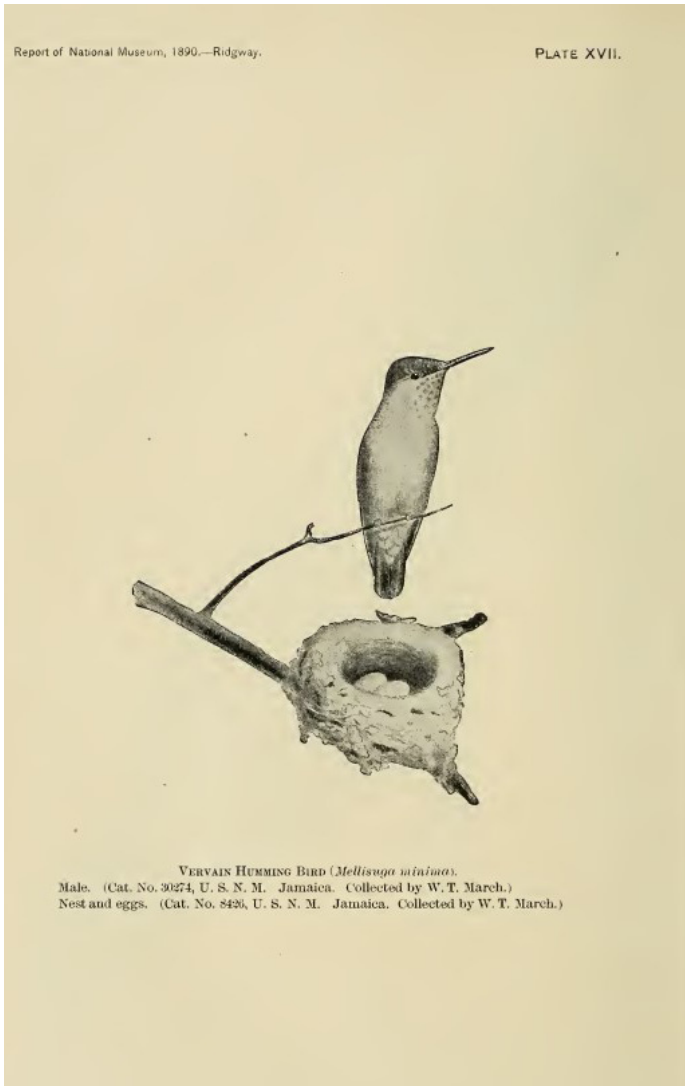

Fig. 7. Plate XVII. illustrating a male Vervain hummingbird, nest and eggs all collected by William Thomas March. Image courtesy of the *Report of National Museum, 1890. – Ridgway.*

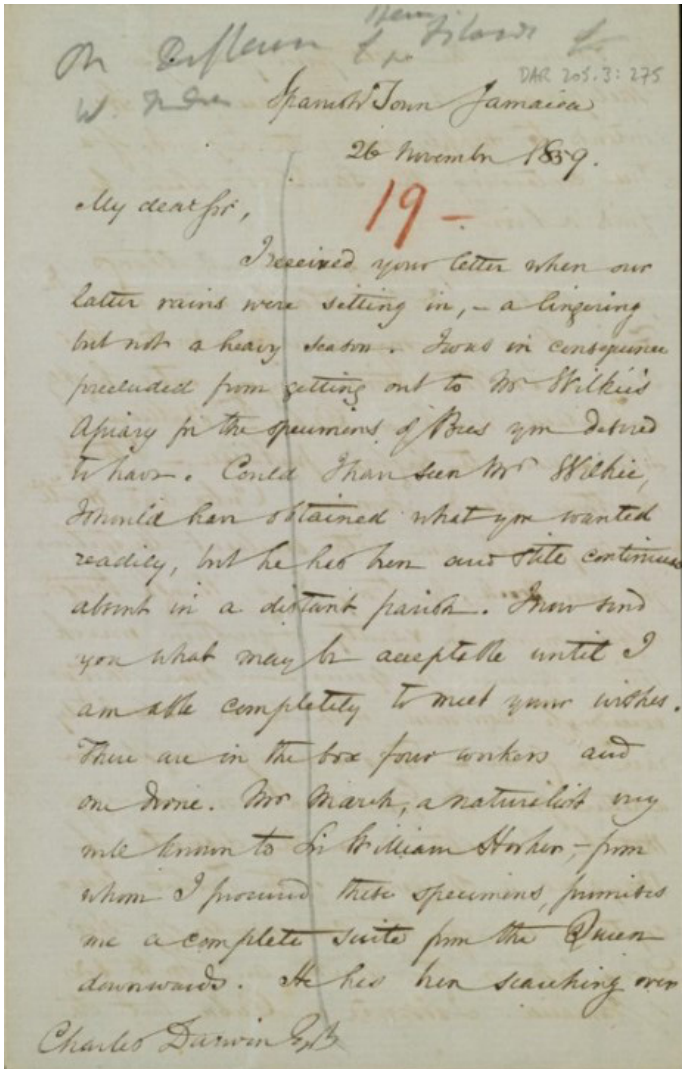

Fig. 8. Darwin Correspondence Project, "Letter no. 2557" 1859. A letter from Richard Hill to Charles Darwin mentioning the specimens collected by March. Images of original letters from the Cambridge University Library collections are courtesy of Cambridge University Digital Library (Darwin Correspondence Project, 1859).

the Caribbean petrels. My thanks also go to Mike Rutherford for editing this paper, for inviting me to speak on William Thomas March in the webinar: "Natural History Specimens & Knowledge Co-Production: The Case of the Jamaican Giant Galliwasp", and for introducing me to colleagues at the Institute of Jamaica and the University of the West Indies. Furthermore, I would like to thank the curators who responded when I asked for further information on March's collections over the NatSCA JISCMail. A special thanks to the Economic Botany Collection's team at the Royal Botanic Gardens, Kew for facilitating my visit to see the collections. Finally, I would like to thank the Living World Journal editors, the peer reviewer Gerhard Aubrecht, and two anonymous reviewers for their support with this paper.

Fig. 9. K000528934 Lectotype of *Stemodia durantifolia* (L.) Sw. var. angustifolia Griseb. collected in Jamaica by 'Mr. March' 1858. An example of William Thomas March's contribution to botany collections at Royal Botanic Garden, Kew. Image courtesy of Royal Botanic Gardens, Kew.

Fig. 10. K000324492 *Peperomia tenella* (Sw.) A.Dietr. collected in Jamaica by 'Marsh'. An example of how easy it is to overlook William Thomas March's contributions to natural science collections. Image courtesy of Royal Botanic Gardens, Kew.

REFERENCES

Baird, S.F. 1863. Notes of the Birds of Jamaica, With remarks by S.F. Baird Pt, ii. *Proceedings of the Academy of Natural Sciences of Philadelphia* 1863, 15: p.297.

Banks, R.C. and **Hole R. Jnr.** 1993. W.T. March's birds collected in Jamaica. *Gosse Bird Club Broadsheet 1960*, 60, p. 7-9.

Campbell, M. 1976. The Dynamics of Change in a Slave Society (London: AUP, 1976), 156p.

Carte, A. 1866. On an Undescribed Species of Petrel from the Blue Mountain of Jamaica. *Proceedings of the Zoological Society of London*, 1866: p. 93-95.

Darwin Correspondence Project. 1859. "Letter no. 2557" 1859 [Online]. Available at https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-2557.xml (Accessed 26 June 2023).

Deignan, H. G. 1961. Type Specimens of Birds in the United States National Museum. *Bulletin of the United States National Museum*: p. 415, 532.

Desmond, A., Moore, J. and Browne, J. 2004. Darwin, Charles Robert. Oxford Dictionary of National Biography (online ed.). Oxford, England: Oxford University Press.

FamilySearch. 2023. Jamaica, Church of England Parish Register Transcripts, 1664-1880, database with images, William Thomas March, 1872. *FamilySearch* 2023 [Online]. Available at https://www.familysearch.org/ark:/61903/1:1:6J2Q-BCHR (Accessed 03 January 2023).

Levy, C. 2008. History of ornithology in the Caribbean. *Ornitologia Neotropical*, 19: 415-426.

Levy, C. 2013. William Thomas March, 1804-1872. *BirdLife Jamaica*, 96.

Livesay, D. 2018. 'Inheritance, Family, and Mixed-Race Jamaicans, 1700–1761'. In: *Children of Uncertain Fortune: Mixed-Race Jamaicans in Britain and the Atlantic Family, 1733-1833* (Chapel Hill, NC, 2018; online edn, North Carolina Scholarship Online, 24 May 2018) [Online]. Available at https://doi.org/10.5149/northcarolina/9781469634432.003.0002 (Accessed 03 Nov 2023).

March, W.T. 1863. Notes of the Birds of Jamaica, With remarks by S.F. Baird Pt, ii. *Proceedings of the Academy of Natural Sciences of Philadelphia* 1863, 15: 283.

March, W.T. 1864. Notes of the Birds of Jamaica, With remarks by S.F. Baird Pt, ii. *Proceedings of the Academy of Natural Sciences of Philadelphia* 1863, 16: 62-72.

Ridgway, R. 1890. Report of National Museum, 1890 [Online]. Available at https://www.biodiversitylibrary.org/bibliography/19633 (Accessed 14 July 2023).

Royal Botanic Gardens, Kew. 2021. Lectotype of *Stemodia durantifolia* (L.) Sw. var. *angustifolia* Griseb. [Online]. Available at http://specimens.kew.org/herbarium/K000528934 (Accessed 08 May 2023).

Royal Botanic Gardens, Kew. 2021. *Peperomia tenella* (Sw.) A.Dietr. [Online]. Available at http://specimens.kew.org/herbarium/K000324495 (Accessed 08 May 2023).

UCL Department of History. 2023. '*William Thomas March'*, Legacies of British Slavery database [Online]. Available at *http://wwwdepts-live.ucl.ac.uk/lbs/person/view/2146652061* (Accessed 25 October 2023).

UCL Department of History. 2023. '*John March'*, Legacies of British Slavery database [Online]. Available at *http://wwwdepts-live.ucl.ac.uk/lbs/person/view/15343* (Accessed 25 October 2023).

Wilkinson, A.B. 2020. 'Mulattoes and Mustees in the Northern Colonies and Carolinas'. In: *Blurring the Lines of Race & Freedom* (Chapel Hill, NC, 2020; online edn, North Carolina Scholarship Online, 20 Jan. 2022) pp.93-127. [Online] https://doi.org/10.5149/northcarolina/9781469658995.003.0004 (Accessed 25 October 2023).

Appendix

Fig. A. Scientific Name: *Coccyzus vetula* (Linnaeus, 1758)
Nickname; Common Name: Old Woman Bird, Ring Tail; Jamaican Lizard-Cuckoo
Date of Collection: Before 1896
Collection locality: Spanish Town, Jamaica
Accession Number: World Museum NML-VZ T1134

Fig. B. Scientific Name: *Coccyzus americanus* (Linnaeus, C 1758)
Nickname; Common Name: Yellow-billed Cuckoo
Date of Collection: 03.1866
Collection locality: Jamaica
Accession Number: World Museum NML-VZ T760

Fig. C. Scientific Name: *Mimus gundlachii hilli* March, 1864
Nickname; Common Name: Spanish mockingbird; Bahama Mockingbird (hillii)
Date of Collection: 1862.10.31
Collection locality: Near Spanish Town, Jamaica
Accession Number: World Museum NML-VZ T5652 formerly 26803 in *U.S. National Museum Bulletin 221 Type Specimens of Birds* (Deignan, 1961, p.415).

Fig. D. Scientific Name: *Myiarchus stolidus* (Gosse, 1847)
Nickname; Common Name: Tom Fool; Stolid Flycatcher
Date of Collection: 1865.02
Collection locality: Spanish Town, Jamaica
Sex: Male
Accession Number: World Museum NML-VZ 1989.66.1279

Fig. E. Scientific Name: *Tyrannus caudifasciatus jamaicensis* (Chapman, FM 1892)
Nickname; Common Name: Jamaican Petchary; Loggerhead Kingbird (jamaicensis)
Date of Collection: 1861.04
Collection locality: Near Spanish Town, Jamaica
Sex: Male
Accession Number: World Museum NML-VZ T19525

Fig. F. Scientific Name: *Tiaris olivaceus* (Linnaeus, 1766)
Nickname; Common Name: Grassbird; Yellow-faced Grassquit
Date of Collection: 1861.11.04
Collection locality: Spanish Town, Jamaica
Accession Number: World Museum NML-VZ T14031

Fig. G. Scientific Name: *Calidris minutilla* (Vieillot, 1819)
Nickname; Common Name: Least Sandpiper
Date of Collection: 1862.10.03
Collection locality: Near Spanish Town, Jamaica
Sex: Female
Accession Number: World Museum NML-VZ T9981

Fig. H. Scientific Name: *Euneornis campestris* (Linnaeus, 1758)
Nickname; Common Name: Bluequit, Long Mouth Bluequit, Blue badas; Orangequit
Date of Collection: 1865.03.18
Collection locality: Spanish Town, Jamaica
Sex: Male

Accession Number: World Museum NML-VZ T12817

Fig. I. Scientific Name: *Melopyrrha violacea ruficollis* (J.F. Gmelin, 1789)
Nickname; Common Name: Black Sparrow, Jack Sparrow, Cotton tree sparrow; Greater Antillean Bullfinch (ruficollis)
Date of Collection: Before 1896
Collection locality: Near Spanish Town, Jamaica
Sex: Male

Accession Number: World Museum NML-VZ T14037

Fig. J. Scientific Name: *Tachornis phoenicobia* Gosse, P.H. 1847
Nickname; Common Name: Rain bird; Antillean Palm-Swift
Date of Collection: Before 1896
Collection locality: Spanish Town, Jamaica

Accession Number: World Museum NML-VZ T1128

Fig. K. Gum/Resin of *Anacardium occidentale*, L. alongside the relevant accession register entry (highlighted yellow). Kew Economic Botany Collections, catalogue number 61854.

Fig. L. A sample of *Ilex obcordata* Sw., collected by W.T. March, from the Kew Economic Botany Collection, catalogue number 4672.

Nature Notes

Anartia amathea (Linnaeus) (Lepidoptera, Nymphalidae) : a striking aberration found in Trinidad, West Indies

Trinidad experienced an abnormal wet season in 2022, with the typical 'Petit Careme' (break in the rainfall) being absent. This no doubt affected butterfly numbers, which were noticeably lower than usual in late September/early October. The *Anartia amathea* (Linnaeus), however, which are always a lovely and welcome sight, were abundant. Barcant (1970) stated that it was "easily the commonest butterfly in Trinidad, inhabiting every nook and corner of the island where flowers bloom". Despite being so common, the male in particular is a most handsome butterfly with its bold red coloration against a black background, the female being more subdued. Since I first started studying Trinidad butterflies in the mid-1990s, I must have seen many thousands of this butterfly, yet I have never seen any significant variation in their markings. Some Trinidad specimens with regular markings are shown below in Fig.1.

On 1 October 2022 at around mid-day, I was studying butterflies along a track in Inniss Field, South Trinidad when I came across the melanic form shown in Fig.2. on on flowers of the Railway Daisy/Spanish Needle *Bidens alba.*

Fig. 1. Specimens of typical *Anartia amathea* from Trinidad. Male (left), female (right), dorsal views (top), ventral views (bottom).

Fig. 2. Male *Anartia amathea*, melanic form, Innis field October 2022, dorsal (left) and ventral (right) views.

Fig. 3. Male *Anartia amathea*, melanic form dorsal view; Guayaguayare September 1932 (Angostura-Barcant Collection).

There is a similar aberration held in the Angostura-Barcant collection, shown here in Fig.3. This was found by Malcolm Barcant at Guayaguayare, Trinidad, September 1932 and marked as 'rare aberration'. In addition, Scott Alston Smith (personal communication) advises that he has seen a totally black aberration of *A.amathea* from Trinidad in the collection of the late Clive Ulrich. Thus, it seems that despite the vast numbers of this butterfly seen in Trinidad and Tobago, aberrations are rarely encountered.

REFERENCES

Barcant, M. 1970. Butterflies of Trinidad and Tobago. London: Collins. 314 p.

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Eurema agave (Cramer) (Lepidoptera: Pieridae: Coliadinae). Rare in Trinidad and beyond, or just overlooked?

There were five different species of *Eurema* recorded for Trinidad in Cock (2014), one of which, (*albula* Cramer) has since been re-classified as *Abaeis* (Zhang *et al.* 2019). An additional three species of the closely related genus *Pyrisitia* were also treated as *Eurema* in Barcant (1970). Four of this group, *Abaeis albula*, *Eurema elathia*, *Pyrisitia leuce* and *P. venusta*, are amongst the most common butterflies found in Trinidad. *Eurema agave* is rare but is very similar in appearance to *A. albula* and might have been overlooked.

On 24 September 2022 at around midday, I was observing butterflies along the roadside about a quarter of a mile past the entrance to the Asa Wright Nature Centre, in the Northern Range of Trinidad. I saw a *Eurema* butterfly settled on a *Bidens alba* flower which looked a little 'different', so kept it as a specimen for further examination. After closer inspection I concluded it was *Eurema agave agave*, a species I had not seen in Trinidad in my 25 years of studying Trinidad butterflies.

I reported my find to Matthew Cock, and he was initially sceptical that it would be *E. agave* because although he had treated *E. agave* as a Trinidad butterfly in his 2014 checklist without question, he had since studied photographs of the *E. agave* specimens in the Angostura-Barcant collection, Port of Spain, which appeared to be *Abaeis albula marginella* (C. Felder & R. Felder), albeit with reduced black markings. So, he had concluded that *E. agave* may not in fact be a Trinidad species. However, I sent images of my specimen's dorsal and ventral views to Matthew and he agreed it did indeed appear to be *E. agave agave*. I subsequently set the specimen, shown in Fig.1 below.

Fig.1. *Eurema agave agave* male dorsal (left) and ventral (right) views. Near Asa Wright Nature Centre, Trinidad 24 September 2022.

I returned to the same locality over several days in late September/ early October 2022, but the weather was poor and the roadside vegetation had been cut down, and no further *E. agave* were seen.

I visited the Angostura-Barcant collection, and it was clear to me that all the specimens on display as *E. agave* are indeed *A. albula* with reduced black markings. Barcant (1970) stated that (over his many decades studying Trinidad butterflies) he had only ever found two *E. agave*, yet there are nine specimens on display in his collection labelled *E. agave*. These specimens are dated between 1965 and 1969, so possibly added after his book was finalised, or these lightly marked specimens of *A. albula* were erroneously placed against *E. agave* after Barcant had sold the collection to Angostura in 1974. The image in Barcant's book that is labelled as *E. agave* (see Barcant (1970); Plate 22, Fig 1) is in fact a specimen of *A. albula*. Also, the description of *E. agave* in his book matches variations of *A. albula* rather than *E. agave*, as he states that there is just a smudge of grey at the base of the forewing costa. Various forms of *A. albula marginella* are shown in Fig.2. Thus, it seems likely that Barcant himself never came across *E. agave* in Trinidad.

Kaye (1904) reported the first and only record of *E. agave* in Trinidad at that time, from Verdant Vale in 1896. His revised checklist (Kaye 1921) still refers to just one specimen. The Kaye collection is now held at the McGuire Center for Lepidoptera and Biodiversity, USA, who supplied the image below in Fig.3, which shows the original Kaye specimen on the left (a male), a specimen dated 1969 from 'Buckfield' (a female), and a specimen on the right dated 1981 (a female) from Wallerfield collected by June and Floyd Preston, reported in Preston and Preston (1983).

Eurema agave, like *A. albula,* has pure white dorsal wings with black borders. The best distinguishing feature of *E. agave* is the grey speckled bar on the costa of the forewing which extends from the base of the wing to just short of

Fig.2. *Abaeis albula marginella*. from various Trinidad localities showing variation in size and markings.

Fig.3. *Eurema agave agave*. Trinidad specimens held at the McGuire Center for Lepidoptera and Biodiversity.

the black border at the apex. In *E. agave* the black border on the forewing extends down along the termen, always terminating fairly squarely on reaching vein 2, leaving a gap to the tornus. In contrast, *A. albula* sometimes has grey speckling at the base of the dorsal forewing, but it only ever extends a short distance along the costa. Furthermore, the black border on the dorsal forewing of *A. albula* usually extends all the way to the tornus, although on variations where the band falls short of the tornus it usually tapers off more pointedly, and there is no consistency as to where the band extends. The dorsal hindwing of *E. agave* on specimens seen, often just shows a hint of black 'smudging' along the termen. The forewings of *E. agave* also appear to be more elongated than *A. albula*, and overall, the wing shapes differ.

Some lightly marked females of *Eurema daira* (Godart) and *Eurema elathea* (Cramer) could also be possibly confused with *E. agave*, but they are both a creamy white, and their speckled band extends right across the forewing costa as far as the black border.

Based on the specimens in the McGuire collection and my own, the two females of *E. agave agave* appear to be very similar to males, though they seem to have slightly more light dusting of grey on dorsal hindwing termen. But further specimens would be needed of both sexes to see if these features are consistent in Trinidad.

Matthew Cock has spent many years researching Trinidadian butterflies, and local collectors Scott Alston Smith and Charles De Gannes have been studying Trinidadian butterflies for decades. Yet they have to date never come across *E. agave*. Matthew Cock advises that there are no *E. agave* specimens in the University of the West Indies Zoology Museum.

There is perhaps a parallel in Costa Rica. DeVries (2007) did not include *E. agave* as a Costa Rican species. Austin (1992) reported *E. agave* specimens dated 1986. Cordoba-Alfaro and Murillo-Hiller (2011) reported that two subspecies of *E. agave* exist in Costa Rica, and also stated that a specimen of *E. agave* collected in 1987 was found in the National Museum of Costa Rica, curated as *Eurema daira eugenia*. But the paper also reports that *E. agave* from Costa Rica had been described and illustrated as far back as Godmin and Salvin (1889-1890), who recorded it as its synonym *Terias mana* (Boisduval). The above demonstrates that confusion with this species has not been restricted to Trinidad.

Eurema agave is not included in the treatment of the butterflies of Suriname by Gernaat *et al.* (2012), but could well be found there, since it is found in Venezuela and French Guiana. Andrew Neild confirms (pers com) its presence in Venezuela, though he adds that it is uncommon and again probably overlooked.

There are currently three subspecies of *E. agave* accepted. *Eurema agave millerorum* (Llorente and Luis) with a range from south-east Mexico to Costa Rica, *E. agave agave* from Costa Rica to more northerly countries of South America (records seen for Venezuela, Ecuador, Colombia, Peru, French Guiana and Costa Rica), and *E. agave pallida* (Chavannes) found in southern Brazil and northern Argentina (Klimaitis *et al.* 2018).

Subspecies *millerorum* and *agave* are fairly similar, though *millerorum* apparently never has any black markings on the dorsal hindwing (based on the limited specimens I have seen from Mexico, Costa Rica, Ecuador, Venezuela, Peru and French Guiana). The single specimen of *E. agave pallida* shown on the Butterflies of America (BOA) website (Warren *et al.* 2017) shows much bolder yellow ventral coloration, and the dorsal forewing grey mottled band is

less pronounced. D'Abrera (1981) stated that ssp. *pallida* lacks the forewing costal band, but specimens seen from Argentina have it and as stated the specimen on BOA from Brazil has it, albeit less prominent.

To my knowledge the life history and early stages of *E. agave* have not been recorded. Beccaloni e*t al.* (2008) gave the larval foodplant in Trinidad as *Senna bacillaris*, but this record was supplied by Matthew Cock, who confirms that this should have been attributed to *A. albula*, not *E. agave*. They also reported *Cassia* spp. as foodplant for 'Neotropics'. However, it seems likely that the foodplant of *E. agave* in Trinidad could be *Senna, Mimosa, Cassia* or other similar *Fabaceae*, as these are the larval foodplants of some other Trinidadian *Eurema* species.

I conclude that *Eurema agave*, as in other countries, is far less common than other species of *Eurema*, for reasons unknown, though it has undoubtedly been overlooked due to its similarity to *A. albula* and possibly other species. Whilst there may well be further specimens in collections and museums, currently I am only aware of the three Trinidad specimens in the McGuire collection plus my recent specimen, so just four since 1896.

Footnote :- I alerted Scott Alston Smith to the specimen of *E. agave* that I found, and he has actively been looking for further individuals since. This paid off on 9 January 2023, when he found a single specimen atop a leaf at the roadside at Innis Field. This is the first known record from South Trinidad.

In January 2023, over a three-week period, I netted and released every white *Eurema* I saw at localities all over the island, but none were *E. agave.*

Thanks to Andrew Warren at the McGuire Center for providing and allowing use of the image of their Trinidad *E. agave* specimens, Andrew Neild for his information regarding *E. agave* in Venezuela and Ecuador and for his review and corrections to this paper, to Angostura Ltd, Port of Spain for their assistance regarding the Angostura-Barcant collection and to Matthew Cock for his input and guidance.

REFERENCES

Austin, G.T. 1992. New and additional records of Costa Rican Butterflies. *Tropical Lepidoptera*, 3: 25-33.

Barcant, M. 1970. Butterflies of Trinidad and Tobago. London: Collins. 314 p.

Beccaloni, G.W., Viloria, A.L., Hall, S.K. and **Robinson, G.S.** 2008. Catalogue of the Hostplants of the Neotropical butterflies. Catálogo de las Plantas huésped de las Mariposas Neotropicales. (Monografías del Tercer Milenio,Vol. 8). Zaragoza, Spain: Sociedad Entomológica .Aragonesa. 536p.

Cock, M.J.W. 2014. An updated and annotated checklist of the larger butterflies (Papilionoidea) of Trinidad, West Indies: Papilionidae, Pieridae and Nymphalidae. *Insecta Mundi*, 0353: 1-41.

Cordoba-Alfaro, J. and **Murillo-Hiller, L.R.** 2011. Presence and distribution of two sub-species of *Eurema agave* (Lepidoptera, Pieridae) in Costa Rica . *Revista Peruana de Biologia,* 18: 133-134.

D'Abrera, B. 1981. Butterflies of the Neotropical region. Part 1 Papilionidae & Pieridae. Melbourne, Australia: Lansdowne Editions. xvi + 172 p.

DeVries P.J. 1987. The Butterflies of Costa Rica and their Natural History: Papilionidae, Pieridae, Nymphalidae. New Jersey, USA: Princeton University Press. 327 p.

Gernatt, H.B.P.E, Beckles, B.G. and **Andel, T. Van.** 2012. Butterflies of Suriname: a natural history. Amsterdam:Kit Publishers. 680p.

Godman F.D. and **Salvin, O.** 1889-1890. Biologia Centrali-Americana. Zoologia. Insecta. Lepidoptera. Rhopalocera. Vol I. London:

Kaye, W.J. 1904. A catalogue of the Lepidoptera Rhopalocera of Trinidad. *Transactions of the Entomological Society of London,* 1904: 159-224.

Kaye, W.J. 1921. A catalogue of the Trinidad Lepidoptera Rhopalocera (butterflies*). Memoirs of the Department of Agriculture, Trinidad and Tobago*, *2*: 163 p.

Klimaitis, J. F. *et al*. 2018 Mariposas - Butterflies - Argentina Guía de Identificación**.** Vázquez Mazzini Eds.

Preston, J.D. and **Preston, F.W.** 1983. Trinidad. p. 34-35. In: 1982 Season Summary. Zone 10. South America. *News of the Lepidopterists' Society*, 1983: 13-35.

Warren, A.D., Davis, K.J., Stangeland, E.M., Pelham, J.P., Willmott, K.R. and **Grishin, N.V.** 2017. Illustrated Lists of American Butterflies (North and South America) 21-XI-2017. [Online]. Available at https://www.butterfliesofamerica.com/L/Neotropical.htm (Accessed 7 November 2022)

Zhang, J., Cong, G., Shen, J., Opler, P.A. and **Grishin, N.V.** 2019. Changes to North American butterfly names. *The Taxonomic Report of the International Lepidoptera Survey*, 8: 11 p.

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New records and defensive behaviour of a rarely seen tarantula, *Trichopelma coenobita* (Simon, 1889) on Trinidad, West Indies

The subfamily Trichopelmatinae of the family Theraphosidae Thorell, 1869 (tarantulas) comprise 31 described species. They are known only from the New World, particularly the Caribbean, Central and South America (Mori and Bertani 2020). However information on the ecology and behaviour of this group is sparse.

Trichopelma coenobita was originally described as *Stothis coenobita* Simon 1889, based on a female specimen from Venezuela. Decades later, a male *T. coenobita* was described for the first time, thanks to a new observation of a male-female pair on Trinidad in February 1964. In this report, we present two additional observations of this tarantula species on Trinidad, expanding its known geographic distribution. These findings supplement the following earlier records of their presence on the island: January 1945 and February 1968, location 10°21'N, 61°13'W; 10-22 February 1964 -Arima Valley; and 14-26 July 1978 - Blanchisseuse (Mori and Bertani 2020). West (1984) misidentified a specimen of *T. coenobita* from the Textel Station, Blanchissuese Road, as *Cyriocosmus elegans,* which also occurs there (Sherwood *et al.* 2022).

Most striking is the number of distinctive physical features, most notably the abdominal pattern, that distinguish *T. coenobita* from other sympatric theraphosids.

Although Mori and Bertani (2020) described their physical characteristics in detail, not much could be said about *Trichopelma coenobita* reproduction, natural behaviour, prey preference and hunting strategies or conservation status.

Observations

On 26 June 2021, at approximately 1955h, while exploring the forests near the lookout, west of Maracas Beach, S.E. George (SEG) observed and photographed a small, patterned tarantula sitting very still on a leaf. This was later identified as *Trichopelma coenobita* by D. Sherwood (DS) (Fig. 1). While attempting to photograph the tarantula, the leaf on which it was sitting was disturbed. SEG then observed the tarantula retract all its appendages tightly to its body, forming almost a spherical shape and protecting its cephalothorax. This appears to be the first report of defensive behaviour in *T. coenobita.*

Another independent observation of this tarantula was made by T. Prime near Biche Forest on 21 November 2022 at approximately 1818h (iNaturalist observation 172424869, Fig 2). This represents another new distribution record. According to the information received, this specimen was much smaller and was likely a juvenile. It was found under a rock, and it displayed the same defensive behaviours as previously described.

In recent years, little to no research has been done on the ecology of theraphosids in Trinidad and Tobago, which could be one reason why distribution and ecological data on *T. coenobita* is so limited.

These new distribution records, and the first behavioural observations of the genus contribute towards a better understanding of the ecology of this poorly known species.

Fig. 1. Dorsal view of *Trichopelma coenobita* at the lookout west of Maracas Beach, Trinidad. June 2021. Photo by S.E. George.

Fig. 2. Dorsal view of *T. coenobita* in defensive posture near Biche, Trinidad. November 2022. Photo by T. Prime.

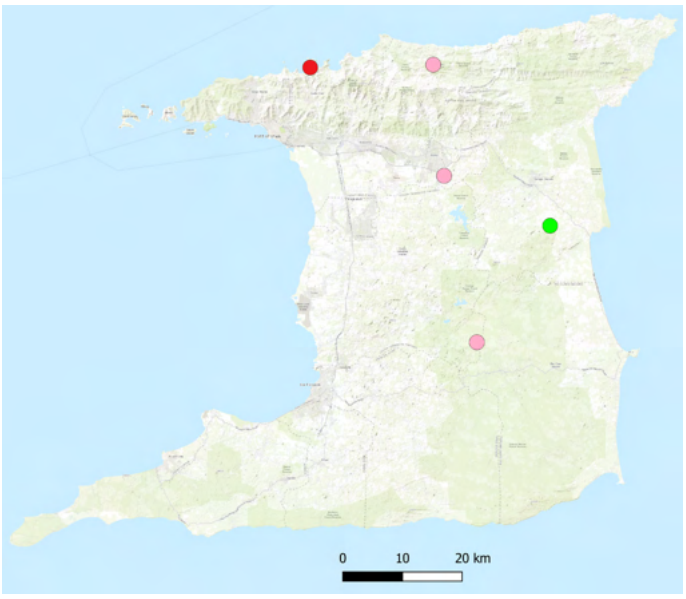

Fig. 2. Distribution of *Trichopelma coenobita* on Trinidad based on previous records and recent observations described in this work. Red circle = new observation by S.E. George reported herein, pink circles = previous literature records (Mori & Bertani, 2020), green circle = general locality of second new observation by T. Prime.

REFERENCES

Mori, A. and **Bertani, R**. 2020. Revision and cladistic analysis of *Psalistops* Simon, 1889, *Trichopelma* Simon, 1888 and *Cyrtogrammomma* Pocock, 1895 (Araneae: Theraphosidae) based on a cladistic analysis of relationships of Theraphosidae, Barychelidae and Paratropididae. *Zootaxa*, 4873: 1-132.

Sherwood, D., Guadanucci, J.P.L. and **Gabriel, R**. 2022. On the lectotype and paralectotype males of *Neoholothele incei* (F. O. Pickard-Cambridge, 1899) and further records of *Spinosatibiapalpus trinitatis* (Pocock, 1903) from the Natural History Museum, London (Araneae: Theraphosidae). *Arachnology*, 19: 644-649.

West, R. 1984. An introduction to the tarantula spiders of Trinidad, W.I. *Living World, Journal of the Trinidad & Tobago Field Naturalists' Club*, 1983–1984: 54–58.

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iNaturalist observations document the biology of *Napata terminalis* (Walker) (Lepidoptera, Erebidae, Arctiinae, Arctiini, Ctenuchina) in Trinidad, West Indies

iNaturalist (https://www.inaturalist.org) is an image-sharing platform that facilitates the sharing and identification of images of animals and plants. In the last two years, this has brought together images that document the previously unreported biology of *Napata terminalis* (Walker) (Lepidoptera, Erebidae, Arctiinae, Actiini, Ctenuchina) in Trinidad.

Napata terminalis is the type species of *Napata* Walker, 1854. Hampson (1898) treated *Uranophora* Hübner, 1831 as a synonym of *Napata*, overlooking that *Uranophora* is the older name and should have precedence. Nevertheless, *Napata* remained in use until Grados (1999) switched to treat *Napata* as a junior synonym of *Uranophora*. Since then, Cerda (2017) clarified that both genera are valid, and so the combination *Napata terminalis* is appropriate.

Kaye and Lamont (1927) recognized two species of *Napata* from Trinidad: *N. terminalis* and *N. leucotelus* Butler. Based on a series of 60 males and 21 females from Trinidad, Fleming (1959) concluded that these should be treated as one species – at least in Trinidad, for which the oldest available name was *N. terminalis*. However, subsequent authors continued to treat the Central American *N. leucotelus* as a valid species. Cerda (2017) treated *N. terminalis* as widespread in South America, but as he had not dissected any material from Central America for comparison, maintained *N. leucotelus* as a valid species. Matthew J.W. Cock (MJWC) compared Trinidad material with the type of *N. terminalis* (♂ Pernambuco, Brazil) and specimens curated as this species in the collection of the Natural History Museum, London.

This identification was further refined by obtaining a cox1 DNA barcode (Hebert *et al.* 2003) from a specimen collected by Tarran P. Maharaj (TPM) (South Oropouche, 11 December 2021, iNaturalist observation 102902387, Fig. 14). The Trinidad sequence (MJWC-523) was compared with sequences in the Barcode of Life database (Hebert *et al.* 2003; www.boldsystems.org). It formed part of Barcode Index Number BOLD:AAA4698, (Ratnasingham and Hebert 2013, Miller *et al.* 2016), which includes sequences from Mexico, Costa Rica, Panama, Colombia and Peru, those from Costa Rica and Panama being mostly identified as *N. leucotelus*. This result supported Fleming's (1959) conclusion, and we maintain the use of the name *N. terminalis* for the species in Trinidad.

Napata terminalis is a common and widespread moth in Trinidad, although it is not known from Tobago (Cock 2017). It is frequently seen in suburban areas and is the most frequently photographed species of Ctenuchina on iNaturalist (2022). Adults can be recognised by their small size (wingspan 24–25 mm), black colour with extensive hyaline areas on the forewing, white tip to the forewing, metallic green markings on dorsal body and base of dorsal forewings, and a broad white ventral stripe from head to just short of the end of the abdomen. We have not located any previous accounts of the life history.

On 20 November 2020 at mid-day, Venkata Siva Gosula and Aditya Gosula observed a female *N. terminalis* oviposit (iNaturalist observation 65333474, Fig. 1) on a leaf of a small, low-growing sedge (*Kyllinga pumila* Michx., Cyperaceae) in the lawns at Mt. Hope (iNaturalist observations 65333474, 129029672, Figs. 3–4). The egg was laid singly, adjacent to the leaf margin, and it was small, whitish and domed (iNaturalist observation 65333474, Fig. 2).

Margaret Chin Sue Min (MCSM) found a small caterpillar on a different sedge, *Cyperus simplex* Kunth (Fig. 5–6), in her yard in St. Joseph on 18 July 2022 (iNaturalist observation 126856702, Fig. 7). When she searched for it again on 21 July, she found a larger caterpillar, which was probably a later instar of the same species, feeding on a sedge leaf (iNaturalist observation 127213181, Fig. 8). This caterpillar (Figs. 9–10) was taken into captivity for rearing and after feeding on sedge leaves, it formed a cocoon on 23 July (iNaturalist observation 127514730, Fig. 11) and a male emerged on 29 July (iNaturalist observation 128440870, Figs. 12–13).

Although we cannot be completely certain that the caterpillar of 18 July belongs to the same species, it does resemble the immature caterpillars of other Ctenuchina, so there is a strong probability that it is the same species, if not the same individual. It was about 9 mm long, brownish with mixed short and long white hairs, longest at the anterior and posterior ends (Fig. 7).

The caterpillar collected on 29 July (Figs. 8–10) was about 22 mm long; head black; body blackish, with a broken white dorsolateral line from thoracic segment 3 to abdominal segment 7, a matching irregular off-white ventrolateral line, and a dark spot on each segment above this; the hairs mixed white, dark or dark with the distal part white; grouped into a dorsal tuft of dark hairs on thoracic segment 3 and abdominal segment 7; true legs dark.

The cocoon was 12 mm long, very flimsy and incorporated the caterpillar hairs, some of which have been placed erect on the substrate around the edge of the cocoon (Fig. 11). The pupa was dark brown within the cocoon, but no details were visible.

Adults fly by day, when they are occasionally seen

attracted to flowers (Figs. 15–17) and drying heliotrope (Beebe 1955, MJWC observations), and at night when they are attracted to lights (MJWC observations, Fig. 14). Nectar flowers recorded in Trinidad include *Austroeupatorium inulifolium* (Kunth) R.M. King & H. Rob. (♂ Cat's Hill, 24 September 2019, J. Morrall), *Bidens alba* (L.) DC. (St. Joseph, 20.xi.2021 15.30–14.00 h, MCSM; iNaturalist observation 101561586, Fig. 16), *Parthenium hysterophorus*

Figs. 1–17. Biology of *Napata terminalis*. **1**, female ovipositing on *Kyllinga pumila*. **2**, newly laid ovum arising from Fig. 1. **3–4**, *Kyllinga pumila* details. **5–6**, *Cyperus laxus*. **7**, immature caterpillar, dorsal view. **8**, final instar caterpillar feeding on leaf of *C. laxus*. **9**, final instar caterpillar, lateral view. **10**, final instar caterpillar, dorsolateral view. **11**, cocoon with pupa visible in lateral view. **12–13**, newly emerged male dorsal and ventral views. **14**, male attracted to light by night. **15**, adult nectaring on *Parthenium hysterophorus*. **16**, adult nectaring on *Bidens alba*. **17**, adult nectaring on *Varronia curassavica*.

L. (♀ South Oropouche, Mon Desir, 5 May 2021 14.04 h, TPM; iNaturalist observation 77598459, Fig. 15), and *Varronia curassavica* Jacq. (South Oropouche, Mon Desir, 11 January 2022, 09.38 h, TPM; iNaturalist observation 104760029, Fig. 17).

This may be the first partial documentation of the life history of *N. terminalis*. Janzen and Hallwach's (2022) database of Lepidoptera rearing in Costa Rica indicated that *N. leucotelus* has been reared from sedges, *Scleria gaertneri* Raddi (= *S. melaleuca*) 19 times and once from *Cyperus esculentus* L. They included photos of a cocoon containing a prepupa, from which it can be seen that the caterpillar has dark hair tufts (as shown here, Figs. 8–10), but as the cocoon is not complete it is not clear how these hairs might be arranged in the completed cocoon.

Since we now know that the caterpillars feed on low-growing weedy sedges, it has become apparent why this species is so frequently seen and photographed around houses in Trinidad.

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REFERENCES

Beebe, W. 1955. Two little-known selective insect attractants. *Zoologica* 40: 27-32, pl. 1-4.

Cerda, J.-A. 2017 Ctenuchina de Guyane française Lepidoptera, Erebidae, Arctiinae, Arctiini (partie 1). *Mémoires de la Société Linnéenne de Lyon* 7: 181 p., ii, 20 pl.

Cock, M.J.W. 2017. A preliminary catalogue of the moths (Lepidoptera except Papilionoidea) of Tobago, West Indies. *Insecta Mundi* 0585: 1-58.

Fleming, H. 1959. The Ctenuchidae (Moths) of Trinidad, B.W.I. Part II. Ctenuchinae. *Zoologica* 44: 85-104, pl. 1-3.

Grados, J. 1999. Lista preliminar de los Ctenuchinae (Lepidoptera: Arctiidae) de la Zona Reservada Tambopata-Candamo, Madre de Dios, Perú. *Revista Peruana de Entomologia* 41: 9-14.

Hampson, G.F. 1898. Catalogue of the Syntomidae in the collection of the British Museum. Catalogue of the Phalaenae in the collection of the British Museum. Volume I. London: Trustees of the British Museum. xxi, 559 p., pl. 1-17.

Hebert, P.D.N., Cywinska, A., Ball, S.L. and **deWaard, J.R.** 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society (London), Series B Biological Sciences* 270: 313-321.

iNaturalist (2022) Observations of *Napata terminalis* from Trinidad & Tobago. [Online]. Available at https://www.inaturalist.org/observations?place_id=7375&taxon_id=972060&verifiable=any (Accessed 29 July 2022).

Janzen, D. H. and **Hallwachs, W.** 2022. Dynamic database for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), northwestern Costa Rica. [Online]. Available at http://janzen.sas.upenn.edu (Accessed 29 July 2022).

Kaye, W.J. and **Lamont, N.** 1927. A catalogue of the Trinidad Lepidoptera Heterocera (moths). *Memoirs of the Department of Agriculture, Trinidad and Tobago* 3: 144 pp.

Miller, S.E., Hausmann, A., Hallwachs, W. and **Janzen, D.H.** 2016. Advancing taxonomy and bioinventories with DNA barcodes. *Philosophical Transactions of the Royal Societ B* 371: 20150339.

Ratnasingham, S. and **Hebert, P.D.N.** 2013 A DNA-based registry for all animal species: the Barcode Index Number (BIN) System. *PLoS ONE* 8: e66213. doi:10.1371/journal.pone.0066213.

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Predation of a Three-lined Snake *Atractus trilineatus* by a Trinidad Black-backed Snake *Erythrolamprus melanotus nesos*

Erythrolamprus melanotus nesos (Dixon and Michaud, 1992), commonly known as the Trinidad Black-backed Snake or Beh Belle Chemin (in Trinidad) or Doctor Snake (in Tobago) is endemic to Trinidad & Tobago (Murphy *et al.* 2018). It is widely distributed across the islands and reaches a length of about 600 mm SVL (snout-vent length), inhabiting forests and forest edges closely associated with streams and ponds (Murphy *et al.* 2018). It is a diurnal snake that feeds on frogs, lizards and fish (Murphy *et al.* 2019). However, unlike other *Erythrolamprus* species in the country, snakes have not previously been reported as part of its diet (Murphy *et al.* 2018).

The Three-lined Snake, *Atractus trilineatus* (Wagler, 1828), is a very distinctive reddish-brown (in females), and greyish-brown (in males) snake easily recognized by a three-lined pattern of dorsal and lateral stripes (Murphy *et al.* 2020). It is distributed throughout Trinidad and Tobago, Little Tobago, and the Bocas Islands and is known from Venezuela and northern Brazil (Murphy *et al.* 2018). It is a small (250 mm SVL) fossorial (burrowing) snake that inhabits forests, savannas and urban areas and is often found under leaf litter, compost heaps, rocks, boards and other debris lying on the ground (Murphy *et al.* 2018). *A. trilineatus* is a nocturnal snake and is known to be predated on by *Erythrolamprus ocellatus* and *Micrurus circinalis* (Murphy *et al.* 2020).

This note provides the first record of predation of *Atractus trilineatus* by *Erythrolamprus melanotus nesos.* The event was observed on 7 February 2023, at approximately 0917h. near Point Fortin in Trinidad (UTM 641945E, 1123299N). The *E. m. nesos* was recognizable by its bright yellow and black coloration as it lay stretched out and motionless in the shelter of grass swards. It was surrounded by leaf litter and broken branches of a mango tree above. It was located approximately seven metres from a pond measuring about 2.4m wide and reaching 0.76m deep. Upon closer inspection, the *E. m. nesos* was observed to be consuming the *A. trilineatus.* The latter was identified by its conspicuous three-lined pattern and sharply pointed tail.

The author captured the images using a cellular phone (Samsung A03). The author moved within 0.3 metres of the snake, being careful to avoid disturbing the snakes and causing regurgitation. The lower half of the body of *A. trilineatus* was wrapped tightly around the stems of some grasses. *E. m. nesos* was observed tugging and pulling at its prey as it attempted to free it from the entangled grasses (Fig.1). As *E. m. nesos* swallowed the snake, it moved up the body of *A. trilineatus* with its jaws to the part that clung to the grasses (Fig. 2). It then clasped its jaws tightly around the body of the snake before pulling it away from the grasses with a strong tug (Fig. 3). It continued this process traveling up the snake's body and then pulling, until it was eventually freed (Fig. 4) and ultimately consumed. Immediately after the entire body of the *A. trilineatus* entered *E. m. nesos* mouth, the predator slithered away.

Fig. 1. Trinidad Black-backed Snake *Erythrolamprus melanotus nesos* feeding on a Three-lined Snake, *Atractus trilineatus.*

Fig. 2. *E. melanotus nesos* travelled up the body of *A. trilineatus* to the grass stem around which it had wrapped its body.

Fig. 3. *E. melanotus nesos* tugging at the body of *A. trilineatus* to free it of the entangled grass.

Fig. 4. *A. trilineatus* lower body half (pointed tail) finally free of the grass.

This event took approximately nine minutes from first noticing it, to complete consumption. *E. m. nesos* was estimated to be approximately 310 mm SVL. This estimate was made by noting the position of the snake's head and tail on the grasses while it lay motionless, and then measuring this distance with a ruler after it had left.

It is unclear whether *A. trilineatus* was actively foraging during the day, despite being a nocturnal species, or whether *E. m. nesos* happened to encounter the *A. trilineatus* while it took refuge under leaf litter surrounding the site where the snakes were observed. However, their habitat does overlap, which may explain this predation encounter.

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REFERENCES

Murphy, J.C., Downie, J.R., Smith, J.M., Livingstone, S.M., Mohammed, R.S., Lehtinen, R.M., Eyre, M., Sewlal, J-A.N., Noriega, N., Casper, G.S., Anton, T., Rutherford, M.G., Braswell, A.L. and **Jowers, M.J. 2018.** A Field Guide to the Amphibians and Reptiles of Trinidad and Tobago. Trinidad and Tobago Field Naturalists' Club, Port of Spain 336 p.

Murphy, J.C., Braswell, A.L., Charles, S.P., Auguste, R.J., Rivas, G.A., Lehtinen, R.M. and **Jowers, M.J.** 2019. A new species of *Erythrolamprus* from the oceanic island of Tobago (Squamata, Dipsadidae). *Zookeys*, 817: 131.

Murphy, J.C., Salvi, D., Braswell, A.L. and **Jowers, M.J**. 2020. Morphology and natural history of Three-lined Snakes, *Atractus trilineatus* (Squamata, Dipsadidae), in the Eastern Caribbean. *Reptiles & Amphibians*, 26: 189-196.

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Great Egret *Ardea alba* preys on Smooth-billed Ani *Crotophaga ani* in Tobago, West Indies

On 21 November 2022, at approximately 0830h, I was birding at the Centre Street Ponds, Canaan, Tobago. A Smooth-billed Ani *Crotophaga ani* landed near the water, possibly to take a drink, in close proximity to a Great Egret *Ardea alba*. The egret stealthily moved in on the ani and captured it. The egret then bashed it around until the ani was still. The egret then made several attempts to position the ani in its bill so it could be swallowed (Fig. 1). Meanwhile, another Great Egret flew in next to the first egret, and attempted to steal its prey. The first egret flew off to the other side of the pond with the ani, where it finally swallowed it, undisturbed.

This observation appears to be the first record of a Great Egret preying on a Smooth-billed Ani. Quinn and Startek-Foote (2020) mention the Smooth-billed Ani being taken as prey by some raptors, but not by egrets or herons. Anis are gregarious and employ a sentinel system with one bird usually positioned at an open, elevated site (Quinn and Startek-Foote 2020). The sentinel presumably warns others of raptors above. In the case at hand, one lone individual ani may have left the group and come to the water's edge for a drink, and in this vulnerable moment was snatched by the much larger, statue-like, opportunistic Great Egret. McCrimmon *et al.* (2020) documented a variety of prey species of the Great Egret, including insects, fishes, frogs, snakes, small mammals, and a few species of birds. The southeast Asian subspecies *A. a. modesta* has been observed preying on crakes *Porzana*, kingfishers *Halycon*, sparrows *Passer*, white-eyes *Zosterops*, swallows *Hirundo*, and terns *Sterna*, and the African subspecies *A. a. melanorhynchos* has been observed feeding Common Gallinule *Gallinula galeata* to chicks (McCrimmon *et al.* 2020).

On 23 February 2023 I was again at the ponds in Canaan, when I saw a Great Egret attempting to swallow a dead Carib Grackle *Quiscalus lugubris*. Photos of this encounter are posted on eBird https://ebird.org/checklist/S129488758. I could not determine whether the Egret killed the grackle or attempted to scavenge a dead individual. In light of the previous observation, this could have been the same Great Egret that captured the Smooth-billed Ani.

Fig. 1. Great Egret eating a Smooth-billed Ani, Canan Tobago, 21 November 2022. Photo Matt Kelly.

REFERENCES

McCrimmon J.D.A. Jr., Ogden, J.C., Bancroft, G.T., Martínez-Vilalta, A., Motis, A., Kirwan, G.M., and **Boesman, P.F.D.** 2020. Great Egret (*Ardea alba*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. [Online] Available at https://doi.org/10.2173/bow.greegr.01 (Accessed 22/01/23)

Quinn, J.S. and **Startek-Foote, J.M**. 2020. Smooth-billed Ani (*Crotophaga ani*), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. [Online] Available at https://doi.org/10.2173/bow.smbani.01 (Accessed 22/01/23)

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Laughing Gull *Leucophaeus atricilla* preys on a Yellow-bellied Elaenia *Elaenia flavogaster* in Tobago, West Indies

On 14 March 2010, I witnessed a Laughing Gull *Leucophaeus atricilla* with a Yellow-bellied Elaenia *Elaenia flavogaster* in its bill on the shoreline vegetation near the jetty on Little Tobago Island, Tobago. The elaenia was struggling to escape. The gull thrashed the elaenia and then flew with its prey to the edge of the surf, where it bashed the elaenia in the water until it appeared to be dead, then the gull swallowed it whole.

The Laughing Gull is described as having a "broad diet" of "aquatic and terrestrial invertebrates, including earthworms, flying insects, beetles, ants, and other insects, snails, crabs, crab eggs, crab larvae, fish, squid, eggs and downy tern chicks" (Burger 2020). There is no documentation listed of the gull taking other birds. It is possible that the elaenia was sick, injured, or in some other distress, which enabled the opportunistic Laughing Gull to take advantage of its unfortunate situation.

Fig. 1. Laughing Gull eating a Yellow-bellied Elaenia, Little Tobago, Tobago WI, 14 March 2010. Photo Matt Kely.

REFERENCES

Burger, J. 2020. Laughing Gull (*Leucophaeus atricilla*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. [Online] Available at https://doi.org/10.2173/bow.laugul.01 (Accessed 22/01/23).

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Predation by an Oliver's Parrot Snake *Leptophis coeruleodorsus* on a Veined Tree Frog *Trachycephalus typhonius* in Trinidad, West Indies

Oliver's Parrot Snake *Leptophis coeruleodorsus*, previously *L. ahaetulla coeruleodorsus* (Murphy *et al.* 2013), is a large, slender, arboreal and diurnal snake inhabiting forests and forest edges of eastern Colombia, Venezuela and Trinidad and Tobago (Murphy 1997, Boos 2001, Mumaw *et al*. 2015, Murphy *et al.* 2018, de Albuquerque and Fernandes 2022). It reportedly preys on frogs, lizards, snakes and small birds (Mole and Urich 1894, Mole 1924, Beebe 1946, Oliver 1948, Emsley 1977, Boos 2001, Hayes 2002, Murphy *et al.* 2013, Mumaw *et al.* 2015), but few of its prey have been identified to genus or species; Oliver (1948) identified a Boddaert's Tropical Racer *Mastigodryas boddaerti* from an unknown locality, Hayes (2002) identified three species of birds in Trinidad, Murphy *et al.* (2013) identified a *Thecadactylus* gecko in Trinidad and Mumaw *et al*. (2015) identified an Emerald-eyed Tree Frog *Boana crepitans* and a Greater Hatchet-faced Tree Frog *Sphaenorhynchus lacteus* in Venezuela. Mumaw *et al.* (2015) also reported an Oliver's Parrot Snake attempting to prey on a Veined Tree Frog *Trachycephalus typhonius*, previously *Phrynohyas venulosa* and *T. venulosus* (Faivovich *et al.* 2005, Lavilla *et al.* 2010), in Venezuela until it was interrupted by a human observer. In this note, I provide the first documentation of an Oliver's Parrot Snake successfully preying on a Veined Tree Frog.

During the morning of 8 May 2009, a participant in a bird banding workshop heard the distress calls of a frog and spotted a large snake (approximately 1.5 m) with a large frog in its mouth at the William Beebe Tropical Research Station in Simla, Arima Valley, Trinidad (10°41′33.66″N, 61°17′21.88″W). The snake was wrapped around a branch about 8 m above the ground and the frog was grasped by its posterior half. As the frog struggled and emitted distress calls, its weight pulled the snake downward until it was hanging only by its tail (Fig. 1). I climbed up a masonry wall under the tree to obtain a closeup of photos within 2 m of the snake. When the snake detected my presence, it dropped down to a lower branch within 1 m of me and began to regurgitate the frog, which was covered with mucous secretions (Fig. 2). After taking a few more photos, I climbed down the wall and the snake resumed swallowing the frog. After completely swallowing the frog within an hour of our initial observation, the snake climbed higher up into the tree and vanished from our sight.

The snake was identified as an Oliver's Parrot Snake by the combination of its slender body, bright green back, copper lateral stripe, black stripe through the eye, and creamy white ventral surface (Fig. 2; Murphy 1997, Boos 2001, Murphy *et al.* 2018). The frog was identified as a Veined Tree Frog by its paired lateral vocal sacs (Fig. 2), unique among Trinidad's tree frog species (Murphy 1997, Murphy *et al.* 2018).

Fig. 1. An Oliver's Parrot Snake dangling from a limb while grasping a Veined Tree Frog in its mouth.

Snakes of the genus *Leptophis* (taxonomy of the *L. ahaetulla* complex follows de Albuquerque and Fernandes 2022) specialize in preying on tree frogs of the family Hylidae, which comprised 83% of their diet (n = 106) in an early study of all taxa combined (Oliver 1948). Tree frogs comprised 90% of the diet (n = 60) of the Giant Parrot Snake *Leptophis ahaetulla* in northern Brazil (de Albuquerque *et al.* 2007) and 63% of the diet (n = 16) of the parrot snake *Leptophis marginatus* in northeastern Argentina (López *et al.* 2003). It is possible that Oliver's Parrot Snake likewise preys predominantly on tree frogs despite the scarcity of reports.

The Veined Tree Frog has toxic mucous secretions that

Fig. 2. An Oliver's Parrot Snake beginning to regurgitate a Veined Tree Frog. The bright green back, copper lateral stripe, black stripe through the eye and creamy white ventral surface characteristic of an Oliver's Parrot Snake are visible. The paired lateral vocal sacs of the Veined Tree Frog distinguish it from all other tree frog species in Trinidad.

are an antipredator strategy (Delfino *et al.* 2002, Rigolo *et al.* 2008). Although toxic skin secretions successfully foiled predation attempts by a Black-skinned Parrot Snake *Leptophis nigromarginatus* (Yeager *et al.* 2019), a Central American Indigo Snake *Drymarchon melanurus* (Leary and Razafindratsita 1998) and an Ashmead's Banded Cat-eyed Snake *Leptodeira ashmeadii* (Manzanilla *et al.* 1998), the Veined Tree Frog has been successfully preyed upon by several species of snakes, including the parrot snake *L. marginatus* (Prado 2003, de Albuquerque and Di-Bernardo 2005, Clegg 2015), Pacific Coast Parrot Snake *Leptophis diplotropis* (García-Mata *et al.* 2020), Mexican Parrot Snake *Leptophis mexicanus* (Henderson *et al.* 1977), Yellow-bellied Liophis *Erythrolamprus poecilogyrus* (da Silva *et al.* 2003), the Brown Sipo *Chironius fuscus* and potentially other species of the genus *Chironius* (Roberto and Souza 2020, Dias-Silva *et al.* 2021). It remains unknown why the toxic mucous secretions are an effective defense against some snakes but not others.

The distress calls of frogs may also function as an antipredator strategy to startle a predator such as a bird or mammal, warn conspecifics of danger, or attract competing predators who might attempt to prey on the predator or steal the prey, facilitating the victim's escape (Hödl and Gollmann 1986, Schuett and Gillingham 1990, Hopkins and Folt 2019). In this instance and in four previous cases (Leary and Razafindratsita 1998, Prado 2003, Clegg 2015, Yeager *et al.* 2019) the distress calls of the Veined Tree Frog attracted the attention of humans. After hearing the distress calls of a Veined Tree Frog seized by a Central American Indigo Snake, Leary and Razafindratsita (1998) observed at least 17 Veined Tree Frog emerging within a 3 m radius from the crevices and cavities of a tree and orienting towards the distressed frog, presumably in response to its distress calls. These observations suggest that the distress calls of Veined Treefrogs may effectively warn conspecifics and attract secondary predators.

I thank the International Institute of Tropical Forestry for sponsoring my trip to Trinidad to attend a bird banding workshop organized by Joseph Wunderle. I also thank Renoir Auguste, Tommy Hamrick and Saifudeen Muhammad for confirming the identity of the snake and Renoir Auguste and Saifudeen Muhammad for confirming the identity of the frog based on photos posted on iNaturalist and John Murphy for reviewing the manuscript.

REFERENCES

Beebe, W. 1946. Field notes on the snakes of Kartabo, British Guiana, and Caripito, Venezuela. *Zoologica*, 31: 11-52.

Boos, H. E.A. 2001. The snakes of Trinidad and Tobago. Texas A & M University Press, College Station, Texas. 270 p.

Clegg, J.R. 2015. *Leptophis ahaetulla marginatus* (Southern Green Parrot Snake): Behaviour. *Herpetological Bulletin*, 131: 26-27.

da Silva, N.J. Jr., Souza, I.F.E., Silva, W.V. and **Silva, H.L.R.** 2003. Natural history notes. *Liophis poecilogyrus* (Trash-snake). Diet. *Herpetological Review*, 34: 69-70.

de Albuquerque, N.R. and **Di-Bernardo, M.** 2005. Natural history notes. *Leptophis ahaetulla marginatus* (Southern Green Parrot Snake). Diet. *Herpetological Review*, 36: 325.

de Albuquerque, N.R. and **Fernandes, D.S.** 2022. Taxonomic revision of the Parrot Snake *Leptophis ahaetulla* (Serpentes, Colubridae). *Zootaxa*, 5153:1-69.

de Albuquerque, N.R., **Galatti, U.** and **Di-Bernardo, M.** 2007. Diet and feeding behaviour of the Neotropical Parrot Snake (*Leptophis ahaetulla*) in northern Brazil. *Journal of Natural History*, 41: 1237-1243.

Delfino, G., Brizzi, R., Nosi, D., and **Terreni, A.** 2002. Serous cutaneous glands in New World hylid frogs: an ultrastructural study on skin poisons confirms phylogenetic

relationships between *Osteopilus septentrionalis* and *Phrynohyas venulosa*. *Journal of Morphology*, 253: 176-186.

Dias-Silva, F., Mattedi, C., Pontes, R.C. and **Pereira, E.A.** 2021. Predation on the treefrog *Trachycephalus typhonius* (Linnaeus, 1758) by a vine snake (genus *Chironius*) in the Amazon rainforest of northern Brazil. *Herpetology Notes*, 14: 379-382.

Emsley, M.G. 1977. Snakes, and Trinidad and Tobago. *Bulletin of the Maryland Herpetological Society*, 13: 201-304.

García-Mata, E.S., Cruz-Sáenz, D., Rodríguez-López, A., Ríos-Martínez, J.O., Hernández-Dávila, L.A., Lazcano, D. and **Wilson L.D.** 2020. Notes on the herpetofauna of Western Mexico 23: predation by a Pacific Coast Parrot Snake (*Leptophis diplotropis*) on a Milky Treefrog (*Trachycephalus typhonius*) in the municipality Huejutla de Reyes, Hidalgo, Mexico. *Bulletin of the Chicago Herpetological Society*, 55: 101-105.

Faivovich, J., Haddad, C.F.B., Garcia, P.C.A., Frost, D.R., Campbell, J.A. and **Wheeler, W.C.** 2005. Systematic review of the frog family Hylidae, with special reference toHylinae: phylogenetic analysis and taxonomic revision. Bulletin of the American Museum of Natural History, 294: 6-228.

Hayes, F.E. 2002. Predation on birds by snakes in Trinidad and Tobago. *Living World, Journal of the Trinidad and Tobago Field Naturalists' Club*, 2002: 59-61.

Henderson, R.W., Nickerson, M.A. and **Hoevers, L.G.** 1977. Observations and comments on the feeding behavior of *Leptophis* (Reptilia, Serpentes, Colubridae). *Journal of Herpetology*, 11: 231-232.

Hödl, W. and **Gollmann, G.** 1986. Distress calls in Neotropical frogs. *Amphibia-Reptilia*, 7: 11-21.

Hopkins, R. and **Folt, B.** 2019. Screaming calls of *Leptodactylus savagei* (Smoky Jungle Frog) function as an alarm for conspecifics. *Journal of Herpetology*, 53: 154-157.

Lavilla., E.O., Langone, J.A., Padial, J.M. and **de Sá, R.O.** 2010. The identity of the crackling, luminescent frog of Suriname (*Rana typhonia* Linnaeus, 1758) (Amphibia, Anura). *Zootaxa*, 2671: 17-30.

Leary, C.J. and **Razafindratsita, V.R.** 1998. Attempted predation on a hylid frog, *Phrynohyas venulosa*, by an Indigo Snake, *Drymarchon corais*, and the response of conspecific frogs to distress calls. *Amphibia-Reptilia*, 19: 442-446.

López, M.S., **Giraudo, A.R.** and **Arzamendia, V.** 2003. *Leptophis ahaetulla marginatus* (Southern Green Parrot-Snake): diet. *Herpetological Review*, 34: 68–69.

Manzanilla, J., La Marc, E., Villareal, O. and **Sanchez, D.** 1998. Natural history notes. *Phrynohyas venulose* (Veined Treefrog, "Rana Lechosa"). Antipredator device. Herpetological Review, 29: 39-40.

Mole, R.R. 1924. The Trinidad snakes. *Proceedings of the Zoological Society of London*, 94: 235-278.

Mole, R.R. and **Urich, E.W.** 1894. Biological notes upon some of the ophidia of Trinidad B.W.I., with a preliminary list of the species recorded from the island. *Proceedings of the Zoological Society of London*, 499-518.

Mumaw, M.N., González, L.F.E. and **Fernández, M.C.** 2015. Atlas serpientes de Venezuela: una visión actual de su diversidad. Dimacofi Negocios Avanzados S.A., Santiago, Chile. 441 p.

Murphy, J.C. 1997. Amphibians and reptiles of Trinidad and Tobago. Krieger Publishing Company, Malabar, Florida. 245 p.

Murphy, J.C., **Downie, J.R.**, **Smith, J.M.**, **Livingstone, S.M.**, **Mohammed, R.S.**, **Lehtinen, R.M., Eyre, M**., **Sewlal, J-A.N.**, **Noriega, N.**, **Casper, G.S.**, **Anton, T.**, **Rutherford, M.G.**, **Braswell, A.L.** and **Jowers, M.J.** 2018. A field guide to the amphibians & reptiles of Trinidad & Tobago. Trinidad & Tobago Field Naturalists' Club, Port of Spain, Trinidad. 336 p.

Murphy, J.C., Charles, S.P., Lehtinen, R.M., and **Koeller, K.L.** 2013. A molecular and morphological characterization of Oliver's Parrot Snake, *Leptophis coeruleodorsus* (Squamata: Serpentes: Colubridae) with the description of a new species from Tobago. *Zootax*a, 3718: 561-574.

Oliver, J.A. 1948. The relationships and zoogeography of the genus *Thalerophis* Oliver. *Bulletin of the American Museum of Natural History*, 92: 157-280.

Prado, C.P.A. 2003. Natural history notes. *Leptodactylus chaquensis* (NCN), *Pseudis paradoxa* (Paradox Frog), and *Phrynohyas venulosa* (Veined Treefrog). Predation. *Herpetological Review*, 34: 231-233.

Rigolo, J.R., Almeida, J.A., and **Ananias, F.** 2008. Histochemistry of skin glands of *Trachycephalus* aff. *venulosus* Laurenti, 1768 (Anura, Hylidae). *Micron*, 39: 56-60.

Roberto, I.J. and **Souza, A.R.** 2020. Review of prey items recorded for snakes of the genus *Chironius* (Squamata, Colubridae), including the first record of *Osteocephalus* as prey. *Herpetology Notes*, 13: 1-5.

Schuett, G.W. and **Gillingham, J.C.** 1990. The function of scream calling in nonsocial vertebrates: testing the predator attraction hypothesis. *Bulletin of the Chicago Herpetological Society*, 25: 137-142.

Yeager, J., Zarling, A., and **Rodríguez, C.** 2019. Successful multimodal amphibian defence in the neotropical frog *Trachycephalus*, including handling and recovery costs to would-be predators. *Herpetology Notes*, 12: 279-280.

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First record of the Grass Anole *Anolis auratus* in Trinidad, West Indies

The diversification of the lizard genus *Anolis* on Caribbean islands stands as one of the most extensively studied instances of adaptive radiation in evolutionary biology (Losos and Thorpe 2004). Within anole assemblages, species distinctly specialize in occupying various niches (Losos and Thorpe 2004) and *Anolis* are the most speciose genus among reptiles (Poe 2004), boasting over 400 described species and counting (Losos and Thorpe 2004; GBIF 2023). On the islands of Trinidad and Tobago, there exist at least nine *Anolis* species, among which *Anolis planiceps* and *Anolis tigrinus* are indigenous; the remaining seven species have been introduced; *A. aeneus, A. extremus, A. richardii, A.sageri, A. trinitatis, A. wattsi* (Murphy *et al.* 2018), *A. cristatellus* (Auguste *et al.* 2018).

Here we present the first documented instance of *Anolis auratus*, the Grass Anole, on southwest Trinidad, Trinidad & Tobago.

Anolis auratus has a wide distribution ranging from Costa Rica in Central America, through northern South America, including Colombia, Venezuela, northern Brazil and the Guianas (Alvila-Pires 1995; Calderón-Espinosa and Barragán-Contreras 2014; Köhler 2008; Moreno-Arias *et al.* 2021; Rivas *et al.* 2012) and now on the island of Trinidad. *Anolis auratus* is predominantly terrestrial and diurnal (Cunha 1981, Vitt and Carvalho 1995, Mesquita *et al.* 2006).

In the Amazonian regions of Brazil, it occupies spaces with open vegetation alongside the Amazon River, as well as natural and perianthropic pockets of open vegetation in Amapá and Roraima states. In these areas, it frequents the ground, grasses, low vegetation, shrubs, and small trees (Cunha 1981, Vitt and Carvalho 1995, Mesquita *et al.* 2006). In Colombia, its extensive presence across diverse life zones implies an adaptive range across varied environments and microhabitats in different geographic regions. Notably, it seems to favour open spaces, showing a preference for grasslands over denser brushy areas (Calderón-Espinosa and Barragán-Contreras 2014).

According to Fleishman (1988), *A. auratus* shows heightened activity between 0900h and 1200h during the wet season, a pattern observed in Panamanian Grass Anoles. These anoles prefer transient grass habitats, vulnerable to frequent disturbances from human activities or natural processes; if left undisturbed, their habitat can transform into secondary forest within months, rendering it unsuitable for the grass anoles (Fleishman, 1988). Consequently, *A. auratus* exhibits adaptability by relocating to nearby territories, typically waiting for their previous habitat to regrow before returning (Fleishman, 1988).

A. auratus is recognizable by the pale grey-brown coloration of the upper body, highlighted by a prominent white stripe that extends from below the eye to the middle of the body and curves over the ear. The tibia has a dark area with lighter edges, blackish patches on either side near the hind limb, and white lower parts. The gular appendage is bluish-black with white scales. (Boulenger 1896).

On August 17, 2023, at 1330h, an anole fitting this description was observed in an outstretched posture on a palm leaf stem of an Areca palm *Dypsis lutescens* in a backyard garden near Point Fortin, Trinidad (Figs. 1-3) (UTM 642070.83E, 1123310.20N) (iNaturalist observation 178888870). The photographs were positively identified as *Anolis auratus* by Martha L. Calderón-Espinosa a

Fig.1. *Anolis auratus* resting on a palm leaf stem. Photo by Shaquille E. George.

Fig. 2. *Anolis auratus* stretched out on a leaf of a palm tree. Photo by Shaquille E. George.

Fig. 3. Dorsal view of *Anolis auratus* stretched out on a leaf of a palm tree. Photo by Shaquille E. George.

herpetologist at the National University of Colombia.

After being photographed, an attempt was made to capture the anole for further measurement and recording. However the anole escaped into the palm leaves. Despite intensively searching for an hour after the initial observation, and subsequent searches over the next two days and nights within a 3 m radius of the initial site, no other anole was observed.

The habitat of the site was characterized by young fruiting trees. At the time of the observation the area resembled a slightly open semi-grassland with knee-high grasses in need of trimming. Following the disturbance caused by grass cutting, one anole was spotted on a palm tree which was surrounded by several other plants including guava *Psidium guajava*, an extended lobsterclaw heliconia patch *Heliconia latispatha*, and a small mango tree *Mangifera indica*.

Notably, this was the first time an *Anolis* of any species in the immediate area was observed by the author. Previously, other lizards (Squamata) such as *Gonatodes vittatus*, *Thecadactylus rapicauda*, *Ameiva atrigularis*, *Iguana iguana*, *Tupinambis cryptus* and members of the subfamily Mabuyinae (skinks) had been observed on the site. This does not represent an exhaustive list of lizards present in the area but rather is a note of the author's specific observations. Also previously observed on site is *Oxybelis rutherfordi* (Rutherford's vine snake) which is a potential predator of *A. auratus* as they are known to feed on lizards and are a principal predator of *A. auratus* (Fleishman, 1988; Murphy et al. 2018).

This observation is the first record of this species on Trinidad. Whether it is a very rare native species that has gone unnoticed or a recent introduction is yet to be determined. There are now at least ten extant species of *Anolis* on the island of Trinidad and Tobago.

I would like to thank Dr Martha L. Calderón-Espinosa for positively identifying this anole.

REFERENCE

Avila-Pires, T.C.S. 1995. Lizards of Brazilian Amazonia (Reptilia: Squamata). *Zoologische Verhandelingen* 299: 1-706.

Auguste, R. J., **Dass, K.** and **Baldeo**. **D.** 2018. Discovery of the Puerto Rican crested anole, *Anolis cristatellus* Duméril & bibron, on Trinidad. *Caribbean Herpetology*, 63:1-2.

Boulenger, G.A. 1896. Descriptions of new reptiles and batrachians from Colombia. *The Annals and Magazine of Natural History including Zoology, Botany, and Geology*, 17: 16-21.

Calderón-Espinosa, M.L. and **Contreras. L.A.B.** 2014. Geographic body size and shape variation in a mainland Anolis (Squamata: Dactyloidae) from Northwestern South America (Colombia). *Acta Biológica Colombiana*, 19: 167.

Fleishman, L.J. 1988. The social behavior of *Anolis auratus*, a grass anole from Panama. *Journal of Herpetology*, 22: 13.

GBIF 2023. GBIF Secretariat: GBIF Backbone Taxonomy. [Online] Available at https://doi.org/10.15468/39omei Accessed via https://www.gbif.org/species/9129157 (Accessed 24 October 2023).

Köhler, G. 2008. Reptiles of Central America. 2nd Ed. Herpeton-Verlag, 400 p.

Losos, J. B. and **Thorpe, R.S.** 2004 Evolutionary diversification of Caribbean Anolis lizards. *Adaptive Speciation*, 2004: 322–344.

Moreno Arias, R.Á., Velasco, J.A., Urbina Cardona, J.N., Cárdenas-Arévalo, G., Medina Rangel, G.F., Gutiérrez Cárdenas, P.D.A., Olaya-Rodriguez, M.H. and **Cruz-Rodríguez, C.** 2021. Atlas de la biodiversidad de Colombia. Anolis. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Bogotá D. C., Colombia. 72 p.

Murphy J.C., Downie, J.R., Smith, J.M., Livingstone, S.R., Mohammed, R.S., Lehtinen, R.M., Eyre, M., Sewlal, J., Noriega, N., Casper, G.S., Anton, T., Rutherford, M.G., Braswell, A.L. and **Jowers, M.J**. 2018. A Field Guide to the Amphibians & Reptiles of Trinidad and Tobago. Trinidad and Tobago Field Naturalists Club, Port of Spain, Trinidad and Tobago.

Poe S. 2005. A study of the utility of convergent characters for phylogeny reconstruction: Do ecomorphological characters track evolutionary history in Anolis lizards? *Zoology*, 108: 337-343.

Rivas, Gilson A.; César R. Molina, Gabriel N. Ugueto, Tito R. Barros, César L. Bar- Rio-Amorós and **Philippe J. R. Kok** 2012. Reptiles of Venezuela: an updated and commented checklist. *Zootaxa*, 3211: 1–64.

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A New Orchid Record for Tobago, W.I. - *Maxillaria porrecta* Lindl.

On January 18, 2014, I was passing over the Main Ridge of Tobago, at about 520 m elevation, when I saw, for the first time, an arboreal orchid in bloom about 4 m high in a roadside tree. I stopped to have a look.

It was a healthy display of yellowish flowers that immediately attracted my attention.

The clump bore a cluster with about 25 - 30 flowers, each flower approximately 2.5 cm across, with three sepals and two petals, each about 1.2 cm long, growing out of a basal scape up to 16 cm long (Fig. 1). The inside of the lateral petals and sepals were white at the base gradually becoming a beautiful deep yellow. The outside of the petals started as a buffy-mottled white, brushed by a deep pink at the outer tips, which curled over, exposing the pinkish tips. The outside of the labellum was white, about 1.5 cm long, with a deep magenta or maroon colour at the tip (Fig. 2). The leaves each grew out of a pseudobulb, which was from 3.5 to 4.5 cm in diameter, and extended into a slender, elongate deep green leaf, about 20 to 25 cm in length and up to 4 to 5 cm in width (Fig. 3).

I returned for another look on January 23, 2014, to find all the flowers withered and closed. I climbed the tree to photograph the cluster of bulbs, leaves and flowers, only to be driven off by a savage attack from a colony of large, aggressive red ants. From then on, the plant was unremarkable, and for the most part, un-noticeable. Another visit on March 21, 2014, showed the orchid still healthy, but with no sign of flowering. I was unable to discern the species of the host tree or the red ant species.

On January 16, 2015, as I was back in Tobago, I stopped to check on the orchid. It was in bloom, with about 20 flowers. I photographed the orchid, and sent photos to Yasmin Baksh-Comeau who was the curator of the National Herbarium of T&T (abbreviated to TRIN hereafter) at that time. She was not familiar with this orchid, and asked that I send her a sample of the flowers, leaves and bulbs. Figure 3 shows the parts of the plant I submitted to Dr Baksh-Comeau. Her response was:

"Thanks for sending the orchid specimen from Tobago. I identified it today as ***Maxillaria porrecta****. Since we do not have a specimen in our collection from Tobago we will keep it and add it to the reference collection … we have a few specimens from Trinidad dating back to the 19th century up to the 1990s. But we have not had any from Tobago before according to our records. Its presence in Tobago begs the question whether is it a recent introduction (deliberate of accidental) or overlooked by naturalists/botanist not being there at the right time and place."* (Baksh-Comeau, pers. comm.).

The specimen was matched against voucher specimens accessioned in TRIN including Broadway s.n (TRIN 22672, AMES 67049). Details of the records from Trinidad are included in Baksh-Comeau *et al*. (2016) and are also available on GBIF.org (Sankar *et al.* 2023).

So, this random stop turned out to be the first record of this orchid for Tobago! In 2016, the orchid was totally gone, with no sign of any leaves or bulbs. To this day, even with constant watching and looking, I have not seen it again.

It is worth noting that it is prohibited to remove plant material from the Main Ridge Forest Reserve, and that the sampling described here was done in collaboration with the National Herbarium of Trinidad and Tobago. I am grateful to Yasmin Baksh-Comeau for her help in preparing this Note for publication.

Fig. 1. *Maxillaria porrecta* in situ. at Main Ridge Tobago. Photo Matt Kelly, 18 January 2014.

Fig. 2. *Maxillaria porrecta* flower. Main Ridge Tobago. Photo Matt Kelly, 17 January 2015.

Fig. 1. Specimen of *Maxillaria porrecta* collected at Main Ridge Tobago, for the National Herbarium . Photo Matt Kelly, 17 January 2015.

REFERENCES

Baksh-Comeau, **Y.**, Personal Communication, 20/01/14, 04/02/15, 05/02/15 and 02/23/23

Baksh-Comeau, Y.S., Maharaj, S.S., Adams, C.D., Harris, S.A., Filer, D.L. and **Hawthorne, W.D.** 2016. An annotated checklist of the vascular plants of Trinidad and Tobago with analysis of vegetation types and botanical 'hotspots'. *Phytotaxa,* 250; 431.

Sankar S., Maharaj T., Manaure K., Falby N., Morales J.F. 2023. Specimens from the National Herbarium of Trinidad and Tobago. National Herbarium of Trinidad and Tobago. Occurrence dataset https://doi.org/10.15468/xbk3ar accessed via GBIF.org on 2023-10-15.

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Report of the Trinidad and Tobago Birds Status and Distribution Committee, Records Submitted during 2022

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The Trinidad and Tobago Bird Status and Distribution Committee (TTBSDC) was established in 1995 to assess, document and archive the occurrence of rare or unusual birds in Trinidad and Tobago and thus provide reliable long-term monitoring of our rarer species. The Committee has assessed all records submitted during 2022. In all, 103 records were adjudged, representing 59 different species, in a year where fieldwork was still seriously impeded by the continuation of the global pandemic. Two species were added to the National Official List bringing the current total to 494 and two additional species were found in Tobago for the first time. As in previous years, we wish to commend the quality of photographic submissions by so many observers. Of the submissions assessed, in only three cases did we find the identification inconclusive.

Records presented below follow the revised nomenclature and taxonomic order of the South American Classification Committee as at June 2023 (Remsen *et al.* 2023). All sightings summarized below occurred in 2022 unless otherwise stated.

The Committee comprises the following members: Martyn Kenefick (Secretary), Faraaz Abdool, Geoffrey Gomes, Nigel Lallsingh, Bill Murphy, Kris Sookdeo and Graham White. Again, there are instances where we have benefitted from supporting international expert knowledge to assist us with certain identification issues. We wish to acknowledge with thanks the valuable assistance provided by Dave Cooper, Juan Freile and James Smith.

Archived records including photographic submissions number 1,849 at the end of 2022. This report is the twentieth report of this committee. All reports were published in Living World and are available at https://ttfnc.org/livingworld/index.php/lwj/issue/archive.

The list of species considered by the TTBSDC, together with the Official List of the Birds of Trinidad and Tobago and details of all accepted records by the Committee can be accessed from our website at http://ttbsdc.ttfnc.org. We urge finders to document and report their sightings to us.

Records accepted

Two **White-faced Whistling-Duck** ***Dendrocygna viduata*** were found at Caroni Rice Project on 11 June (MK, NL), increasing to four birds by 16 June with at least one remaining until 19 July at least. The vast majority of records for this species occur between end of May and the end of August.

An unseasonal female **Ring-necked Duck** ***Aythya collaris*** was found at Centre Street ponds, Canaan, Tobago on 25 May (JM, JMM), remaining until 15 June at least. At the same site, an adult male was found together with the Lesser Scaups (see below) on 9 December (MKe). With the exception of this May sighting, all records have been between mid November and early March.

A group of six **Lesser Scaup** ***Aythya affinis,*** including two moulting male birds, were found on Centre Street ponds, Canaan, Tobago on 9 December (MKe) with at least one remaining until the month's end. This migrant duck from continental North America has now been found in 10 of the last 13 winters.

A female, or non-breeding plumaged male **Masked Duck** ***Nomonyx dominicus*** was found at the Pitch Lake on 22 May (ES *et al.*). Whilst this is a scarce resident species to both Trinidad & Tobago, its reclusive nature may well mask its true abundance.

Slowly but surely, the increase in distribution of **Eurasian Collared Dove** ***Streptopelia decaocto*** in suburban Trinidad gathers pace with one at Federation Park, north-west Port of Spain on 20 August (BW); up to 25 birds at Lange Park, Chaguanas from mid October to the years' end (ES) and two birds along the Maraval river, Westmoorings on 18 November (Bd'A).

A **Dark-billed Cuckoo** ***Coccyzus melacoryphus*** was photographed along Rahamut Trace on 2 September (KF) (Fig, 1). This wanderer from mainland South America has been found annually in Trinidad for the last six years with 78% of all sightings being during the narrow window of 12 July-30 August.

Fig. 1. Dark-billed Cuckoo, Woodland, September 2022. Photo Kevin Foster.

Individual **Yellow-billed Cuckoos *Coccyzus americanus*** were found on southbound migration as follows: Castara, Tobago on 19 October (JW); Waterloo on 23 October (ES) and Bon Accord, Tobago on 26 October (FA)(Fig. 2).

Fig. 2. Yellow-billed Cuckoo, Bon Accord, October 2022. Photo Faraaz Abdool.

A male **Common/Antillean Nighthawk *Chordeiles minor* / *gundlachii*** was photographed alongside several Nacunda Nighthawks, *C. nacunda* in a sweet potato field along Bam Bam Road, Waterloo on 25 September 2017 (NL *et al.*)(Fig. 3). Unfortunately these two species cannot be visually separated and can only be safely identified on their nesting grounds by vocalization. Recent studies show that both potentially migrate through/over Trinidad. In either case, this would constitute a first documented sighting for T&T.

Fig. 3. Common/Antillean Nighthawk, Waterloo, September 2017. Photo Jerome Foster.

An immature **Rufous-shafted Woodstar *Chaetocercus jourdanii*** was photographed briefly feeding on Vervain at Pax Guest House on 24 June (FA). This is just the third documented sighting in the last 14 years with each bird seen between 3 May and 24 June.

A **Limpkin *Aramus guarauna*** was heard repeatedly calling at night during mid July in Canaan, Tobago before being photographed on 25 July. (TB-Y) This is the first documented record for Tobago.

A **Uniform Crake *Amaurolimnas concolor*** was photographed late at night on 30 June in Santa Cruz. (MM) (Fig. 4). This is the first documented record of the species for T&T. Whilst nowhere common and normally extremely secretive, Uniform Crakes occur throughout much of Central America and the northern half of South America. They are considered sedentary within their normal range and this occurrence is likely due to the extreme adverse weather conditions in the region at the time.

Fig. 4. Uniform Crake, Santa Cruz, June 2022. Photo Mario Manuel.

For the sixth year running a **Double-striped Thick-knee *Burhinus bistriatus*** was found in exactly the same area of the Queens Park Savanna, Port of Spain as in previous years on 27 August (Bd'A). Elsewhere a soaking wet and bedraggled bird took refuge from a downpour in the carpark of Trincity Mall on 28 June (SA).

The **Killdeer *Charadrius vociferus*** found on Caroni Rice Project on 27 December 2021 was joined by five more on 15 January (NL) with up to four birds remaining until 3 March at least.

An **Upland Sandpiper *Bartramia longicauda*** was photographed flying over Caroni Rice Project on 8 May (NL) (Fig. 5). This is just the second ever documented northbound migrant. Additionally on 31 August, one was found in a wet grassy field close to Millennium Lakes golf course, Trincity (Bd'A), remaining until 5 September at least. Southbound migrants have now been documented in five of the last six years, all between end August-end October.

Fig. 5. Upland Sandpiper, Trincity, August 2022. Photo Brian d'Abreau.

A **Hudsonian Godwit *Limosa haemastica*** was photographed at Bon Accord, Tobago on 5 November (FA). Whilst this is an anticipated southbound migrant shorebird through Trinidad, this is just the fourth documented sighting for Tobago in more than 30 years.

An immature male **Ruff *Calidris pugnax*** was seen briefly and photographed at Bon Accord, Tobago on 1 November (FA). This is just the fifth documented sighting in the last eight years of this Old World shorebird.

An alternate plumaged **Spotted Redshank *Tringa erythropus*** was found on Caroni Rice Project on 16 June (MK, NL)(Fig. 6) seen in tall grass within a flooded field and quickly flew east. This is just the second documented record for T&T, the previous being a basic plumaged bird seen at Bon Accord, Tobago on 13 February 1983 (Fig. 7).

Fig. 6. Spotted Redshank, Caroni Rice Project, June 2022. Photo Nigel Lallsingh.

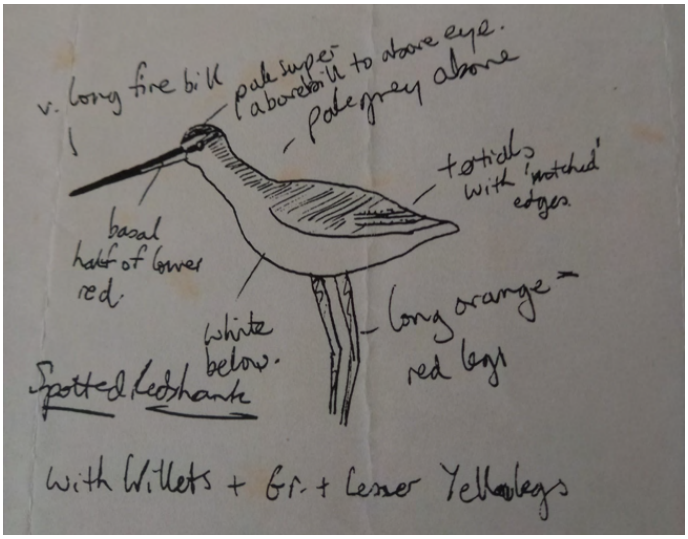

Fig. 7. Spotted Redshank, Bon Accord, February 1983. Diagram David Fisher.

An immature **Pomarine Jaeger *Stercorarius pomarinus*** was photographed flying past Orange Valley on 3 March (NL). Whilst the species regularly winters in the coastal waters of the Lesser Antilles, there are only two documented records for T&T in the last 25 years

A first-winter plumaged **Black-headed Gull *Chroicocephalus ridibundus*** was photographed at Orange Valley on 11 February (NL). It, or possibly another, was found on 18 March at Crown Pt., Tobago and was the subject of sightings at various localities in south-west Tobago until 16 July at least (many obs). On 3 October, a basic plumaged adult was photographed on the flooded golf course at Lowlands, Tobago (JR). All sightings may refer to the one individual.

The first-winter plumaged **Franklin's Gull *Leucophaeus pipixcan*** initially found at Orange Valley on 27 November 2021 re-appeared on 8 January together with two others. At least one bird remained faithful to roosting on the fishing boats tied to the jetty until 19 March at least (NL *et al.*).

An immature **Jabiru *Jabiru mycteria*** was found on the tidal mudflats south of Orange Valley on 15 April (NL), present until the next morning. It was subsequently photographed at the Aripo Livestock Farm on 4 July. Whilst still a rare wanderer from mainland South America, it has been documented in 10 of the last 13 years with all sightings between April-September.

A **Wood Stork *Mycteria americana*** was seen in flight over the Caroni Swamp Visitor Centre on 3 April (MH, AS). This is still an extremely rare wanderer to Trinidad, documented in just five of the last 22 years.

An adult **Striated Heron *Butorides striata*** was photographed at Bon Accord, Tobago on 22 January 2019 (AC). Whilst an abundant resident in Trinidad, this is just the fourth documented sighting for Tobago in the last 27 years.

An immature **Gray Heron *Ardea cinerea*** was found at Tobago Plantations on 28 March (JR)(Fig. 8). There have now been 21 documented sightings in the last 17 years in both Trinidad & Tobago of this Old World heron, inevitably involving some duplication.

Fig. 8. Gray Heron, Tobago Plantations, March 2022. Photo John Mangold.

An adult **Cocoi Heron *Ardea cocoi*** was photographed at Bon Accord, Tobago on 25 April (JR). This species is a regular dry season visitor to Trinidad, however this is just the fourth documented wanderer to Tobago in the last 10 years.

The **Whistling Heron *Syrigma sibilatrix,*** first seen flying over the Aripo Livestock Station in December 2021, was re-found at East Lake, Arima on 19 February (JRy).

An adult **Capped Heron *Pilherodius pileatus*** was photographed along Bowen Trace, Granville on 16 July (KF)(Fig. 9). This is just the second documented sighting of this secretive heron from mainland South America and could well be the same individual seen flying nearby on 16 May 2020.

Fig. 9. Capped Heron, Granville, July 202. Photo Kevin Foster.

Sightings of **Snail Kite *Rostrhamus sociabilis*** within fresh water wetland and wet agricultural sites in Trinidad were follows: an adult female at Caroni Rice Project on 3 January (NL); an adult female in Aranguez farmland on 10 January (RJ); an adult male at Orange Grove on 11 February (JF); two adult males in Caroni Rice Project on 15 February (MK, MKe) and an immature by Caroni Swamp Visitor Centre on 30 October (JF).

A **Plumbeous Kite *Ictinia plumbea*** was seen over Cuffie River, Tobago on 5 August (FA). Whilst this is a common breeding visitor from the mainland to Trinidad, this is just the third documented sighting for Tobago.

A dark-morph **Long-winged Harrier *Circus buffoni*** was photographed over Centre Street ponds, Canaan, Tobago on 20 January (MKe). This is the first documented record for the island.

A **Black Kite *Milvus migrans*** was photographed initially over La Peyrouse Estate, Gran Couva on 20 March (MK, NH) and subsequently at La Vega on 1 April (VR)(Fig. 10). Previous sightings of this Old World raptor have been from Gasparillo in 2014 and more recently Claxton Bay in 2020. Given the proximity of all of these sites to the Forres Park landfill site and the fact that the species commonly lives for at least 20 years suggests just one bird may be involved in all sightings.

Fig. 10. Black Kite, Gran Couva, March 2022. Photo Nigel Hacking.

A **Roadside Hawk *Rupornis magnirostris*** was found in trees close to Caroni North Bank Road on 15 March (VR) (Fig. 11). This is just the third documented sighting for the country, the previous two being from Cascadoux Trace in both January 2019 and January 2020 and may possibly involve the same individual bird.

Fig. 11. Roadside Hawk, Caroni, March 2022. Photo Vishal Rangersammy.

The **White-tailed Hawk *Geranoaetus albicaudatus*** initially seen flying over north Port of Spain on 25 October 2021 was re-found in the Queens Park Savanna on 15 January and was seen intermittently until the years' end (many obs). Elsewhere an immature was photographed at Icacos on 13 February (KF).

A **Burrowing Owl *Athene cunicularia*** was photographed in the unlikely setting of the Brentwood Court, Chaguanas, around 11 January (Fig. 12). The only other previous sighting of the species was of a pair at Pt. Lisas back in June 1982. The species is predominantly non-migratory hence the origin of this bird, whilst uncertain, is most likely from resident populations in either Venezuela or Colombia.

Fig, 12. Burrowing Owl, Brentwood, January 2022. Photo Andre Hamid.

Up to 5 **Small-billed Elaenias *Elaenia parvirostris*** were present feeding on Black Sage adjacent to Caroni Rice Project; first found on 21 May (NL) with at least one remaining until 7 August. Elsewhere one was photographed at Waterloo Estate on 4 June (NL).

An immature male **Crested Doradito *Pseudocolopteryx sclateri*** was found at Caroni Rice Project on 24 October (NL)(Fig. 13). This is just the third documented sighting in the last 27 years; the previous both being along Rahamut Trace in July 2010 and August 2018.

Fig. 13. Crested Doradito, Caroni Rice Project, October 2022. Photo Nigel Lallsingh.

Just two south-bound migrant **Cliff Swallows *Petrochelidon pyrrhonota*** were documented this year; on Caroni Rice Project, 4 September (NL) and at Orange Valley on 18 September (NL). There have now been 16 documented sightings in all but one of the last 10 years.

Late autumn is peak time to find **Bobolink *Dolichonyx oryzivorus*** in T&T. Documented sightings were as follows: at least 10 on Caroni Rice Project on 2 October (NL); two at Lowlands, Tobago on 14 October (JW); three at Centre Street ponds, Canaan, Tobago on 26 October (FA) and up to 39 at Caroni Rice Project on 6 November (MH, AS).

A **Black-and-White Warbler *Mniotilta varia*** was found along Gilpin Trace, Tobago on 23 January and present the following day (NG, MKe). This migrant from North America is found almost annually in T&T with 76% of all sightings documented between mid October and late January.

The adult male **Cerulean Warbler *Setophaga cerulea*** found along Tortuga Shortcut Road on 7 December 2021, remained, faithful to a circuit of mango trees until 5 February at least, returning yet again on 22 October and present until the years' end (NL *et al.*). An adult female was photographed in the same mango tree on 12 February (MK, JMM).

A male **Bay-breasted Warbler *Setophaga castanea*** was initially found at La Peyrouse Estate, Gran Couva on 7 March (NL). It remained until 20 March by which time it had moulted into alternate plumage. Elsewhere, a male in transitional plumage was photographed at Talparo on 19 March (JF). A total of 22 birds have now been documented in the last nine years.

A non-breeding plumaged male **Blackburnian Warbler *Setophaga fusca*** was photographed along Las Lapas Trace on 23 January (FA) and an immature was found on Tortuga Shortcut Road on 22 October (NL). Once a very rare migrant from the north, there have now been eight documented sightings in the last six years.

A basic-plumaged male **Chestnut-sided Warbler *Setophaga pensylvanica*** was found in the forest south of Grande Riviere on 26 March (NH, NA). This remains a scarce winter visitor with just seven documented sightings in the last 10 years.

Adult male **Lesson's Seedeaters *Sporophila bouvronides*** were photographed close to Bush Bush Reserve on 25 June 2016 (WR) and along Rahamut Trace on 4 December (SP, SW *et al.*). We also received documented evidence from a known breeding site in south Trinidad.

A **Saffron Finch,*Sicalis flaveola*** was photographed at Canaan, Tobago on 24 May (KT). Whilst this species has spread rapidly throughout Trinidad, this is just the second documented sighting for Tobago.

Escaped cage and aviary species

Red-and-Green Macaws *Ara chloropterus* continue to be regularly reported from the south-west peninsula and north coast of Trinidad plus sightings near Chaguanas. **Festive Parrots *Amazona festiva*** were seen in Port of Spain Botanical Gardens and **Village Weavers *Ploceus cucullatus*** are frequently seen within the Caroni Rice Project.

The provenance of most seedeater and seed-finch species continues to be a problem. The Committee has taken a decision that, unless there is supporting evidence to the contrary, all sightings will be considered under this category and that assessment will be based on identification alone.

Additional records

Acceptable records were also received or submitted to Ebird for a further 34 sightings of the following species whose status has been established but whose distribution continues to be monitored by the Committee. **Trinidad Piping-Guan *Pipile pipile***, **Scaled Dove *Columbina squammata*** (Fig. 14), **Rufescent Tiger-Heron *Tigrisoma lineatum***, **Little Egret *Egretta garzetta***, **Glossy Ibis *Plegadis falcinellus***, **Hook-billed Kite *Chondrohierax uncinatus***, **Black Hawk-Eagle *Spizaetus tyrannus***, **Crane Hawk *Geranospiza caerulescens***, **Rufous Crab Hawk *Buteogallus aequinoctialis*** (Fig. 15), **Great Black Hawk *Buteogallus urubitinga***, **Crested Caracara *Caracara plancus***, **Aplomado Falcon *Falco femoralis***, **Variegated Flycatcher *Empidonomus varius***, **Summer Tanager *Piranga rubra*** and **Yellow-bellied Seedeater *Sporophila nigricollis***.

Fig. 14. Scaled Dove, Mayaro, May 2022. Photo Cyril Coomansingh.

Fig. 15. Rufous Crab Hawk, Icacos, February 2022. Photo Kevin Foster.

Inconclusive records

Submissions of the following species were deemed inconclusive: **Kelp Gull *Larus dominicanus***, **Northern Gannet *Morus bassanus*** and **Striated Heron *Butorides striata***.

Nomenclature changes

Part of the mission statement of the South American Classification Committee is to create a standard classification, with English names, for the birds of South America. This is subject to constant revision by the proposal system to allow incorporation of new data. The following change were made in 2022: the former superspecies Grayish Saltator ***Saltator coerulescens*** has been split reflecting the visible plumage differences between populations in Central and South America; and the species found in Trinidad (and the northernmost regions of continental South America) has been re-named Olive-gray Saltator ***S olivascens***.

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REFERENCES

Remsen, J.V., Jr., Areta, J.I., Bonaccorso, E., Claramunt, S., Del-Rio, G., Jaramillo, A., Lane, D.F., Robbins, M.B., Stiles, F.G., and **Zimmer. K.J.** Version 24 June 2023. A classification of the bird species of South America. Museum of Natural Science, Louisiana State University. [Online], Available at http://www.museum.lsu.edu/~Remsen/SACC Baseline.htm (Accessed 7 July 2023).

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