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Research Article

Redescription of *Asura toxodes* Hampson, 1907 (Lepidoptera: Arctiinae: Lithosiini) after 117 years

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Abstract

Asura Walker, 1854 is a large genus in the tribe Lithosiini subfamily Arctiinae of the Erebidae family. It is known for 61 species from the world out of which only a single species i.e., *Asura toxodes* Hampson, 1907 is known from India. *Asura toxodes* were described only on the basis of external morphology. Hence, in the present manuscript, we have redescribed *Asura toxodes* by external morphology and genitalic attributes in detail for the first time. Illustrations of the adult and its genitalia are provided.

Abbreviations

KOH: Potassium Hydroxide; NZCZSI: National Zoological Collection, Zoological Survey of India, NHMUK (formerly BMNH): Natural History Museum (London, United Kingdom). Abbreviations used in figures are Ant. Line: Antemedial Line; Med. Line: Medial Line; Pos. Line: Post Medial Line; HW: Hind Wing; Unc: Uncus; Teg: Tegumen; Vinc: Vinculum; Jux: Juxta; Mcpr: Medial Costal Process; Dspr: Distal Saccular Process; Pha: Phallus; Crn: Cornutii; Ddm: Distal Diverticulum' Subd: Subbasal Diverticulum.

Introduction

Asura Walker, 1854 belongs to the *Asura/Miltochrista* complex of subtribe Nudariina of tribe Lithosiini. This is one of the largest genera in the tribe Lithosiini comprising 61 species from the world [1]. In India, the genus known for only *Asura toxodes* Hampson, [2] from Andaman and Nicobar Islands [3-5]. However, Walker (1854) established the genus *Asura* Walker, 1854 for its type species *Asura cervicalis* Walker, 1854. Later, Volynkin et al. [1] redefined the genus on the basis of certain attributes of the male genital capsule i.e., the presence of medial costal process; well-developed distal membranous lobe of valva; the distal saccular process is present, robust; aedeagus vesica with several short diverticula bearing clusters of numerous spinules. In the female genitalia, the ductus bursae is dorso-ventrally flattened, sclerotised, and not narrowed anteriorly, and the antrum is absent. Though Arora [3]; Kirti & Sing 2015, 2016[6,7]; and Volynkin et al. [1] did revisionary work on this group, *Asura toxodes* could not be recharacterized in these publications. Therefore, in this manuscript, we redescribed *Asura toxodes* by both external morphology and genitalic capsule in detail. The adult and its genitalia are illustrated in detail. The redescription of *Asura toxodes* will help Lithosiin workers throughout the world by quick and precise identification. Furthermore, this species is a single representative of this group from India which occurs mainly in the Andaman islands. As with other lichen moths, *A. toxodes* are also an indicator of air pollution, only inhabiting an air pollution-free environment.

Material and methods

The adult moths were collected from the Andaman and Nicobar Islands (Diglipur, Wandoor, Long Island, and Campbell Bay) by using a 160 W mercury vapor lamp in front of vertical white cloth. For killing adult moths, Ethyl Acetate was used,

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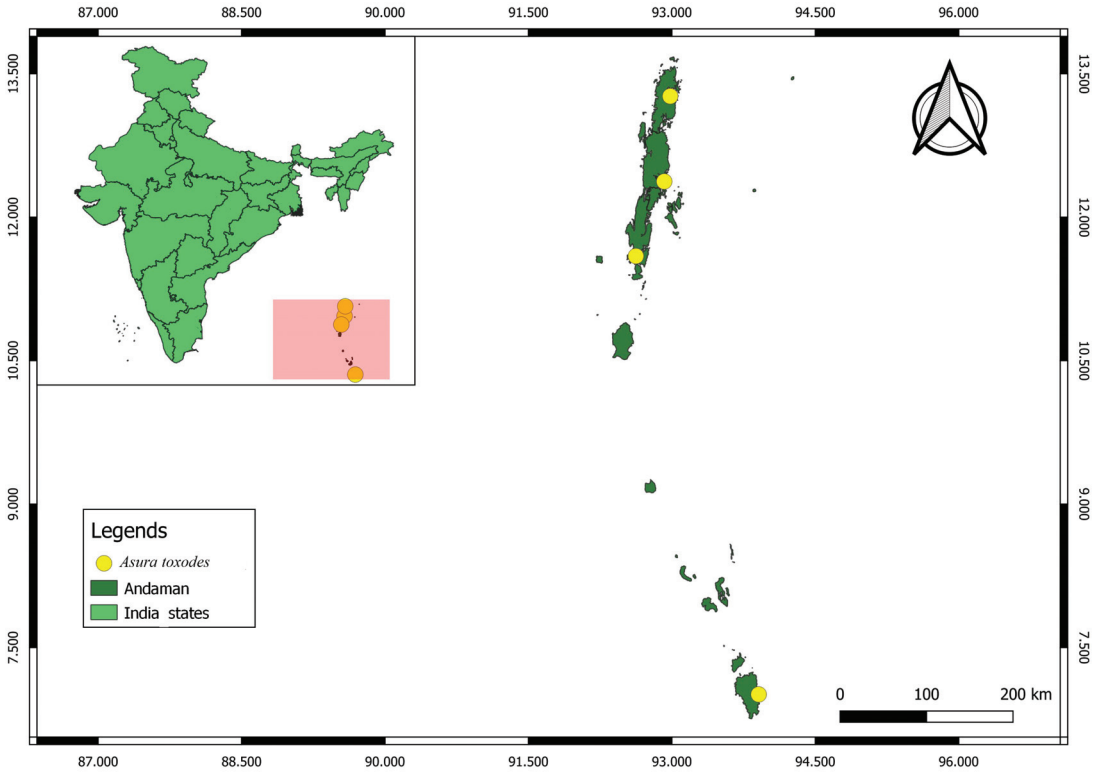


Map: Distribution map of *A. toxodes*.

thereafter the adults were examined, identified, and mounted for photography with a Nikon D7000 with a 105mm, F2.8 Nikkor lens. Dissections of the adult's abdomen were done under a Leica E24 binocular microscope after 24 hours of incubation of the detached abdomen in a 10% KOH solution. The genital organs were photographed with a Leica M205 FA fully motorized fluorescence stereo microscope and all pictures were processed using Adobe Photoshop CS6 software. After photography, genital organs were preserved in an alcohol-glycerol solution (4:1) in cryo-vials.

Results

Asura toxodes Hampson, 1907

(Figures 1-7)

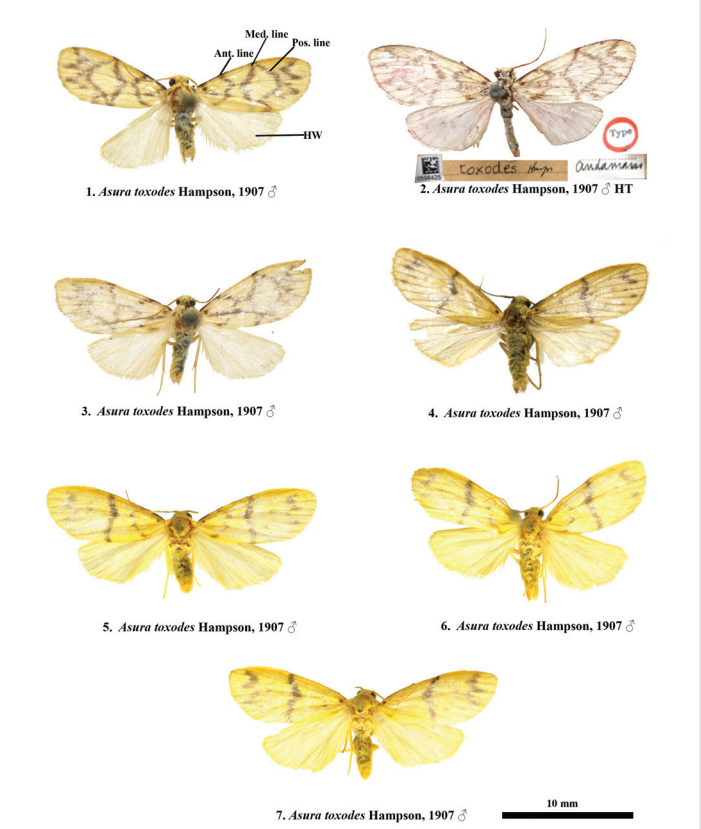
Asura toxodes Hampson, 1907 *Ann. Mag. nat. Hist.*, (7) 19: 233

Type locality: Andamans

Type material examined: Holotype ♂, INDIA, Andaman (©NHMUK Barcode no 10598425).

Other material examined (7♂♂): INDIA, Andaman & Nicobar: 2♂♂, Long Island (35m) 6.i.2018, S. Singh leg. (NZCZSI); 1♂, Diglipur (60m) 2.i.2018, S. Singh leg. (NZCZSI); 2♂♂ Wandoor (45m) 31.xi.2017, S. Singh leg. (NZCZSI); 2♂♂, Campbell Bay, 25.xi.2016 S. Singh leg. (NZCZSI).

Description: Forewing length 9 mm in males (n=7), wing span 20 mm. Adult ochreous yellow.



Figures 1-7: Habitus of *Asura toxodes* Hampson, 1907:
1. *A. toxodes* Hampson, 1907 ♂, INDIA, Andaman, Long Island (NZCZSI);
2. *A. toxodes* Hampson, 1907 ♂, INDIA, Andaman (NHMUK);
3.*A. toxodes* Hampson, 1907 ♂, INDIA, Andaman, Diglipur (NZCZSI); 3. *A. toxodes* Hampson, 1907 ♂, INDIA, Andaman, Wandur (NZCZSI); 4–6. *A. toxodes* Hampson, 1907 ♂, INDIA, Andaman, Campbell bay (NZCZSI).

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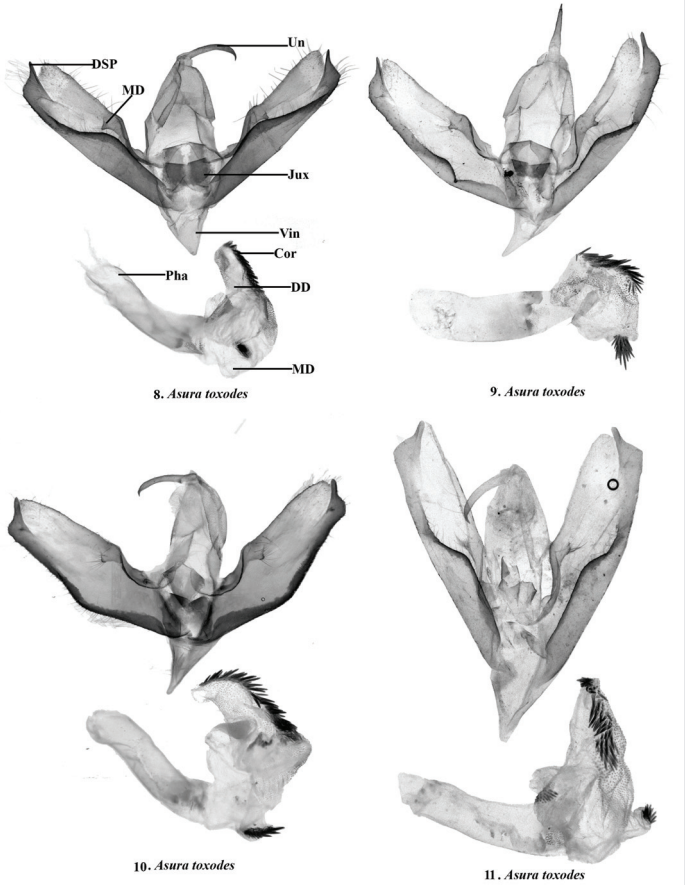
Head: frons and vertex ochreous yellow; antennae pale yellow, bipectinate.

Thorax: Pale yellow, patagia with black spot, legs pale yellow tibia and extremities fuscous; forewing pale ochreous; costal margin black up to the antemedial line; a black basal spot conjoint with long basal streak; antemedial line wavy and incurved; medial line angled inwardly in cell; postmedial line confluent with medial line at costa and inner margin forming a bow-shaped line; sub-marginal line wavy; cilia fuscous. Hindwing pale semihyaline.

Abdomen: Pale yellow with fuscous suffusion, anal tuft ochreous. Male genitalia (Figures 8-11): uncus long slender, slightly curved apically; tegument short and broad; in valve basal costa depressed, medial process poorly developed; distal saccular process short and thick, juxta bilobed; vinculum long V-shaped. In the aedeagus, the phallus is short, thick, and slightly curved, vesica is divided into three diverticulums, basal diverticulum short and bears 10-12 long cornuti, medial diverticulum highly scobinated and without cornuti, and distal diverticulum long scobinated having a row of long 30-40 cornuti.

Distribution: Endemic to Andaman and Nicobar Islands (India).



Figures 8-11: Male genitalia of *Asura toxodes* Hampson, 1907; 8. *A. toxodes* Hampson, 1907, INDIA, Andaman, Long Island (NZCZSI); 9. *A. toxodes* Hampson, 1907, INDIA, Andaman, Diglipur (NZCZSI); 10–11. *A. toxodes* Hampson, 1907, INDIA, Andaman, Campbell bay (NZCZSI).

Remarks: The present study is the first complete description of the *A. toxodes* after 117 years of its superficial description. Furthermore, the habitus of *A. toxodes* show variation in their forewing. In some specimens, the forewings are dark ochreous, without antemedial and postmedial fascia (Figures 3,4) whereas some specimens are dull ochreous with fuscous suffusion and also have prominent antemedial and postmedial fascia (Figures 1,2). The dissection and examination of genitalia under a microscope indicate both types of specimens possess the same genitalic attributes hence all specimens are conspecific.

Discussion

A. toxodes usually prefer mangrove forests and evergreen forests of the Andaman and Nicobar Islands. The adults of the species take flight at night. Due to nocturnal behavior, biological information of the species could not be collected. After Hampson [2], a couple of studies were concerned with the Indian Lithosiin fauna by Arora [3]; Kirti and Singh (2015, 2016); and Singh et al. [5-7] but none of the researchers could find the adults of *A. toxodes*, and these researchers only mentioned this species on the bsis of previous literature. Hence, for more than one century this species was only being treated without its physical examination. The present study shows the physical presence of *A. toxodes* in the Islands after more than one century.

Conclusion

This manuscript evidently showed the presence of the *A. toxodes* on the Island after Hampson [2]. Illustration of adults and their genitalia will enhance the precise identification of the related species as well as refraining taxonomists from any homonymy of the species. The presence of the species in the Islands also indicates the diversity of its host plant and the persistent favorable environment of the species in the Andaman and Nicobar Islands. Hampson only observed and collected *A. toxodes* from the Andaman Islands but in the present study, *A. toxodes* are also found in the Nicobar Islands showing range extension in the adjoining Islands.

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