Discovery of the genus *Hidari* Distant, 1886 (Lepidoptera: Hesperiidae: Hesperiinae) in Cambodia and life cycle of *Hidari bhawani* de Nicéville [1889]

Gerard CHARTIER*

Koh Andet Village, Tatai Kraom Commune, Koh Kong District, Koh Kong Province, Cambodia

* Corresponding author. Email gee@geenature.com

Paper submitted 2 February 2019, revised manuscript accepted 7 December 2019.

មូលន័យសង្ខេប

អត្ថបទនេះមាននិយាយអំពីវត្តមាននៃសត្វមេអំបៅពីរប្រភេទ ស្ថិតក្នុងពូក*Hidari* (ដោយ Distant ឆ្នាំ១៨៨៦) ដែលជាកំណត់ត្រាដំបូងសម្រាប់ប្រទេសកម្ពុជា គឺ៖ មេអំបៅស្លឹកដូង (*Hidari irava*) ដោយ Moore ឆ្នាំ១៨៥៨ និងមេអំបៅមានទ្រនង់លើស្លាបជាប់គ្នា (*Hidari bhawani*) ដោយ de Nicéville ឆ្នាំ១៩៨៩។ ការពិពណ៌នាអំពីដំណាក់កាលមិនទាន់ពេញវ័យនៃ *H. bhawani* (ស៊ុត ដង្កូវ និងដឹកឌឿ) រុក្ខជាតិធ្នូលរបស់វា និងលក្ខណៈលំអិតនៃការលូតលាស់ និងការវិវត្តន៍មួយចំនួនត្រូវបានបង្ហាញ។

Abstract

This paper documents the occurrence of two species of the genus *Hidari* Distant 1886 for the first time in Cambodia: coconut skipper *Hidari irava* (Moore, [1858]) and veined palmer or cresentric skipper *Hidari bhawani* de Nicéville [1989]. Descriptions of the immature stages of *H. bhawani* (egg, larvae, and pupa), its host plant and some details of life history are provided.

Keywords Host plant, *Licuala spinosa*, new country record.

Introduction

The genus *Hidari* Distant, 1886 contains three species: coconut skipper *H. irava* (Moore, [1858]), veined palmer or cresentric skipper *H. bhawani* de Nicéville, [1989], and long-spotted skipper *H. doesoena* Martin, 1895. *Hidari irava* has a wide distribution and has been recorded in South Myanmar, Thailand, Malaysia, Sumatra, Java, Sulu Archipelago (Philippines), Borneo, and Banka (India) (Evans, 1949). It has also been recorded near to Cambodia in the Chanthaburi and Trat provinces of Thailand (Pinratana, 1985). *Hidari bhawani* has been recorded in the Arakan Coast (Myanmar), Toungoo (Myanmar), Lakhimpur (India), Assam (India), Langkawi Island (Malaysia) (Evans, 1949), Rayong Province (Thailand) (Ek-Amnuay, 2012), and Dong Nai Province (Vietnam) (Monastyrskii & Devyatkin, 2015). *Hidari doesoena* is known from Sumatra, Batoe Island, Sipora Island (Indonesia), Kinabalu (Malaysia) (Evans, 1949), Ranong (Peninsular Thailand) (Ek-Amnuay, 2012), and Thua Thien Hue (north-central Vietnam) (Monastyrskii & Devyatkin, 2015).

Hidara ivara is common in Thailand and one of the most common Malayan hesperiids. *Hidara bhawani* is rare in Thailand and very rare in Peninsular Malaysia. *Hidara doesoena* is also rare in Thailand and much rarer than *H. irava* in Peninsular Malaysia (Corbett & Pendlebury, 1992; Ek-Amnuay, 2012).

CITATION: Chartier, G. (2019) Discovery of the genus *Hidari* Distant, 1886 (Lepidoptera: Hesperiidae: Hesperiinae) in Cambodia and life cycle of *Hidari bhawani* de Nicéville [1889]. *Cambodian Journal of Natural History*, **2019**, 121–127.

 © Centre for Biodiversity Conservation, Phnom Penh

Robinson *et al.* (2010) listed the following host plants for *H. irava*: *Bambusa* spp. (Gramineae), *Arenga* spp., *Caryota urens*, *Cocos nucifera*, *Elaeis guineensis*, *Livistona* spp., *Metroxylon* spp. (including *M. sagu*), and *Nypa* spp. (including *N. fruticans*) (Palmae). Igarashi & Fukuda (1997) also listed Musaceae as host plants for the species. Robinson *et al*. (2010) and Ek-Amnuay (2012) did not include host plant information for *H. bhawani* or *H. doesoena*, although Corbett & Pendlebury (1992) suggested that the latter probably feeds on jungle palms. Aside from this vague comment, no mention of the larvae or host plant of *H. doesoena* appears in the literature.

The larva of *H. irava* is pale yellowish-green with a dark brown lateral stripe (Corbett & Pendlebury, 1992). The larvae spin a bag-like nest with two neighbouring leaves, in which 2–3 larvae live. These feed at night and are usually found about 1–2 m above the ground and the final instar reaches approximately 60 mm in length (Igarashi & Fukuda, 1997). The pupa is a shiny reddish to blackish-brown colour with a dark brown lateral line and is covered in white powder (Corbett & Pendlebury, 1992; Igarashi & Fukuda, 1997).

The mangrove fan palm *Licuala spinosa* Wurmb is widespread in Southeast Asia, occurring in the Andaman Islands, Borneo, Cambodia, Myanmar (Tanintharyi), Peninsular Malaysia, Philippines, Sumatra, Thailand, and Vietnam (Henderson, 2009). Its habitats include lowland rain forest in low wet places, savanna, scrub forest, and disturbed land up to 600 m in elevation (Henderson, 2009).

Robinson *et al*. (2010) did not list any lepidopteran species whose larvae use *L. spinosa* as a host plant. However, a blog post (Han, 2011) documents the use of *L. spinosa* as the larval host plant by the yellow streak darter *Salanoemia tavayona* (Evans, 1926), another skipper which is rare in neighbouring Thailand (Ek-Amnuay, 2012) and Peninsular Malaysia (Corbett & Pendlebury, 1992).

The present paper documents the first records of *H. bhawani* and *H. irava* from Cambodia and presents the first details of the life history of *H. bhawani*. The *Hidari* genus was previously unrecorded in Cambodia and the life history of *H. bhawani* was also undescribed.

Methods

The study area was located in the Tatai Kraom Commune, Koh Kong District of Koh Kong Province (Fig. 1). The author has recorded observations of fauna and flora in this area on many occasions over the last decade. Most of these observations have focused on a ca. 5 ha area (indicated in yellow in Fig. 1 and centering on 11.580°N, 103.128°E), but all areas outlined in red in Fig. 1 have been visited many times. All evidence for Lepidoptera was based on photography alone, due to the lack of local storage facilities for lepidopteran specimens.

Identification of *Hidari* species was undertaken using keys in Evans (1949). The genus was first established as follows: FW origin of vein 5 nearer vein 4 than vein 6 (Ea); hindwing cell normal (Fa); antennal club not restricted before the apiculus and vein 5 well marked (Fb); palpi second segment erect (Ha); antennal apiculus finely pointed (Ia); HW vein 5 not decurved at origin and wings produced (J); hindwing cell not abnormally long (J.1a); antennal apiculus longer than twice width of club, hooked or obtuse; palpi third segment not protruding (J.12a); F cell very long ≥ dorsum (J.19a); antennae not > ½ costa (J.19b); FW vein 5 decurved (J.20a); HW cell = ½ wing; apiculus hooked; UpF with yellow hyaline spots; spot in space 1b (J.20).

The two species were identified as follows:

- UpF hyaline yellow spot in space 2 not reaching origin of vein 3: central spots in spaces 2, 3 and cell separate and equidistant (J.20.1a).
- UnF pale brown with more or less well-developed small brown, whitish centred, spots; UnH, with a small pale spot near upper end of cell (J.20.1a.I = *H. irava*).
- UnF pale brown tessellated with dark, brown dashes; UnH with small·discal spots as in *irava*, no pale cell spot, but with a more or less developed brown streak under·vein 8 (J.20.2 = *H. bhawani*).

The immature stages of *H. bhawani* were studied by collecting and observing one larva (Larva A) on 26 May 2015 (at 11.581°N, 103.128°E), plus three eggs and one larva (Larva B) on 23 July 2019 (at 11.518°N, 103.143°E). The eggs and larvae were checked at least once a day and photographed to document their stage of development.

The identity of the host plant was determined using keys in Henderson (2009). The genus was first determined as follows: leaves palmate (1); leaf blades divided into leaflets (2b); hastulas present (4b); leaf sheaths fibrous, not split at base (6b); petiole margins with thorns (10a); leaflets split to their bases into multi-fold, wedge-shaped leaflets with lobed apices (11a = *Licuala*).

The relevant parts of the key for species of *Licuala* in Henderson (2009) are purely based on geography, with those for Cambodia (1b, 2b, 4b, 7b, 11a: Henderson, 2009) indicating *L. spinosa*. As such, the parts of the key that referred to the neighbouring region of Thailand were also considered due to its proximity to the study area

© Centre for Biodiversity Conservation, Phnom Penh

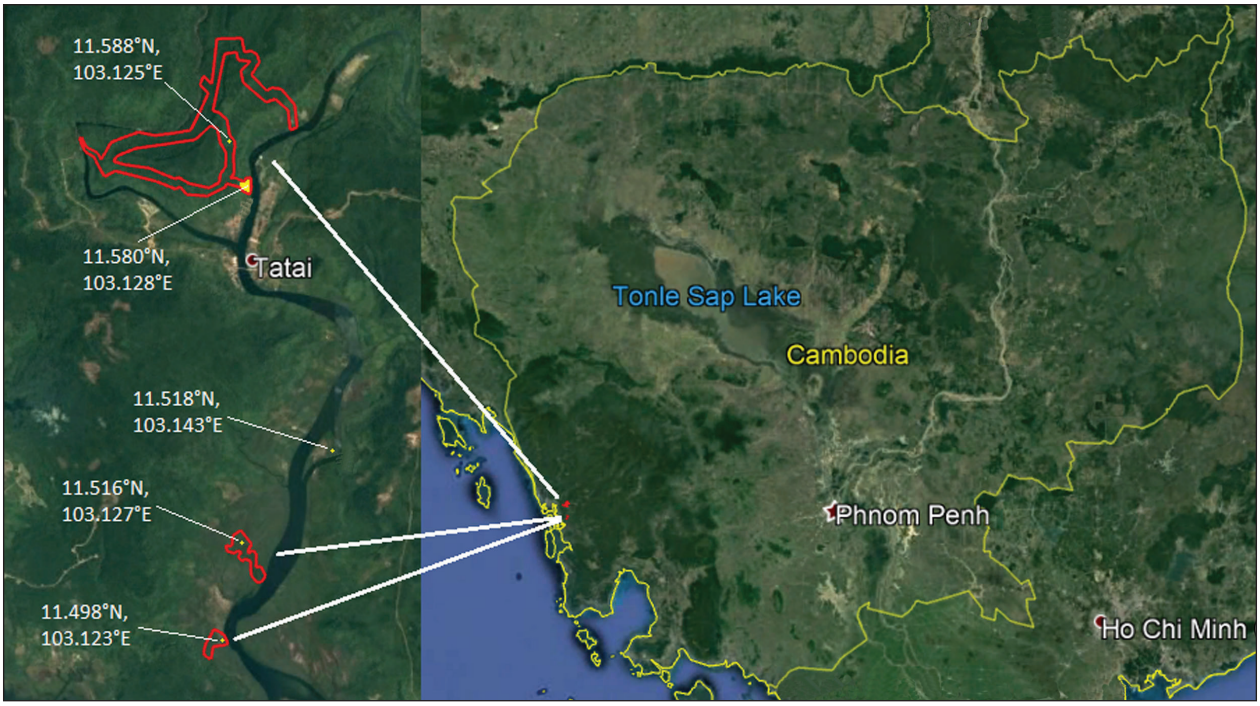

Fig. 1 Study areas in Tatai Kraom Commune, Koh Kong District, Koh Kong Province, southwest Cambodia.

(11b, 12a, 13a: Henderson, 2009). The specific diagnosis comprised: stems forming large clumps of equal-sized stems; petiole thorns stout, to 1.2 cm, borne all along the petioles (14a = *Licuala spinosa*). This was confirmed in personal communication with Andrew Henderson.

Taxonomic placement of Lepidoptera is based on Beccaloni *et al*. (2018). No tribes are given therein for any hesperiid mentioned here due to current uncertainties regarding tribal relationships within some clades of Hesperiinae (Warren *et al*., 2009).

Photographs were taken with three different cameras. Photographs were taken in 2012 and 2013 using a Canon EOS 500D with a 55-250 mm lens, whereas in 2015 these were taken using a Panasonic DMC-FZ200 and in 2019 with Olympus TG-4, fitted with FD-1 flash diffuser.

GPS coordinates were recorded with the Olympus TG-4 camera from June 2016 onwards, whereas coordinates for earlier photographs were estimated using Google Earth. All coordinates are given as latitude/longitude degrees in decimal format to three decimal places.

Approximate measurements of the eggs, larvae and adult of *H. bhawani* were made using a handheld tape measure. These were estimated from photographs taken of subjects together with the tape measure.

Results

Observations of adults of genus *Hidari*

Photographs were obtained of adults of *H. irava* (Fig. 2A) on 24 separate occasions between March 2011 and October 2018. These were observed in all months from February to November and at times ranging from 06:18 to 21:08 hrs. Twenty-three of the observations were in the yellow region marked in Fig. 1 (11.580°N, 103.128°E), whereas the remainder occurred in the northernmost location (11.588°N, 103.125°E). Most observations were made in shady secondary growth and scrubby areas, but occasional sightings of adults were also made indoors after dark or very early in the morning, these being presumably attracted by lights.

Photographs were obtained of adults of *H. bhawani* (Fig. 2B) on seven separate occasions (excluding adults reared from larvae) between June 2012 and July 2019. Observations were made in March, May, June, and July, and at times ranging from 05:56 to 18:03 hrs. Four observations occurred in the yellow region marked in Fig. 1 (11.580°N, 103.128°E), whereas the remainder were at the three marked points (11.518°N, 103.143°E; 11.516°N, 103.127°E; 11.498°N, 103.123°E). Six sightings were in similar habitats to those of *H. irava*, with two of the seven photographs taken indoors. One adult was photographed

 © Centre for Biodiversity Conservation, Phnom Penh

Fig. 2 A) *Hidari irava,* adult, B) *H. bhawani,* adult, C) *H. bhawani,* egg ca. 24 hrs after oviposition, D) *H. bhawani,* first instar and egg, E) *H. bhawani,* first instar making its shelter, F) *H. bhawani,* leaf damage from first instar, G) *H. bhawani,* first instar with frass, H: *H. bhawani,* first instar during moulting, I) *H. bhawani,* second instar, J) *H. bhawani,* penultimate instar during moulting, K) *H. bhawani,* final instar, L) *H. bhawani,* final instar, fully evacuated prior to pupation, M) *H. bhawani,* prepupa, N) *H. bhawani,* pupa, O) *H. bhawani,* leaf damage from final instar, P) *H. bhawani,* final instar eating, Q) Habitat where *H. bhawani* eggs and Larva B were collected, R) Habitat where Larva A of *H. bhawani* was discovered.

© Centre for Biodiversity Conservation, Phnom Penh

ovipositing on a very small (only 10 petioles) individual of *L. spinosa* in a small area of vegetation in the middle of plastic decking at a resort on the river island of Koh Andet (Fig. 2Q). Some nearby habitat is similar to that where the other sightings were made, particularly across the narrow (approximately 20 m) stretch of river directly in front of the resort.

Life history of *H. bhawani*

Little can be said about the development of Larva A because it was a late final instar when collected. However, comparative remarks on this and other larvae reared are given further below.

On 23 July 2019 (day 1), one day after oviposition was observed, eight eggs and one larva (Larva B) were found. Three of the eggs were collected and the chronological development of these and Larva B are detailed separately below.

Eggs, Day 1: Six of the eggs were on separate leaf segments and the remaining two were on the same segment. One of the eggs was on the tubular shelter of Larva B. The eggs were pale, creamy-orange in colour with a pinkish-red top and irregular line, the same pinkish-red, around the middle but with its ends not meeting. The eggs were almost hemispherical, but flat or slightly indented dorsally, with 20–21 ribs (Fig. 2C), ca. 1.7 mm in diameter.

Day 2: Two of the eggs had changed to become more uniform creamy-pink in colour. This change did not occur to the third egg until day 4. This failed to hatch and was later discarded.

No observation was made on day 3.

Day 4: Two larvae (Larva C and Larva D) had hatched the previous night. Each was creamy-yellow in colour with a dark brown head and had a thin, dark brown dorsal line at the base of the abdomen (Fig. 2D). These were approximately 5 mm in length. Little remained of the eggs, the rest having presumably been eaten by the larvae. The larvae had already made shelters in folds of the leaf segments and made new shelters (Fig. 2E) within 30 minutes of breaking the original shelter. By evening, Larva C had darkened to almost black.

Day 5: By early morning, Larva C had grown to a little over 6 mm in length (Fig. 2G) and become more green in colour, presumably in part from the green food showing through its translucent body. Its frass was also green (Fig. 2G). Larva D had not grown and was still yellow in colour. Despite the presence of tiny amounts of frass which showed that it was eating, larva D failed to grow and was dead by day 8.

Day 6–9: Larva C grew to ca. 8 mm by the evening of day 6. By the evening of day 7, it had developed a whitish lump behind its head and had begun moulting. The white lump increased in size in the morning of day 8 (Fig. 2H) and moulting was complete that evening. There was little difference between the first and second instar. The head was a paler brown colour and there was no dorsal line at the base of the abdomen (Fig. 2I). By the end of day 9, Larva C had grown to 10 mm in length.

Day 10: Larva C had left its leaf and was on the plastic container. This was the only time the larva was seen away from its leaf. Some minutes later, Larva C had liquid around it and died that evening. It appeared to have a lesion in its side.

Larva B, Day 1: Larva B was found in a tubular shelter formed by the folds of a leaf segment and was in the process of moulting when collected (Fig. 2J). The following morning, it was ca. 38 mm long (Fig. 2K). Its head was grey in colour and bordered with black, with four black spots. Two large spots were almost central to each half of the anterior portion of the head, whereas two smaller spots were conjoined in the posterior portion. The body had less colour and was more transparent than earlier instars, revealing more of the internals of the larva, including lateral white trachaeae originating ventrally and spreading dorsally. In captivity, Larva B created a tubular shelter similar to the one in which it was found.

Day 2–8: Larva B showed no changes in appearance, apart from growing to a length of 46 mm.

Day 9–10: Larva B had changed colour, with no hint of green by the morning (Fig. 2L). It frass had also changed from loosely-packed and pale brown to appearing harder and much darker (almost black). By evening, the larva began to prepare for pupation (Fig. 2M). It sealed itself within a much narrower shelter in the folds of its leaf segment. Its colour was slightly darker and becoming less yellow. The head appeared to be already dislocated. There was a white powdery substance on the leaf and around the prolegs of the larva. The prepupa was 40 mm in length. By the following morning (day 10), body colour had darkened to an almost uniform tan, but was darker at the end of the abdomen, and there was also slightly more white powder. Its length had reduced to 35 mm.

No observations were possible on day 11.

Day 12–22: The pupa had formed by the morning of day 12 (Fig. 2N). This was a light golden-brown colour which darkened towards its anterior and the remains of the head were still attached to the posterior end of the pupa. The pupa appeared to be shiny and smooth beneath the white powder with which it was lightly

 © Centre for Biodiversity Conservation, Phnom Penh

dusted and was ca. 28 mm long, excluding the remains of the head. No further changes were noted in the pupa up to and including day 21, but by the evening of day 22, it had darkened to almost black.

Day 23: The adult (a female) had already emerged and its wings were fully expanded by the morning (Fig. 2B). Its length was ca. 13 mm, from tip of the labial palps to the end of the abdomen. The length of the forewing from base to apex was ca. 24 mm.

Remarks on Larva A, B and C

Larva A was discovered in secondary scrub (Fig. 2R), which included several *L. spinosa* among a mixture of plants including unidentified small trees, bamboo and palms (including snake fruit *Salaca* sp.). The plant which Larva A was feeding on was at the edge of a small clearing where a small house stood. This was collected in its feeding tube (Fig. 2O) where it was first observed eating from the apex of the leaf (Fig. 2P). Larva B ate in a similar manner in captivity. However, Larva C differed, eating instead from the side of the leaf segment (Fig. 2F).

Larva A was slightly different from Larva B in appearance, as the two clear, black, and conjoined spots on the head of the latter were barely visible on the former. Larva A alone also had a pair of pale parallel stripes running dorsally along its body. The morning after collection, Larva A had already begun preparations for pupation, having eaten its entire shelter between collection at 16:50 hrs and 07:16 hrs. The time from preparations for pupation to emergence of the adult (a male) was 12 days for Larva A, whereas it was 14 days for Larva B.

When disturbed in nature, Larva A exhibited defensive behaviour which consisted of retreating into its tubular shelter. In captivity, Larva B differed: if touched, it trashed its head from side to side and made an audible clicking noise, both of which would continue for up to a minute.

Discussion

The discovery of *Hidari* spp. in Cambodia is not surprising. *Hidari irava* is very common and has been recorded close to the study area in the neighbouring Trat and Chanthaburi provinces of Thailand (Pinratana, 1985). *Hidari doesoena* and *H. bhawani* have also been recorded in locations on either side of Cambodia, in Thailand and Vietnam (Ek-Amnuay, 2012; Monastyrskii & Devyatkin, 2015).

The location of the oviposition site observed in 2019 (Fig. 2Q) was unexpected. *Licula spinosa* is a very common in the area and frequently grows in secluded places that are less disturbed by humans. Despite this, the skipper chose a very open location frequented by people, this being directly between the bar and restaurant of a popular resort. This was similar in some ways to the location of the *L. spinosa* individual chosen by the skipper in 2015. This was located on the edge of a clearing less than 10 m from the authors house, despite the presence of several *L. spinosa* in more secluded locations nearby.

It seems paradoxical that while *H. bhawani* is a very rare skipper, its host plant (*L. spinosa*) is abundant in the study area. Although *L. spinosa* plants were examined on multiple occaisions in several locations during the period between the two study collections (26 May 2015 and 23 July 2019), no further evidence of *H. bhawani* or other lepidopteran larvae was observed. However, a similar scenario (i.e. a rare skipper using *L. spinosa* as a larval host plant) has been reported for *S. tavoyana* (Han, 2011) and it is possible that the development cycle is rarely successful. Of the three eggs collected in this study, none produced an adult skipper. However, the results of captive-rearing efforts may not necessarily apply to development in a natural environment.

Little can be said about the breeding habits of *H. bhawani* from this study. What is clear is that breeding was recorded in both May and July. It is also apparent that either multiple adult females oviposit on the same plant or a single adult oviposits on the same plant on more than one occasion. This is demonstrated by the simultaneous presence of newly laid eggs and a penultimate instar on the same plant.

The larval habits of *H. bhawani* observed in this study differ from those reported for *H. irava*. For example, *H. irava* has been reported to feed at night (with no mention of daytime feeding) and to make a feeding shelter by joining two leaves together, with 2–3 larvae sharing the same shelter (Igarashi & Fukuda, 1997). In contrast, the individuals observed in this study made tubular shelters from single leaf segments, fed during the day (observed at 13:36 and 17:47 hrs), and remained solitary in their feeding shelters. However, given the quantity of leaf consumed by Larva A during the brief and mostly overnight period it spent in its container before pupation, it would seem likely that *H. bhawani* also feeds at night.

Acknowledgements

The author thanks Tek Lin Seow and Les Day for help with butterfly identification, Oleg Kosterin for kindly reviewing the content of this paper and several anonymous reviewers for their very constructive comments.

© Centre for Biodiversity Conservation, Phnom Penh

Thanks are also due to Alexander Monastyrski and Andrew Henderson for clarifying several points in this paper and to Anna Carangian Pawlik for allowing the author to cut her *L. spinosa* plants to collect butterfly material and photograph the site.

References

Beccaloni, G., Scoble, M., Kitching, I., Simonsen, T., Robinson, G., Pitkin, B., Hine, A. & Lyal, C. (eds) (2018) *The Global Lepidoptera Names Index (LepIndex)*. Https://www.nhm.ac.uk/our-science/data/lepindex/lepindex/ [Accessed 7 November 2019].

Corbet, A.S. & Pendlebury, H.M. (1992) *The Butterflies of the Malay Peninsula*. Malayan Nature Society, Kuala Lumpur, Malaysia.

Ek-Amnuay, P. (2012) *Butterflies of Thailand*. Amarin Printing and Publishing Public Co. Ltd., Bangkok, Thailand.

Evans, W.H. (1949) *A Catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History)*. Trustees of the British Museum, London, UK.

Han T. (2011) *Life History of the Yellow Streak Darter*. Https://butterflycircle.blogspot.com/2011/08/life-history-of-yellow-streak-darter.html [Accessed 24 August 2018].

Henderson, A. (2009) *Palms of Southern Asia*. Princeton University Press, Princeton, USA and Oxford, UK.

Igarashi S. & Fukuda H. (1997) *Life Histories of Asian Butterflies Vol. 1*. Tokai University Press, Tokyo, Japan.

Monastyrskii, A.L. & Devyatkin A.L. (2015) *Butterflies of Vietnam (An Illustrated Checklist)*. Planorama Media, Hanoi, Vietnam.

Pinratana, A. (1985) *Butterflies of Thailand, Vol. 5., Hesperiidae*. St. Gabriel, Bangkok, Thailand.

Robinson, G.S., Ackery, P.R., Kitching, I.J., Beccaloni, G.W. & Hernández, L.M. (2010) *HOSTS - A Database of the World's Lepidopteran Hostplants*. Natural History Museum, London. Http://www.nhm.ac.uk/hosts [Accessed 24 August 2018].

Warren, A.D., Ogawa J.R. & Brower, A.V.Z. (2009) Revised classification of the family Hesperiidae (Lepidoptera: Hesperioidea) based on combined molecular and morphological data. *Systematic Entomology*, **34**, 467–523.

 © Centre for Biodiversity Conservation, Phnom Penh