Staphylus spp. (Lepidoptera, Hesperiidae, Pyrginae, Carcharodini) in Trinidad, West Indies

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ABSTRACT

Staphylus kayei, S. lenis and *S. tyro* are known from Trinidad; *S. tyro* is also known from Chacachacare Island, but no *Staphylus* spp. are known from Tobago. Observations are provided on the food plants, leaf shelters, early stages and parasitoids of *S. kayei* and *S. lenis*. The food plants in Trinidad are all species of Amaranthaceae, apart from one record from *Piper* sp. (Piperaceae) considered to need confirmation, and one from *Mimosa pigra* (Fabaceae) considered to be an error.

Key words (not in title): *Staphylus kayei*, *Staphylus lenis*, *Staphylus tyro*, Amaranthaceae, caterpillar, larva, pupa, leaf shelter, parasitoid.

INTRODUCTION

Staphylus is a genus of at least 50 small, brown, variably spotted Carcharodini skippers (Mielke 2004, Warren *et al.* 2016). Cock (1996) provided a detailed account of the genus in Trinidad and Tobago, based on four species: *S. kayei* Cock, *S. lenis* Steinhauser, *S. tyro* Mabille and an unidentified species known from reared females only. The recent checklist of Trinidad Hesperiidae (Cock 2014) repeated this information. No *Staphylus* spp. are known from Tobago, and since Tobago has been reasonably well collected and these butterflies fly in open disturbed spaces such as flowery roadsides, they are unlikely to have been overlooked.

The purposes of the following note is (1) to provide better illustrations of the adults, as those of Cock (1996) were of poor quality inadequate for identification, (2) document and illustrate the life history of *S. kayei*, (3) illustrate the partial life history of *S. lenis*, and (4) clarify that the unidentified species is now recognised to be *S. kayei*, which is more variable than previously recognised. Information is not repeated if given in Cock (1996), so that paper should also be consulted.

Staphylus is one of very few Hesperiidae genera that feed on Amaranthaceae. Thus far, all seven species for which food plants are known are Amaranthaceae feeders, with just a few records from other families (Beccaloni *et al.* 2008, Janzen and Hallwachs 2015), so records from other families are noteworthy and should be critically evaluated. All plants mentioned here belong to this family unless indicated otherwise. Beccaloni *et al.* (2008) list only Amaranthaceae as food plants for this genus, apart from two Trinidad records of *S. mazans*, which Cock (2014) considered misidentifications for *S. lenis*. Cock (1985) reported the work of M. Yaseen (CABI) who reared a specimen identified as *S. mazans* from *Mimosa pudica*. This single specimen is now held in the UWI Zoological Museum (M. Rutherford, pers. comm. 2015). It is a female *S. lenis*, which probably was reared as part of a general survey of insects feeding on *M. pudica* without careful observation of the biology, and is likely to represent a caterpillar wandering off its Amaranthaceae food plant to pupate on *M. pudica* or pupating in a shelter combining *M. pudica* and its normal food plant. Accordingly I discount this record. S. Alston-Smith (pers. comm. in Beccaloni *et al.* 2008) reports *Piper* sp. (Piperaceae) as a food plant of *S. mazans* (i.e. *S. lenis*). This does not seem to be the normal food plant and further observations would be desirable for confirmation.

In Trinidad, Simmonds (1964) recognised nine genera of Amaranthaceae, and notes that several species are cultivated as food (spinach) and ornamentals. I have reared *Staphylus* spp. from *Alternanthera*, *Pfaffia*, and *Cyathula* spp. and found empty leaf shelters on *Achyranthes aspera* (Figs. 1–4).

Fig. 1. Whole plant of *Achyranthes aspera* growing at the base of a concrete wall, Point Gourde, 16 October 2011; MJWC 11/63.

Fig. 2. Stage 1 shelter of a *Staphylus* sp. on *Achyranthes aspera*, Point Gourde, 16 October 2011; MJWC 11/63.

Fig. 3. Stage 1 (right) and open stage 2 shelter (left) of a *Staphylus* sp. on *Achyranthes aspera*, Point Gourde, 16 October 2011; MJWC 11/63.

Fig. 4. Stage 3 shelter of a *Staphylus* sp. on *Achyranthes aspera*, Point Gourde, 16 October 2011; MJWC 11/63.

***Staphylus kayei* Cock**

In Trinidad, this is a common species in disturbed areas of low vegetation including roadsides and neglected gardens. Pinned and living specimen are shown as Figs. 5–9. Cock (1996, 2014) included an unidentified *Staphylus* sp., based on a short series of female specimens reared from the south of Trinidad on *Cyathula achyranthoides*, an introduced African species. Selected specimens were barcoded in association with Professor N.V. Grishin, University of Texas, using methods similar to those described by Cong and Grishin (2014) and Shiraiwa *et al.* (2014). Initial results showed that one of these specimens has almost the same barcode as that obtained from one of the male paratypes of *S. kayei*, and should very likely be considered conspecific. Re-examination of preserved material led to the conclusion that they are all one species, sharing features of the UNS, particularly the pale shading at the tornus, but being more variable in the UPS than previously realised. Thus, Cock (1996, 2014) treated specimens of *S. kayei* with subapical spots but no discal spots (Fig. 6) as *S. kayei*, and those with discal spots in spaces 1A, 1B and 2 (Figs. 7 and 9) as *Staphylus* sp.

I reared this species from *Pfaffia iresinoides* at Mt. St. Benedict's 15 July 1996 (96/10) and several times from *Cyathula achyranthoides* at Inniss Field, north-east of Moruga (2 October 1994 94/53, 17 May 1999 99/11, 16 January 2004 04/30). A further collection on C. *achyranthoides* near Moruga Bouffe (24 March 2003, 03/222) was not reared through. Leaf shelters photographed on *Achyranthes aspersa* (Point Gourde, 16 October 2011, 11/63, Figs. 2-4) and on *P. iresinoides* (Mt. St. Benedict's, 9 October 2011, 11/10, Fig. 11) are most likely this species too. Collection 94/53 was described in Cock (1996) as *Staphylus* sp., but the following is based primarily on collection 96/10.

Leaf shelter 1 is an oval two-cut shelter, about 4 x 3mm cut from the edge of the leaf lamina (Fig. 2) or from the edge of a hole in the leaf lamina (Fig. 3) and folded upwards. Leaf shelter 2 is often made on the same leaf (Fig. 3) and is an irregular flap about 12 x 7 mm cut from the leaf edge and folded upwards along a main vein. The stage 3 shelter may be similar to the stage 2 shelter but larger, and the fold may be along the midrib (Figs. 4, 11), with or without making a cut depending on the leaf size. In captivity, one caterpillar constructed the pupal shelter from a whole leaf rolled upwards. The cremaster hooked into a cross bar of silk at one end and there was no evidence of a Y-shaped silk girdle to support the pupa.

The final instar (Figs. 12–13) is up to 18mm long. Head 2.1 x 2.3 mm wide x high; chordate, broadly indent at vertex; matt black or very dark brown; rugose, shiny; a group of seven small concolorous domes adjacent to each other

Fig. 5. Paratype male *Staphylus kayei*, Spanish Farm, near las Lomas.17 December 1980 (Cock 1996, Plate 3).

Fig. 6. Paratype female *Staphylus kayei*, Curepe, March 1980 (Cock 1996, Plate 4).

Fig. 7. Female *Staphylus kayei*, reared from caterpillar collected on *Cyathula achyranthoides*, Inniss Field, north-east of Moruga, 2 October1994; 94/53.

Fig. 8. Male *Staphylus kayei*, Rio Claro–Guayaguayare Road, 9 October 2011. The forewing costal fold indicates that it is a male, the yellow-orange dorsal head and lack of white spots are diagnostic for male *S. kayei* in Trinidad.

Fig. 9. Female *Staphylus kayei*, reared from caterpillar collected on *Cyathula achyranthoides*, Inniss Field, 2 October 1994; photographed 31 October; MJWC 94/53. (See also Fig. 7; DNA MJWC 2015-060). The absence of a costal fold indicates this is a female; the white spots are similar to those of *S. lenis* (Fig. 21); in Trinidad female *S. kayei* can be distinguished by the relatively even speckling of the wings, but more reliably by the pale area at the tornus UNH (Figs. 6-7).

Fig. 10. *Pfaffia iresinoides*, a food plant of *Staphylus kayei*, Mt St Benedict's, 9 October 2011; MJWC 11/10.

dorsolaterally on the face; head covered with short, pale, erect setae, those on face shorter and divided near apex, those laterally and dorsally longer with multiple branches; posterior margin a very narrow, long 'neck'. Pronotum transparent, shiny, concolorous with body. Body smooth dull translucent green with underlying pale fat bodies and scattered small dull yellow speckles, except on dorsal line which therefore seems darker; pale tracheal line; male gonads conspicuous dull yellow; scattered short, pale, erect setae, which are branched distally; all legs concolorous; spiracles pale, inconspicuous.

Fig. 11. Two stage 2 shelters of *Staphylus ?kayei* on *Pfafffia iresinoides*, Mt St Benedict's, 9 October 2011; MJWC 11/10

Fig. 12. Final instar caterpillar of *Staphylus kayei*, collected on *Cyathula achyranthoides*, Inniss Field, north-east of Moruga, 17 May 1999; photographed 20 May; pupated 25 May; 18mm; MJWC 99/11A.

The penultimate instar (Fig. 14) is similar to the final instar, 13mm long; head 1.5 x 1.6mm wide x high; as final instar, but no domes dorsolaterally on face. T1 pronotum is slightly dark on the posterior margin. Body dull translucent green; dorsal line darker due to absence of underlying fat bodies; gonads pale, diffuse; pale tracheal line; ventrolaterally and ventrally pale; all legs concolorous. The earlier instar caterpillars are dull green; T1 pale; head black, chordate; Ln-2 1.0 x 1.0 mm, Ln-3 0.7 x 0.7 mm wide x high.

The pupa (Fig. 15) measures 10–12 mm long; elongate, fairly smooth, with bulbous eyes; brown;

Fig. 13. Detail of head of final instar caterpillar of *Staphylus kayei*, collected as penultimate instar on *Cyathula achyranthoides*, Inniss Field, 16 January 2004; moult to final instar not recorded; photographed 29 January 2004; pupated 15 February; MJWC 04/30B.

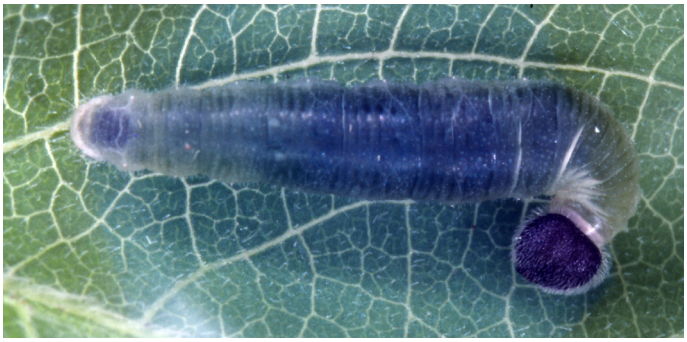

Fig. 14. Penultimate instar caterpillar of *Staphylus kayei*, collected on *Cyathula achyranthoides*, Inniss Field, north-east of Moruga, 17 May 1999; photographed 20 May; moulted to final instar 1 June; 11mm; MJWC 99/11B.

short pale, erect setae; covered with white waxy protrusions except for a stripe down the centre of the eye, and spiracle T1 which is large, brown and slightly protuberant; other spiracles inconspicuous.

An *Apanteles* sp. (Braconidae, Microgasterinae) was reared from one of two caterpillars collected on *Cyathula achyranthoides* at Inniss Field, north-east of Moruga, 16 January 2004 (04/30). Three parasitoid larvae emerged from the mature caterpillar and span cocoons in the leaf shelter on 2 February; on 14 February two adult parasitoids emerged. J.L. Fernández-Triana (pers. comm. 2014) advises that they represent an undescribed species of *Apanteles*, closely related to *A. ruthfrancoae* Fernández-Triana.

Fig. 15. Pupa of *Staphylus kayei*, collected as caterpillar on *Pfaffia iresinoides*, Mt. St. Benedict's, 15 July 1996; pupated 7 September; photographed 8 September; adult 22 Sep; 10mm; MJWC 96/10.

Another collection made on *Pfaffia iresinoides* at Mt. St. Benedict's 15 July 1996 included final instar host remains in a leaf shelter with emerged Microgasterinae cocoons (96/10E), which could have been the same species. Approximately 20 white cocoons were arranged in an irregular group held together with silk.

One pupa reared from a caterpillar collected on *C. achyranthoides* at Inniss Field, north-east of Moruga, 17 May 1999 (99/11A) was parasitised by a larval-pupal tachinid parasitoid. Five days after the pupa was formed, the parasitoid puparium was formed within the host pupa and the head of the pupa broke off as the fly emerged. The tachinid has not been identified.

Staphylus lenis Steinhauser

This is a fairly common species in Trinidad, found in similar habitats to *S. kayei* (e.g. Figs. 8 and 19 were taken on the same occasion). Males have a costal fold, and can be readily separated from those of *S. kayei* by the minimal orange scaling of the dorsal head and head, and the white dots in fore wing spaces 2, 3, 6–8 and cell (Figs. 19, 19, 20). Females have variable white dots in fore wing spaces 1A, 1B, 2, 3, 6–8 and cell (Figs. 17, 18, 21); the sub-basal spots in spaces 1A and 1B distinguish this species from heavily marked female *S. kayei* when present (Figs. 7, 9), but they are not always present or may be inconspicuous (Fig. 6). The two dark discal bands on both wings upper side and the lack of white shading at the tornus UNH should separate this species from female *S. kayei*.

I have found and reared a larva of this species on *Alternanthera tenella* at Brasso, central Trinidad (1.x.1994, 94/45) which I described in Cock (1996). Here I include images of the caterpillar (Fig. 22) and pupa (Fig. 23) of collection 94/45, which was reared through. Re-examination of the caterpillar remains indicates that they are indistinguishable from those of *S. kayei*, except that in this individual there were only five small contiguous domes dorsolaterally on the face. The pupa is covered with white waxy powder rather than the erect extrusions noted in S. kayei, but the latter would probably rapidly abrade to a powder-like texture.

A caterpillar found on *A. philoxeroides* at Sangre Grande, Sans Souci Estate, 23 January 1982 (88/38B) died before pupation, but would have been a *Staphylus* sp., probably *S. lenis*.

Fig. 16. Male *Staphylus lenis*, Rio Claro – Guayaguayare Road, milestone 4.5–5.5, 1 October 1994.

Fig. 17. Female *Staphylus lenis*, Brigand Hill, 6 April 1982.

Fig. 18. Female *Staphylus lenis*, Curepe, 3 May 1982 (Cock 1996, Plate 6).

Fig. 19. Male *Staphylus lenis*, Rio Claro – Guayaguayare Road, 9 October 2011. The forewing costal fold indicates that it is a male, and the dark dorsal head and scattered white spots distinguish it from male *S. kayei* in Trinidad.

Fig. 20. Male *Staphylus lenis* reared from caterpillar collected on *Alternanthera tenella*, Brasso, 1 October1994; photographed 19 October 1994; MJWC 94/45.

Fig. 21. Female *Staphylus lenis*, Diego Martin, July-August 2012 (photo P.Geerah). The absence of a costal fold indicates this is a female; the white spots are similar to those of *S. kayei* (see Fig. 9), but note the two dark discal bands on both wings.

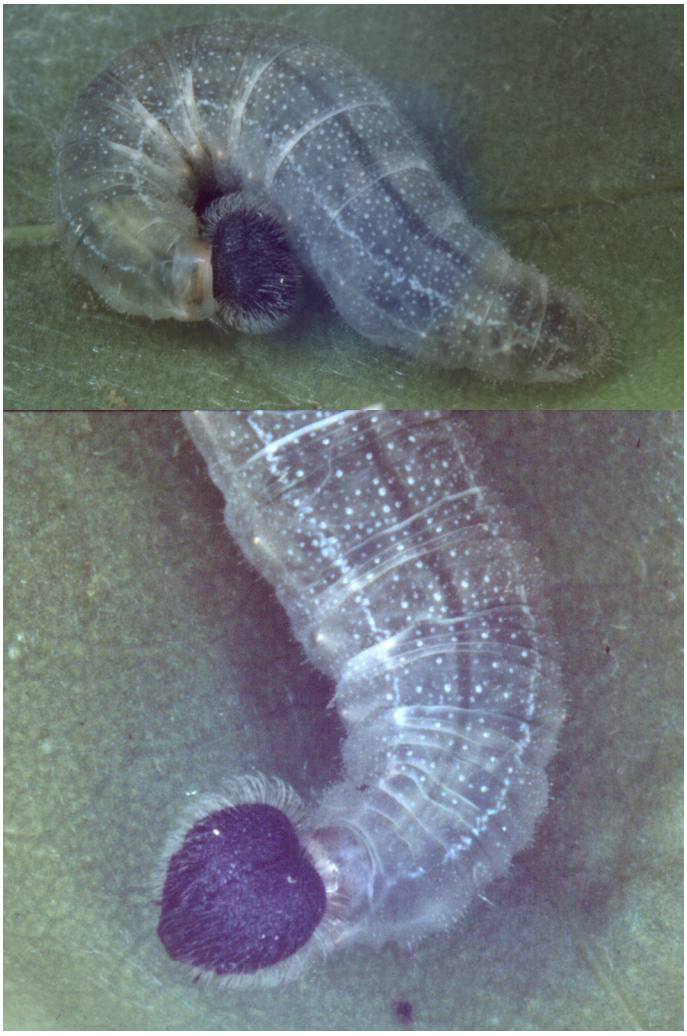

Fig. 22. Final instar caterpillar of *Staphylus lenis*, collected on *Alternanthera tenella*, Brasso, 1 October 1994; photographed 1 October; pupated 7 October; MJWC 94/45.

Staphylus tyro Mabille

Cock (1981) reported the original capture of a pair on Chacachacare Island. These specimens are illustrated here (Figs. 24 and 26). Since then, SAS has collected five males and five females, all from Chacachacare Island apart from single specimens from Point Gourde and Morne Catherine in north-west Trinidad.

At present, this is the only *Staphylus* sp. known from the Bocas Islands, and only in north-west Trinidad may *S. tyro* co-occur with the other two species of *Staphylus* found in Trinidad. In Cock (1996) I indicated that the males have no spots, but subsequent collecting by S. Alston-Smith indicates they may have three apical spots (Fig. 25). Males have a costal fold; the absence of orange scales on the dorsal head and palpi and the absence of white dots on the fore wing discal area (Figs. 24–25) separate this species from the other two *Staphylus* spp. known from the island of Trinidad. The female has small subapical spots in forewing spaces 6–8, which may resemble the markings of some female *S. kayei* (Fig. 26), or may be more elongate

Fig. 23. Pupa of *Staphylus lenis*, collected as final instar caterpillar on *Alternanthera tenella*, Brasso, 1 October 1994; pupated 7 October; photographed 7 October; adult 19 October; MJWC 94/45.

(Fig. 27), but the UNH lacks the white suffusion at the tornus characteristic of *S. kayei* (Figs. 6–7).

No food plants have been reported for *S. tyro*, but it is likely to be a species of Amaranthaceae, perhaps *Iresine angustifolia* which in Trinidad and Tobago is restricted to the Bocas Islands (Simmonds 1964).

DISCUSSION

At the moment, *S. kayei* is known from *Pfaffia iresinoides* and *Cyathula achyranthoides* and *S. lenis* from *Alternanthera tenella*. Observations from *Achyranthes aspersa* and *Alternathera philoxeroides* are provisionally allocated to *S. kayei* and *S. lenis* respectively. I can see no useful distinguishing characters to separate the early stages of *S. kayei* and *S. lenis*, although more careful examination of additional material may help in this regard. Accordingly all *Staphylus* spp. should be reared through to confirm the host plant records, until we have enough to see whether there is a clear division of host plants as appears to be the case at the moment, or whether there are shared food plants.

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Fig. 24. Male *Staphylus tyro*, Chacachacare Island, lighthouse track, M.J.W. Cock and J.O. Boos, 15 January 1980 (Cock 1996, Plate 8).

Fig. 25. Male *Staphylus tyro*, Chacachacare Island, (photos S. Alston-Smith).

Fig. 26. Female *Staphylus tyro*, Chacachacare Island, Rusts's Bay, M.J.W. Cock and J.O. Boos, 15 January 1980 (Cock 1996, Plate 9).

Fig. 27. Female *Staphylus tyro*, Chacachacare Island, S. Alston-Smith (photos S. Alston-Smith).

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