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The Biology and Descriptions of Immature of *Dysdercus stehliki* in Two Environments

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ABSTRACT: A recently described species of *Dysdercus*, named *Dysdercus stehliki* Schaefer, 2013 (Hemiptera: Heteroptera: Pyrrhocoridae), found in Viçosa, Minas Gerais State, Brazil, feeds upon the seeds of fallen fruits of *Sterculia chicha* A. St. Hil. (Malvales: Sterculiaceae). The biology and immature stages' descriptions of *D. stehliki* were assessed in two environments: laboratory and field. Individuals of the five nymphal instars were collected in March, 2011, in Viçosa, Minas Gerais State, Brazil on fruits of *S. chicha*. The presence of eggs, nymphs, and adults inside of the fruits was observed daily. Developmental time for eggs, nymphs, and adults were 9, 45 and 30 days, respectively in the field. The five nymphal instars were described. First instar: overall color dark red, paler ventrally except for head. Second instar: overall color darker red (darker than first instar). Third instar: overall color slightly darker than 2nd instar. Fourth instar: slightly darker and browner than 3rd instar. Fifth instar: overall color brown red.

Key words: Brazil, Malvales, Morphology, Neotropical region, Nymph

INTRODUCTION

Seeds of *Sterculia* spp. (Malvales: Sterculiaceae) are eaten raw by human and animals, and boiled or roasted by humans. They are tasty and rich in nutrients (except sodium) and some compounds of the seeds are used to manipulate drugs (medical and pharmaceutical importance) (Carvalho *et al.*, 2008; Silva and Fernandes, 2011). Seeds are surrounded by a sticky protective exudate that is also found in the tree trunk. This exudate is used for manufacturing cosmetics and in the food industry, primarily as an emulsifying agent (Zampa *et al.*, 2007; Eiras *et al.*, 2010). The wood is light with low durability when exposed to weather and is used in interior constructions, such as liners and boards, or in the manufacture of matchsticks. There is also potential for the production of cellulose. Open fruits (exocarp) can be used as ashtrays (Carvalho *et al.*, 2008).

The tree, *Sterculia chicha* A. St. Hil., is native in Brazil, reaching 30 m in height and occurring in the Brazilian Southeast in Bahia, Espírito Santo, Goiás, Minas Gerais, Rio de Janeiro, and São Paulo States (Taroda and Gibbs, 1982). The plant is cultivated as an ornamental and shade tree and is suitable for environmental recovery. Species of *Sterculia* L. have a Pantropical distribution, but biological, physiological, and ecological studies are scarce. Approximately 300 species of *Sterculia* are distributed in the tropics of Southeast Asia and the New World; they occur singly in the rain forests of the New World (Eiras *et al.*, 2007). With some regional variations, *S. chicha* blooms from January to March and produces fruit from July to October (Taroda and Gibbs, 1982).

A recently described species of *Dysdercus*, named *Dysdercus stehliki* Schaefer, 2013 (Hemiptera: Heteroptera: Pyrrhocoridae) (Figs 1.1a and 1.1b), found in Viçosa, Minas Gerais State, Brazil, feeds upon the seeds of fallen fruits of *S. chicha* (Schaefer, 2013). In Brazil, the closely related, morphologically similar

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Dysdercus longirostris Stål, 1861 (Fig 1.2) feeds on *Sterculia excelsa* Mart. (Doesburg Jr., 1968) while, in Costa Rica, *Dysdercus fasciatus* Signoret, 1861 feeds on *Sterculia apetala* (Jacq.) H. Karst. (Janzen, 1972). The latter species is African, but has arrived in the New World (Janzen, 1972). In Nigeria, *Dysdercus superstitiosus* (Fabricius, 1775), feeds on *Sterculia* sp. between January and March, but then moves to cotton (*Gossypium* sp., Malvales: Malvaceae) (Golding, 1928). In India, the related *Odontopus* (=*Probergrothius*) *sanguinolens* Amyot & Serville, 1843 (Hemiptera: Heteroptera: Pyrrhocoridae), feeds on *Sterculia foetida* (Linnaeus) (Gurusubramanian *et al.*, 1995).

The feeding biology and food plants of the Pyrrhocoridae were summarized by Ahmad and Schaefer (1987) and the damage they cause was discussed by Schaefer and Ahmad (2000). In fact, the 29 species of *Dysdercus* Guérin Méneville, Old and New World, as well as several other genera of Pyrrhocoridae, feed nearly exclusively on Malvales, especially on Bombacaceae, Malvaceae, and Sterculiaceae (Ahmad and Schaefer, 1987). The aim of the present study was to study the biology and to describe immature stages of *D. stehliki* collected in Viçosa, Minas Gerais State, Brazil in two environments: laboratory and field.

MATERIAL & METHODS

Eight open, ripe fruits of *S. chicha* (Figs 2a and 2b) were collected in May, 2011, from the ground after falling from a mature tree in the herbarium of the Federal University of Viçosa (UFV) in Viçosa, Minas Gerais State, Brazil (20º 45' S, 42º 51' W, 651 m above sea level).

Each of these fruits was placed into a 5-liters plastic bag and brought to the Laboratory of Biological Control of Insects (LCBI) of the UFV; they were kept at 25 ± 1 ºC, a photoperiod of 12 hours, and relative humidity of 70 ± 10%. The eight fruits, which contained eggs, nymphs, and adults were maintained in 20-liters plastic pots. However, because of the high mortality of the nymphs in the laboratory, we decided to observe the biology of this insect in the field, where eight fruits were observed daily and insects maintained from the egg to adult stages. The number of consecutive days with presence of eggs, nymphs, and adults was evaluated. Each fruit was numbered in the field and daily assessments of the number of days with presence of each stage were performed. The values shown are the average of the eight fruits sampled.

Some nymphs and adults of *D. stehliki* were removed from other fruits and fixed in 70% isopropyl alcohol. These insects were sent to the Department of Ecology and Evolutionary Biology, University of Connecticut, in Storrs, Connecticut, United States (34 first instars, 26 second instars, 13 third instars, 5 fourth instars, 10 fifth instars, and 10 adults) for identification and description by Carl W. Schaefer.

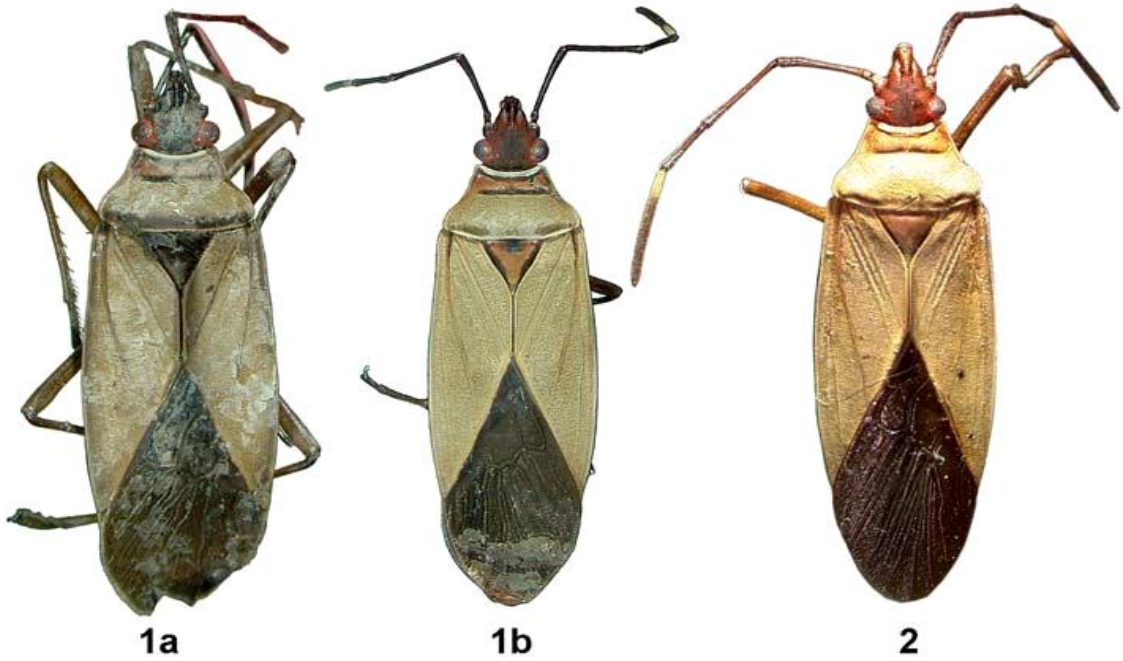

Fig. 1. *Dysdercus* spp. (Hemiptera: Heteroptera: Pyrrhocoridae), habitus, dorsal view. 1. *Dysdercus stehliki* Schaefer, 2013: a. holotype, male; b. allotype, female. 2. *Dysdercus longirostris* Stål, 1861, female

Fig. 2. Open ripe fruits of *Sterculia chicha* A. St. Hil. (Malvales: Sterculiaceae) (2a and 2b) collected on the ground after falling from a mature tree with its seeds colonized by nymphs and adults of *Dysdercus stehliki* Schaefer, 2013 (Hemiptera: Heteroptera: Pyrrhocoridae), larvae of *Anastrepha bezzii* Lima, 1934 (Diptera: Tephritidae), a species of Scolytinae (Coleoptera: Curculionidae) and a fungus in Viçosa, Minas Gerais State, Brazil (20º 45' S, 42º 51' W, 651 m above sea level)

All measurements are in millimeters. All specimens were preserved in isopropanol. Abdominal tergite or sternite are indicated by T or S.

RESULTS & DISCUSSION

Ripe fruits of *S. chicha* that had opened on the plant or after falling to the ground (fruit dehiscence) were collected; only the latter were attacked by *D. stehliki*. Green fruits that had fallen to the ground but were not opened had no insects inside. *Dysdercus stehliki* inserts its mouthparts and sucks exudates and the endosperm from the seeds, causing probably moisture and nutrient loss, which reduce germination and seedling survival. The interior of damaged fruits consisted of a mass of seeds, debris, and feces. The fruits, which have been attacked, had the seeds loose inside, which makes it easy to recognize *D. stehliki* infestations. The seeds and the bugs remain inside the fruit until the deterioration of the seeds, which comes after contact with the soil, because of abundant decomposing microorganisms. When deterioration occurs, the bugs leave the fruits. *Sterculia chicha* flowers on alternate years, so insects feeding on the fruits of *S. chicha* must use other plants as well. We found, for example, that *D. stehliki* did not occur in Viçosa in the summer of 2012-2013, perhaps because of scarce rains. We have not identified alternative hosts. The area in which the bugs were found is unusual–a botanical garden with trees and shrubs found in the Atlantic Rainforest biome. The shade of the trees and fallen leaves creates a microclimate for the bugs (First author, unpublished data). We have found *D. stehliki*, as nymphs and adults, within the sheaths of *Heliconia* sp. (Zingiberalis: Heliconiaceae, a monocot). The sheaths contain fluids (largely water) and the developing fruit.

Nymphs of different instars were found in the same fruit, which may be related to ovipositions at different times. Some first instars of *D. stehliki* were stuck to the sticky exudate, where the insects often die. The closed, green fruits of *S. chicha* fell to the ground, were not attacked, suggesting that females of this insect oviposit only on ripe fruits. Indeed, *O. sanguinolens*, when fed in the laboratory on unripe seeds of *S. foetida*, often became malformed and died, presumably because of quantitative and qualitative changes in developing seeds (Gurusubramanian *et al.*, 1995). Nymphs of *D. stehliki* could not enter fruits without dehiscence, indicating that they could not penetrate the exocarp. All fruits sampled contained nymphs of different instars in groups of more than 20 individuals, suggesting variations in the number of eggs laid per female or in the variability of the egg-to-nymph period inside the fruits. *Dysdercus urbahni* Schmidt presents the same pattern of development feeding on *Pseudobombax munguba* (Mart. & Zucc.) Dugand (Bombacaceae), in the Amazon region of Brazil, near Manaus (Amazonas State) (Adis and Froeschner, 1982). Fruits on the ground are fed upon only when the surface is open. A single fruit may contain all instars and adults. When the fruiting season is past, the insects could not be found (Adis and Froeschner, 1982). Honeybees, wasps, and flies are common on the flowers of *S. chicha*. Larvae of *Anastrepha bezzii* Lima (Diptera: Tephritidae) and a species of Scolytinae Latreille (Coleoptera: Curculionidae) have also been

reported damaging and sucking exudates from fruits of this tree (Santos *et al.*, 1993) in the same plants sampled for this work (Tavares *et al.*, 2013). In addition, hyphae of white fungi were observed colonizing the *S. chicha* seeds (Tavares *et al.*, 2013). There appeared to be no interaction between the pyrrhocorid and the tephritid.

Evaluations performed in the field showed that eggs, instars, and adults were found for 9, 45, and 30 consecutive days, respectively. There were 90-100 days between the fall of the fruit and the drying of the fruit, and 135-150 days between the falling of the fruit and its deterioration. After falling, some fruits remained on the ground with the opening directed upwards, allowing rainwater to be deposited within them, prolonging the permanence of the insects by increasing the humidity. The nine day egg developmental period of *D. stehliki* recorded in the field appears higher than the incubation period for the eggs of *D. koenigii*, 4.70 ± 0.42 days, at 35 ºC in a Pakistani laboratory (Jaleel *et al.*, 2013). We also found nymphs of *D. stehliki* for 45 days in the field, perhaps higher than the duration of the nymphal period of *D. koenigii*, 23.42 ± 2.49 days (Jaleel *et al.*, 2013). This may be the result of rearing *D. koenigii* at a higher temperature (35 °C) than *D. stehliki* in the field in Viçosa during the months of April (20.8 ºC mean temperature and 43.3 mm total rainfall), May (17.5 °C mean temperature and 2.6 mm total rainfall), and June (16.8 °C mean temperature and 22.7 mm total rainfall), of 2011 (temperature and rainfall data obtained from a meteorological station near to *S. chicha* plants infested by *D. stehliki*). We observed adults of *D. stehliki* for 30 days in the field, perhaps longer than the longevity of *Dysdercus cingulatus* (F.) adult (17 days), with an artificial diet of cotton in the laboratory (Sahayaraj *et al.*, 2011).

The nymphs of *D. stehliki* varied in size (Table 1).

First instar—Overall, color dark red, paler ventrally except for head. Head: Rostrum reaching (n = 6) the anterior margin of 6S; darker than the whole body, dorsally and ventrally. Ecdysial line, Y-shaped, stem pointing ventrally, paler than rest of head. Eyes paler red. First rostral segment dark red, segments II-IV pale yellowish-brown, at end dark brown. Below rostral suture, a median pale line. Antennifers pale red. Antennal segments dark red, occasionally I-III segments slightly brown-red; segment IV with basal white stripe. Thorax: Red, paler on the metathorax. Collar white. Sterna yellowish-white, becoming red laterally. Legs pale yellow-brown; except trochanters pale yellow. Tibiae with very small adflexed spines ventrally, with distally longer spines pointing toward tarsus; 1st tarsomere with small spines ventrally; rest of tarsomeres without spines. Abdomen: 1T not visible. Dorsal abdominal scent gland darker red, contrasting with red on abdomen; on 3-4T, 4-5T, 5-6T, the last largest. 6T medially on 7T. Spiracles concolor with abdominal venter. Trichobothria pale yellow, arranged as follows: 3S, 3 horizontally, medial, behind spiracle; 4S, same, but level with spiracle; 5S, 2 vertically just anterior to spiracle; 6S, 1 anterior to spiracle, 2 posterior and vertical to spiracle; 7S, 2 horizontal behind and slightly medial to spiracle (sensu Weirauch, 2006; Kment and Vilímová, 2010; Vilímová and Kutalová, 2012).

Second instar—Overall, darker red (darker than first instar). Head: Rostral lengths (n = 5), barely to 6S. Ecdysial line lighter red, continuing (as a straight line) on all thoracic terga, metaterga obscure. Eyes paler red. Antennifers dark red, like head, lighter distally. Antennae paler red, first and tip of fourth slightly darker red; segment IV with basal white stripe. Rostrum yellow-brown, tip of rostrum darker brown. Thorax: Very pale yellow-brown, meso- and metathorax laterally tipped with brown. Legs yellow-brown; last tarsal segments dark brown; coxae with some streaks of red. Base of tibiae and first tarsal segments ventrally and basally with small few sharp setae; at tibial tips, setae also laterally. No spines on femora. Abdomen: 2T almost completely white, remaining terga lightly reddish. Dorsal abdominal scent gland orifices dark brown, contrasting with red on abdomen. Venter of abdomen red laterally, pale yellow-brown medially. Terminalia of abdomen brown.

Third instar—Overall, slightly darker than 2nd instar. Head: Rostral lengths to 5S (n = 4) and 6S (n = 1).

Table 1. Minimum, maximum, and average body lengths (in mm) of *Dysdercus stehliki* Schaefer, 2013 (Hemiptera: Heteroptera: Pyrrhocoridae) nymphs, variation (%) from the smallest to the largest, and number (n) of specimens measured

	Minimum	Maximum	Average	Variation	n
1st instar	2.60	3.77	3.87	31	10
2nd instar	4.16	5.72	4.91	27	10
3rd instar	6.37	7.67	6.92	17	8
4th instar	7.54	8.32	7.72	9	5
5th instar	7.41	10.00	9.16	26	6

Dorsally dark red. Ecdysial line extending clearly to end of metathoracic tergum and obscurely to first abdominal scent gland orifice; eyes dark red surrounded by lighter red; clypeal-mandibular plates sutures brown-red and laterally mandibular plates brown-red to level of antennae. Antennifers dark red like head, lighter distally. Antennae yellow-brown, occasionally red-brown, with some pale red on 3rd and 4th segments; fourth very slightly darker and with basal white stripe. Venter of head dark red, but less than that of dorsum. Gula well-marked with a pale line (like that of ecdysium), paler red medially, where first rostral segment lies. Rostrum similar to color of legs, except on apex, where it is dark brown. Thorax: Dorsally light yellow-red. Prothorax slightly and broadly raised medially, and anteriorly and posteriorly with brown stripes. Margin of the thorax white and posterior margin bearing a brown stripe, more narrow. Sternites red, extending almost to midline; white line immediately lateral to thoracic sternites, extending to thoracic sternal borders. Collar extending ventrally, sometimes with a reddish splash anteriorly. Pteroteca (meso- and metathorax) light brown, both darker lateroposteriorly; mesopads laterally elongated and with another short elongation medially; pads not protruding beyond level of thorax. Trochanters yellow and occasionally red-splashed; rest of legs pale brown; second tarsomere darker brown, less so on hind leg. Tibia ventrally with a line of brown bristles apically to upper midline, with a cluster of bristles on tibiae just adjacent to tarsus; Tibial comb present on lateral surface anteriorly; tarsi densely setose bristled. Metafemur slightly larger than other femora, with series of small dark brown spines. Abdomen: Tergites uniformly red, slightly paler on 2T mainly lateroposteriorly; 6T slightly and 7T deeply encroaching upon 7T and 8T. Sternites whitish medially, red laterally extending to further on the segmental borders (but not extending medially). Spiracles pale. Trichobothria dark; arranged on 3S. Female: very slight V-shaped incision at base of 8S; male: 8S without incision. Trichobothria dark in the third instar is arranged on 3S as in *Dysdercus* sp. probably *koenigii* (F.) (Schaefer, 1975): 2nd just anterior to spiracle submedially, 3rd much further anteriorly and at same level as the pair; succeeding trichobothria arranged as both *D.* sp. probably *koenigii* and *D. mimulus* Hussey (Schaefer, 1975).

Fourth instar—Slightly darker and more brown than 3rd instar. Head: Rostral lengths to 5S (n = 1) and 6S (n = 4). Dorsally very dark red-brown. Ecdysial line on head bright red, on thorax pale yellow; not on abdomen. Eyes dark red, without lighter red surrounding them; clypeal-mandibular plates sutures darker, brown; clypeus paler apically; antennifer becoming dark brown-red (like head) proximally to red and then pale apically. Antenna red-brown, tips of segments red; 1st segment more brown; 1st slightly curved and it and 4th thickened; 1st slightly clavate; 2nd and 3rd slightly thickened apically. Ventrally, red-brown, lighter just inside eyes and antennifers, and medially below 1st rostral segment. First segment of rostrum dark yellow-brown, and also tip of 4th; remainder pale yellow-brown (like tibia and femur). Thorax: Pronotum light brown with white collar joining prosternal collar; posteriorly a very narrow red or light brown line continuing laterally; just anterior to posterior border, a narrow brown line; wing pads concolor with pronotum; meso-, metanotum light red to white. Dorsally, ecdysial line pale yellow. Wing pads not extending further than in 3rd instar, but much darker and more developed; overall, much like 3rd instar, but medial elongation now disappeared. Ventrally, prosternum light red, laterally white; white collar on prosternum, continuous with collar on protergite; meso- and metasternum white medially or becoming light red. Trochanters light red or white; tibiae, femora, and 1st segment of tarsus yellow-brownish, sometimes splashed with darker yellow-brownish; coxae, 2nd segment of tarsi, and claws darker, and 2nd segment of tarsi even darker apically. Femora with very small spines ventrally; apical tips of tibiae with small spines pointing towards tarsi; other scattered spines becoming larger apically; first tarsal segment heavily spined (many spines); the first tarsomere small, but larger toward apex. Metathoracic scent glands (nonfunctional in immatures evidenced in the specimens examined) very small, outlined in light brown. Abdomen: Dorsally, pale red, sometimes lighter laterally. 1T visible, below wing pads. 5-6T, the largest segments; 5-6T scent gland and border far posterior relative to rest of 5-6T intertergal margins, as a result, median of 7T nearly interrupted by extension of 6T; 8T also medially more posterior; 5-6T scent gland itself a reddish area below the cuticle. Ventrally, pale red; sometimes slightly darker laterally. Genital and anal segments dark brown. Spiracles very dark in anterior third of each segment. Trichobothria very small, brown. Trichobothria very small, brown in the fourth instar; on 3S and 4S is arranged like *D.* probably *koenigii*; on 5S, 6S, and 7S arranged like *D.* probably *koenigii* and *D. mimulus* (Schaefer, 1975).

Fifth instar—Head: Rostral lengths 5S (n = 4) and 6S (n = 2). Dorsally dark brown with reddish overtones. Ecdysial line on head bright red, extending anterior to each eye; on thorax and abdomen to first scent gland, light red (or on abdomen, sometimes yellow). Eyes red, sometimes light brown, medially; between eye and ecdysial line, a thin strip of brown, which enclose the eye. Antennifer red apically, ventrally and posteriorly. Apex of mandibular plates red. Obscure suture from apex of mandibular plates to between eyes, brown.

Antenna brown, with some red apically; 1st segment slightly clavate and slightly curved; the latter and the 4th thicker than the other segments; 3rd slightly thickened apically. Ventrally, brown-red, more red anterior to genal-gular suture basally, and extending below 1st segment of rostrum. Rostrum light yellow brown, becoming slighter darker on first and basally on 4th segment. Thorax: Dorsally, prothorax lighter brown than head; protergum divided into 3 parts, like the adult: collar, callus, disc (sensu Doesburg Jr., 1968); dirty white collar joining prosternal collar, the white continuing posteriorly on tergite I and wingpads; another narrow stripe, darker brown, also ending laterally and continuing slightly posteriorly; callus and disc separated by a deep groove not extending to lateral edge. Ecdysial line extending medially from head to 1st abdominal scent gland. Scutellum slightly lighter brown than protergite and wing pads, and raised above level of wing pads; edges of wing pads dark, the meta-pads extending halfway onto 3rd abdominal segment. Ventrally, median yellow, extending laterally to light red or light red-brown; median yellow extending more in some specimens; white line from white prosternal collar to abdomen, this line in some specimens obscured; laterally, intersegmental regions white. Base of legs white; trochanters yellow with light brown patch; coxae yellow, apically with brown border and brown patch anteriorly; femora and tibiae light yellow-brown; all femora with very tiny spines, profemora with 2 parallel rows of larger spines ventro-apically (extending about one-third length of hind femora); all tibiae with spines, these larger on mid tibiae, and located ventro-basally; first tarsal segment light yellow-brown, second more brown; first tarsal segment with few spines laterally and 2 larger ones basally; second tarsomere with very small adpressed spines ventrally. Metathoracic scent gland slightly darker than the brownish-red coloration on surrounding segments, within each darkened area a whitish spot. Abdomen: Dorsally red becoming yellow-red laterally, especially on 5-7T. Openings of dorsal abdominal scent glands dark brown. Ventrally, pale red or yellow-red, in some specimens becoming darker red laterally; posterior border of each sternum with a white band ending sublaterally and medially; anterior border with a red band, ending medially. Genital and anal segments dark brown. A rounded area, red, with vague shallow wrinkles. Interestingly, a specimen of the fifth instar, seemed to have a supernumerary trichobothrium, below the other two, what occurred on both sides. But the third supernumerary did not have a bothrium. Another specimen, also of the fifth instar, had the same third supernumerary on one side only, but not the other.

There are few descriptions of *Dysdercus* nymphs (Ballard and Evans, 1928; Coscarón, 1998), even though they are conspicuously colored and frequently harmful. The last two instars of *D. ruficollis* (L.), another *Dysdercus* species which bears a white annulus on its fourth antennal segment, were described by Coscarón (1998).

The greatest variation in the size of nymphs occurred in the first and the fifth stadia. Some nymphs die as a consequence of predation, starvation, and/or disease, or (in the case of first instars) being stuck to the fruits' exudate. The difference here may be that between the lengths of the rostra in male and female fifth instars, as well as having eaten more or less food over the earlier instars. Adult antennal and rostral segment lengths of *D. stehliki* were described (Schaefer, 2013).

In all instars, the fourth antennal segment has a white basal annulus about 2/5 of the length of the segment, as do the adults (see description, and discussion, of adults in Schaefer, 2013). It seems that in later instars there may be a difference between the rostral lengths of males and females. In females, the rostrum extends to 7S and in adult males to 6S. Presumably, the rostral length of both gender increases between the fifth instar and the adultin the male, from 5S to 6S; in the female, from 6S to 7S. The longer rostrum may allow the female to access more of the fruit tissue and thus extract more food.

The pattern of the 3S and 4S trichobothria resembles the 3S and 4S trichobothria of the Paleotropical (Indian) species, *Dysdercus* probably *koenigii*, rather than the Neotropical species, *D. mimulus* (Hussey and Sherman, 1929) (see diagrams in Schaefer, 1975). It would be interesting to see if other Old and New World *Dysdercus* have these same differences especially because the New World species seem to have come from a single African ancestor (Stehlík, 1965a, 1965b; Doesburg Jr., 1968). However, a single species of a trichophoran (*i.e.*, a heteropteran bearing abdominal trichobothria) may bear trichobothria in several patterns, although always in the same numbers (Schaefer, 1975).

The succeeding sternites (5S-7S), with lateral trichobothria, bear them as does *D. mimulus*. We would expect that all Neotropical *Dysdercus* will have the same pattern of trichobothria on these sterna as well.

CONCLUSION

The biology and immature descriptions of *D. stehliki* nymphs were presented. Evaluations performed in the field showed that eggs, instars, and adults were found for 9, 45, and 30 consecutive days, respectively. Average body length (in mm) of *D. stehliki* instar 1 is 3.87, instar 2 is 4.91, instar 3 is 6.92, instar 4

is 7.72, and instar 5 is 9.16. First instar: overall color dark red, paler ventrally except for head. Second instar: overall color darker red (darker than first instar). Third instar: overall color slightly darker than 2nd instar. Fourth instar: slightly darker and browner than 3rd instar. Fifth instar: overall color brown red.

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