

Partial life history of *Lophocampa walkeri* (Rothschild, 1910) (Lepidoptera, Erebidae, Arctiinae) in Trinidad, West Indies

Here we document the colourful and regularly photographed caterpillar of *Lophocampa walkeri* from Trinidad. *Lophocampa walkeri* is a common and widespread moth in Trinidad, particularly in suburban and disturbed areas (M.J.W. Cock unpublished data; MJWC). It has been reared several times in Trinidad, but the early stages have not hitherto been documented. MJWC has examined adults in the University of the West Indies Zoology Museum (UWIZM) reared from the following food plants: *Ipomoea* sp. (Convolvulaceae), *Cordia* sp. (probably *Varronia curassavica* Jacq.) (Cordiaceae), *Passiflora* sp. (Passifloraceae), and mountain immortelle (*Erythrina poeppigiana* (Walp.) O.F. Cook) (Fabaceae). Here we document the caterpillar, cocoon and additional food plants from Trinidad. However, first, it is necessary to explain why the name *L. walkeri* is used rather than *L. catenulata* Hübner, [1812] (= *Halisidota catenulata*), which has been used in Trinidad for this moth in the past (Kaye and Lamont 1927).

Taxonomy

For the Trinidad fauna, *Lophocampa* is one of the more challenging genera in the subtribe Phaegopterina, tribe Arctiini, due to several very similar species, confusion about names applied in the past, and lost type material. Preparing a study of the Phaegopterina of Trinidad, MJWC has recognised six *Lophocampa* species, but another three species that have been reported from the island are probably misidentifications. Rothschild (1910) described *Halisidota walkeri* Rothschild, 1910 based on 71 male and 15 female specimens from Caura Valley, Venezuela, but when he later published the plates to go with the paper (Rothschild 1911), he indicated that *H. walkeri* is a synonym of *H. catenulata* Hübner, [1812]. Watson & Goodger (1986) treated *H. walkeri* as a form of *L. catenulata*, i.e. a synonym, whereas Vincent and Laguerre (2014) treated *L. walkeri* as a separate species, and designated a lectotype. A male and female from this type series have been dissected in The Natural History Museum, London (NHMUK). MJWC has compared the dissected genitalia of two comparable Trinidad males in his collection with those of the dissected male syntype and found them the same.

DNA barcodes based on a section of the *cox1* mitochondrial gene have proved useful in differentiating closely related forms and species (Hebert et al. 2003), and the Barcode of Life Data System (BOLD, <https://v4.boldsystems.org/>) provides a global repository for these sequences with analytic tools. One of these, the Barcode Index Number (BIN), uses

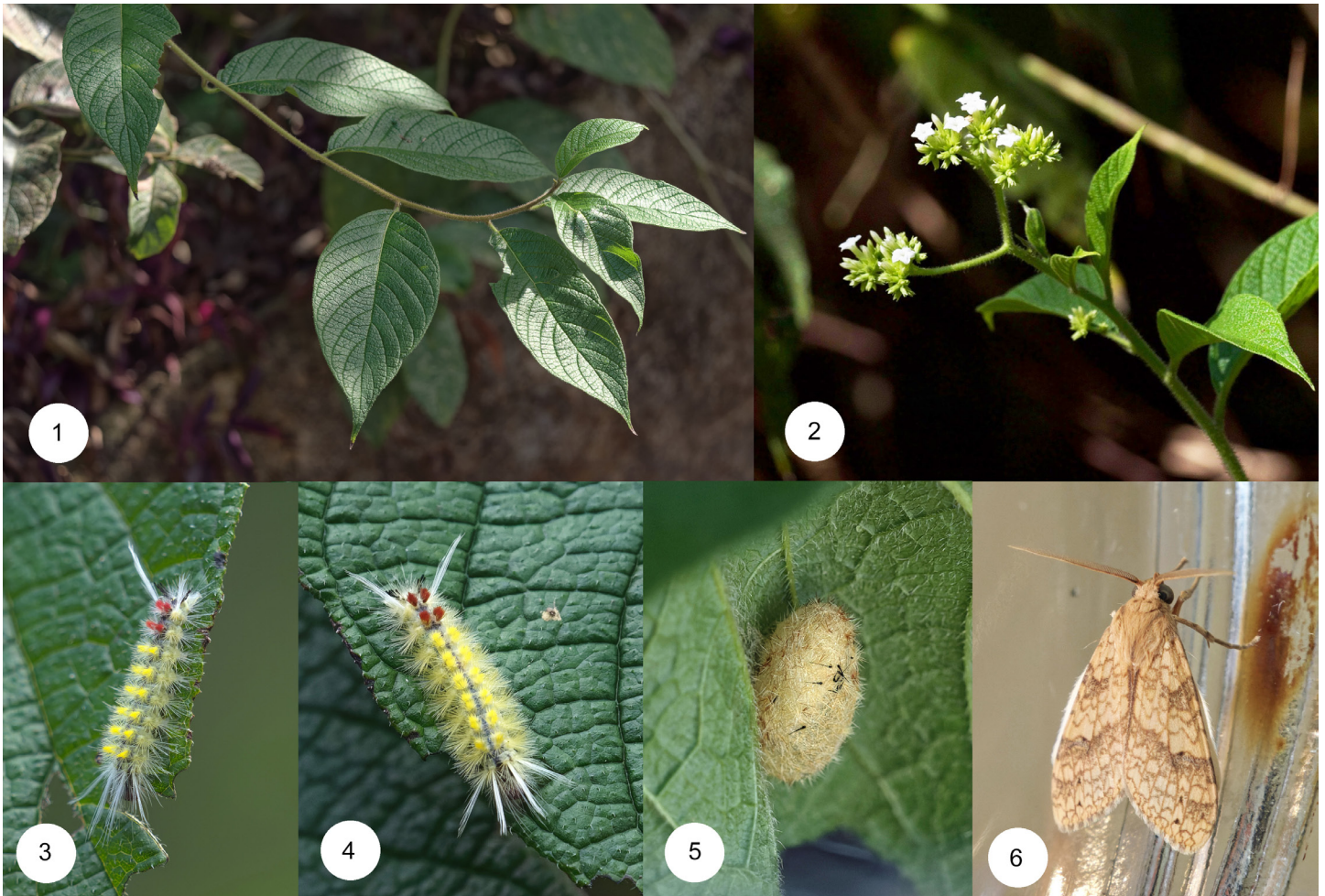
algorithms to group similar barcode units together at a level that frequently corresponds with species (Ratnasingham and Hebert 2013). Three DNA barcodes (MJWC-516, MJWC-611, MJWC-624) were obtained from Trinidad specimens collected at South Oropouche by T.P. Maharaj (TPM). They form part of BIN BOLD:AEW4841, which is in a cluster of three BINS mostly identified as *L. catenulata*: BIN BOLD:AEW4841 from Trinidad, French Guiana and Peru, which is 1% different from BOLD:AAA1447 from Mexico to Panama and Colombia, and 1.37% different from BOLD:ACE7424 from coastal Ecuador and Costa Rica. These three BINS are considered potential separate species or subspecies, but information on life histories, ecology, genitalia structure and other gene sequences will be required to test this.

Hübner [1812] (in Hübner 1806–[1819]) described *L. catenulata* (as *Hypocrita catenulata*) without giving a locality, but moths of this appearance are recognised from Central and South America, and in BOLD correspond to the three BINS just mentioned. Although it is plausible that *L. walkeri* is a junior synonym of *L. catenulata*, it is equally possible that the Central American taxon is *L. catenulata*, and *L. walkeri* is a separate, valid, South American taxon. We are not aware of any type material for *L. catenulata*, so until type material is found (which seems unlikely) or a neotype is designated, we do not consider the taxon *L. catenulata* adequately defined to use for Trinidad, and therefore prefer the name *L. walkeri* which is defined by a lectotype and characterized by a dissected syntype. Given the Caura Valley, Venezuela, type locality, this name can also be reasonably applied to BIN BOLD:AEW4841, which includes the Trinidad DNA barcodes.

Observations

R.K. Ali (RKA) photographed two caterpillars feeding on cattle tongue (*Heliotropium verdcourtii* Craven, Heliotropiaceae; = *Tournefortia hirsutissima* L.) (Figs. 1-2) at Haleland Park on 6 March 2023 (Fig. 3) and 11 March 2023 (Fig. 4), the second of which he reared. A cocoon (Fig. 5) was formed on 13 March and a male moth (Fig. 6) emerged on 23 March.

The mature caterpillar (Figs. 3-4) was estimated to be about 20-25 mm long (without projecting setae). The head is not clearly visible in the photographs but appears to be dark brown. An image by skemmanuel that we identify as *L. walkeri* (Fig. 7) shows that the head is unmarked red-brown. In our images each of the discernible segments



Figs. 1-6. Life history of *Lophocampa walkeri*, Haleland Park, R.K. Ali. **1-2**, the food plant, cattle tongue, *Heliotropium verdcourtii* [iNaturalist 150517376]. **3**, final instar caterpillar (not reared), 6 March 2023 [iNaturalist 150494110]. **4**, final instar caterpillar (reared), 11 March 2023 [iNaturalist 150861209]. **5**, cocoon, 14 March 2023. **6**, adult male 23 March 2023.

of the thorax (T1-3) and abdomen (A1-9) has two pale, subdorsal scoli, one behind the other, and four pale scoli on each side, all with radiating, pale, spine-like setae. T2 has a tuft of long white hairs on each scoli, pointing forwards above and beside the head. The subdorsal scoli of T3 to A5 are surmounted with a 'brush' of yellow hair-like setae. The subdorsal scoli of A6 and A7, have a similar brush of red setae, while the dorsolateral scoli of A7 has a tuft of long, white setae directed slightly upwards, and backwards at an angle of 45° to the body. A8 bears a tuft of black spatulate setae ventral to the white tufts on A7. The body is not clearly visible below the scoli but is generally pale, with a dark dorsal line. True legs are not visible in the available images; prolegs and claspers concolorous with body.

The cocoon (Fig. 5) is oval, 16 mm long x 7 mm wide; dull yellow due to the incorporation of the yellow hair-like setae from the subdorsal T3-A5 scoli, with scattered red-brown setae from the subdorsal scoli of A6-A7 and a few contrasting black spatulate setae from the tufts on A8. It was formed resting on a leaf in the rearing container. The

cocoon is similar to those of other *Lophocampa* species (Janzen and Hallwachs 2023).

Based on these photographs of a successfully reared caterpillar, we were able to identify other images of caterpillars of this species on iNaturalist (www.inaturalist.org/). A solitary caterpillar, apparently in the final instar, was photographed by skemmanuel on wonder of the world, *Kalanchoe pinnata* (Lam.) Pers. (Crassulaceae) (Fig. 7) but there was no sign of feeding and this ornamental succulent is considered unlikely to be a food plant. Another was photographed by TPM on what appears to be *Ipomoea squamosa* Choisy at South Oropouche (Fig. 8). Other images of mature caterpillars were on unidentified plants or not associated with plants. Several observations of caterpillars off plants suggest that mature caterpillars may disperse from their food plant to find a suitable location for cocoon formation. RKA photographed a group of smaller caterpillars (probably in the penultimate instar moulting to the final instar) on Barbados cherry or West Indian cherry, *Malpighia coccigera* L. (see Baksh-Comeau et al. 2016;



Figs. 7-10. Caterpillars of *Lophocampa walkeri* (not reared). **7**, final instar on wonder of the world, *Kalanchoe pinnata*, 22 November 2009, skemmanuel [iNaturalist 83964608]; © under CC-BY-NC. **8**, final instar on *Ipomoea* sp., 6.i.2023, T.P. Maharaj [iNaturalist 145965783]. **9**, ?penultimate instar on Barbados cherry, *Malpighia coccigera*, 9 December 2022, R.K. Ali [iNaturalist 144008378]. **10**, ?penultimate instar on bois canot, *Cecropia peltata*, 13.i.2023, T.P. Maharaj [iNaturalist 146520436].

Malpighiaceae) (Fig. 9), and TPM a similar group on bois canot, *Cecropia peltata* L. (Urticaceae) (Fig. 10). It seems that the younger larvae feed in small groups of 8–10, and probably only disperse to feed individually in the final instar. Clearly, this is a polyphagous species that will feed on a variety of diverse dicotyledonous plants.

Other species of *Lophocampa* have caterpillars similar in morphology to those documented here (Janzen and Hallwachs 2023; MJWC unpublished), and at least two more species from Trinidad appear in iNaturalist. Hopefully, in the future these will be reared and documented to help elucidate the *Lophocampa* species found in Trinidad.

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REFERENCES

- Baksh-Comeau, Y.S., Maharaj, S.S., Adams, C.D., Harris, S.A., Filer, D.I. 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(1): 1-431.
- 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.
- 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.** 2023. 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 25 March 2023).
- 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.
- 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. <https://doi:10.1371/journal.pone.0066213>
- Rothschild, W.** 1910. Catalogue of the Arctiinae in the Tring Museum, with notes and descriptions of new species. [Text]. *Novitates Zoologicae* 17(1) (1910): 1-85, (2) (1910): 113-171, (4) (1911): pl. XI-XIV.
- Rothschild, W.** 1911. Catalogue of the Arctiinae in the Tring Museum, with notes and descriptions of new species. [Plates]. *Novitates Zoologicae* 17(4): pl. XI-XIV.
- Vincent, B. and Laguerre, M.** 2014. Catalogue of the Neotropical Arctiini Leach, [1815] (except Ctenuchina Kirby, 1837 and Euchromiina Butler, 1876) (Insecta, Lepidoptera, Erebidae, Arctiinae). *Zoosystema* 36: 137-533.
- Watson, A. and Goodger, D.T.** 1986 Catalogue of the Neotropical Tiger-moths. *Occasional Papers on Systematic Entomology* 1: 71p.
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