

Phasmatodea of Jamaica, part I: a new species of *Diapherodes* Gray, 1835 (Phasmatodea, Phasmatidae, Cladomorphinae)

Yannick BELLANGER¹, Toni JOURDAN², Philippe LELONG³ & Laurent PENET⁴

¹ La Ville-Jouy, F – 22250 Trédias <yannick.bellanger2@wanadoo.fr>

² 95 chemin des Chevêches, F – 74150 Vallières <toni-jourdan@wanadoo.fr>

³ Le Ferradou n°3, F – 31570 Sainte-Foy-d'Aigrefeuille <plelong@wanadoo.fr>

⁴ INRAE, UR ASTRO, F – 97170, Petit-Bourg, Guadeloupe, <laurent.penet@inrae.fr>

<http://zoobank.org/C5740488-CA89-4C1F-877C-C3372DDE2F27>

(Accepté le 3.II.2021 ; publié le 8.III.2021)

Abstract. – *Diapherodes hennemanni* n. sp. was discovered in Jamaica in 2018 and is here described in both sexes and egg. It is compared with the two other known species of the genus in Jamaica.

Résumé. – **Phasmatodea de Jamaïque, partie I : une nouvelle espèce de *Diapherodes* Gray, 1835 (Phasmatodea, Phasmatidae, Cladomorphinae).** *Diapherodes hennemanni* n. sp. a été découverte en Jamaïque en 2018 et est ici décrite pour les deux sexes et l'œuf. Elle est également comparée avec les deux autres espèces Jamaïcaines du genre.

Keywords. – Taxonomy, morphology, egg, Caribbeans.

In November 2018, the three first authors conducted a preliminary inventory of the Phasmatodea of Jamaica. They spent seven days in the Blue Mountains area where they found two species of the genus *Diapherodes* Gray, 1835: *Diapherodes jamaicensis* (Drury, 1773) and an unknown species.

The genus *Diapherodes* is thought to encompass two differentiated groups, or species complexes, divided by geography (HENNEMANN *et al.*, 2016): the *D. gigantea* complex from the Lesser Antilles, and the *D. jamaicensis* complex in the Greater Antilles.

The *gigantea*-group is currently seen as comprising five taxa (among which four recognized species and two sub-species), in alphabetical order: *D. angulata* (Fabricius, 1793) from Guadeloupe, *D. dominicae* Rehn & Hebard, 1938, from Dominica, *D. gigantea gigantea* (Gmelin, 1789) from Saint Vincent and the Grenadines, *D. gigantea saintlucia* Hennemann, Conle & Perez-Gelabert, 2016, from Saint Lucia and *D. martinicensis* Lelong & Langlois, 2005, from Martinique. The *jamaicensis*-group, on the other hand, previously included three species, namely *D. achalus* (Rehn, 1904) from Puerto-Rico, *D. jamaicensis* (Drury, 1773) and *D. laevicollis* Redtenbacher, 1908, the last two from Jamaica. Those two species-complexes are best distinguished as more spiny, granulose or tuberoso body and clearly vestigial alae in females for the *gigantea*-group, compared to smooth body and females with alae as long as tegmina in *jamaicensis*-group, along with the geographical origin [see HENNEMANN *et al.* (2016) for a more complete comparison]. All the species in the genus seem to prefer hygrophilous niches, and are sometimes observed on trees in agricultural areas.

The present work raises the number of species in the genus to eight, and to three the number of species of *Diapherodes* occurring in Jamaica. We also discuss the plausibility of other undescribed species of the genus in Jamaica, especially in the Blue Mountains area, after careful examination of available naturalized specimens.

MATERIAL AND METHODS

Measurements are given in millimeters with a precision of ± 0.1 mm for the insects, and ± 0.01 mm for the eggs.

The classification used here follows ZOMPRO (2001, 2004). The study is based on the recent revision of the tribe Haplopodini by HENNEMANN *et al.* (2016).

Samples were taken at night using a LED flashlight and specimens were kept alive for as long as possible in mosquito net cages to observe behaviour and obtain eggs. Specimens were dried for their transport; females were eviscerated and cleaned out from their thoracic and abdominal content, which was replaced by a mix of boric acid and talc (50/50) and cigar-shaped cotton. Back to France, the collected eggs were kept in a small plastic box on wet peat at a temperature of 20°C. Freshly hatched nymphs were bred in a small cage with one side in mosquito net, with a mix of plants until finding a substitute plant. When they were growing and the substitute plant was found, they were moved in a larger cage until they became adults, at a temperature ranging from 18 to 25°C. Preserving and collecting methods are more detailed in JOURDAN *et al.* (2014). The dates written on the specimens' labels correlate with the date when the specimens were killed and prepared.

Abbreviations. – **FSCA**, Florida State Collection of Arthropods, Gainesville, USA; **MNHN**, Muséum national d'Histoire naturelle, Paris, France; **NHMJ**, National History Museum of Jamaica, Kingston, Jamaica; **NHMW**, Naturhistorisches Museum Wien, Vienna, Austria; **coll. ASPER**, collection of the ASPER (**FH**: collection of Frank Hennemann, Germany, Bad Homburg; **OC**: collection of Oskar Conle, Germany, Duisburg; **PL**: housed in Philippe Lelong's collection, France, Sainte-Foy-d'Aigrefeuille; **TJ**: housed in Toni Jourdan's collection, France, Vallières; **YB**: housed in Yannick Bellanger's collection, France, Trédias).

RESULTS

Phasmatodea, Anareolatae, Phasmatidae, Cladomorphinae, Haplopodini

Genus *Diapherodes* Gray, 1835

Type species: *Mantis gigantea* Gmelin, 1789, by subsequent designation (KIRBY, 1904a: 362).

jamaicensis species-group

Diapherodes jamaicensis (Drury, 1773)

Material examined. – 15 ♂, 12 ♀, 41 eggs: 1 ♂, JAM18-001, 7.XI.2018, Jamaica, Blue Mountains, Irish Town; rec. & det. ASPER, Bellanger Y., Jourdan T., Lelong P., Expédition Jamaïque Nov. 2018 [ASPER-YB]; 1 ♀, JAM18-064, *idem* [ASPER-TJ]; 1 ♀, JAM18-076, 7.XI.2018, Jamaica, Blue Mountains, Road between Section and Newcastle, N18°05'22.1" W076°42'33.6"; rec. & det. ASPER, Bellanger Y., Jourdan T., Lelong P., Expédition Jamaïque Nov. 2018 [ASPER-PL]; 1 ♂, JAM18-077, 14.XI.2018, Jamaica, Cockpit Country, Road between Sherwood and Windsor House, N18°21'22.7", W077°38'48.5"; rec. & det. ASPER, Bellanger Y., Jourdan T., Lelong P., Expédition Jamaïque Nov. 2018 [ASPER-PL]; 1 ♀, JAM18-111, *idem*, 15.XI.2018 [ASPER-YB]; 1 ♂ JAM18-210 and 1 ♀ JAM18-211, 14.IX.2019, Jamaica, Blue Mountains, Elev. F1 Y. Bellanger [ASPER-TJ]; 1 ♂, JAM18-169, *idem*, 21.VII.2019 [ASPER-YB]; 2 ♂, JAM18-189 and -192, *idem*, 10.VIII.2019 [ASPER-YB]; 1 ♀, JAM18-196, *idem*, 30.VIII.2019 [ASPER-YB]; 1 ♂ JAM18-214 and 1 ♀, JAM18-215, *idem*, 20.IX.2019 [ASPER-TJ]; 1 ♀, JAM18-220, *idem*, 28.IX.2019 [ASPER-YB]; 3 ♂, JAM18-226, -227 and -228, *idem*, 19.X.2019 [ASPER-YB]; 1 ♂ JAM18-230 and 1 ♀ JAM18-231, *idem*, 16.XI.2019 [ASPER-YB]; 1 ♀, JAM18-240, *idem*, 15.XII.2019 [ASPER-YB]; 2 ♀, JAM18-236 and -237, 6.XII.2019, Jamaica, Cockpit Country, Road between Sherwood and Windsor House, Elev. F1 Y. Bellanger [ASPER-YB]; 1 ♂, JAM18-229, *idem*, 19.X.2019 [ASPER-YB]; 1 ♂ JAM18-284 and 1 ♀ JAM18-283, 24.VII.2020, Jamaica, Cockpit Country, Road between Sherwood and Windsor House, Elev. F2 Y. Bellanger [ASPER-PL]; 2 ♂, JAM18-

281 and -282, 23.VII.2020, Jamaica, Blue Mountains, Elev. F2 Y. Bellanger [ASPER-PL]; 1 egg, XI.2018, from ♀ JAM18-111 [ASPER-YB]; 20 eggs, 2020, Cockpit Country, elev. F1 Y. Bellanger [ASPER-YB]; 20 eggs, 2020, Blue Mountains, elev. F1 Y. Bellanger [ASPER-YB].

***Diapherodes laevicollis* Redtenbacher, 1908**

Material examined. – ♀ holotype, Coll. Br. v. W., Jamaica, Staudinger; det. Br. v. W. *Diapherodes laevicollis*; 18.887; No. 839 [NHMW]; 3♀, “Retained from old collection” [NHMJ]; 1 ♀, *Diapherodes laevicollis* Redt., det. C.F. Moxey 1972; B.W.I., Jamaica, Portland, Summit Blue Mtn Peak. Aug. I.1954, G.R. Proctor, on *Eugenia alpina* (SW); W0191 [NHMJ].

Comments. – This latest female in NHMJ exhibits criteria that would justify a placement in *D. laevicollis* but also shows some significant differences, departing from the holotype and the three other females examined in NHMJ. In particular, the head and pronotum are very spiny and the tergite VII has not rounded lateral but subtriangular expansions. By the way, the taxonomic position of this specimen is probably doubtful and we indisputably need more material to make a definite statement about it. We will still consider it as *D. laevicollis* but we issue the hypothesis that it could belong to a fourth undescribed *Diapherodes* species from Jamaica. Evidence based on greater number of sampled specimens would allow a formal diagnosis.

***Diapherodes hennemanni* n. sp.**

<http://zoobank.org/28FE38C0-4843-4FF8-9B30-D71C582F3669>

HOLOTYPE: ♀, JAM18-120, 11.XI.2018, Jamaica, Blue Mountains, Holywell Park; rec. & det. ASPER, Bellanger Y., Jourdan T., Lelong P., Expédition Jamaïque Nov. 2018 [NHMJ].

PARATYPES (13 ♂, 11 ♀): 1 ♂, Jamaica: Saint Andrew, Parrish, Hard war Gap, 26-27.VII.1985, C. B. & H. V. Weems, G. B. Edwards [FSCA]; 1 ♂, JAM18-188, 10.VIII.2019, Jamaica, Blue Mountains, Holywell Park, Elev. F1 Y. Bellanger [MNHN]; 1 ♀, JAM18-197, *idem*, 30.VIII.2019 [MNHN]; 1 ♂, JAM18-203, *idem*, 13.IX.2019 [MNHN]; 1 ♂, JAM18-224, *idem*, 16.X.2019 [MNHN]; 1 ♂ JAM18-232 and 1 ♀ JAM18-233, *idem*, 22.XI.2019 [NHMJ]; 1 ♀, JAM18-235, *idem*, 6.XII.2019 [MNHN]; 1 ♂ JAM18-264 and 1 ♀ JAM18-265, *idem*, 4.VII.2020 [NHMJ]; 5 ♂, FH 1237-1, -2, -3, -4 and -5, ex Zucht F. Hennemann 2020, F2-Gen., Herkunft: JAMAICA, Holywell Park, leg. Bellanger; Lelong & Jourdan, XI.2018 [FH]; 5 ♀, FH 1237-6, -7, -8, -9 and -10, *idem* [FH]; 2 ♂, East-Jamaica: Holywell Park. Leg. Y. Bellanger VIII-IX.2019, OC-0542-10 and OC-0542-1 [OC]; 2 ♀, *idem*, OC-0542-16 and OC-0542-11 [OC].

OTHER MATERIAL EXAMINED (21 ♂, 15 ♀, 71 eggs): 1 ♂, JAM18-170, 21.VII.2019, Jamaica, Blue Mountains, Holywell Park, Elev. F1 Y. Bellanger [ASPER-YB]; 1 ♂, JAM18-190, *idem*, 10.VIII.2019 [ASPER-TJ]; 1 ♀ Gynandromorph, JAM18-198, *idem*, 30.VIII.2019 [ASPER-YB]; 1 ♂, JAM18-218, *idem*, 28.IX.2019 [ASPER-TJ]; 1 ♂, JAM18-219, *idem*, 28.IX.2019 [ASPER-YB]; 1 ♀, JAM18-221, *idem*, 4.X.2019 [ASPER-TJ]; 1 ♂, JAM18-225, *idem*, 16.X.2019 [ASPER-YB]; 1 ♀ JAM18-242 and 1 ♂ JAM18-241, *idem*, 20.XI.2019 [ASPER-PL]; 2 ♂, JAM18-258 and -259, 10.VI.2020, Jamaica, Blue Mountains, Holywell Park, Elev. F2 Y. Bellanger [ASPER-PL]; 3 ♂, JAM18-266, -267 and -268, *idem*, 4.VII.2020 [ASPER-TJ]; 3 ♂, JAM18-269, -270 and -271, *idem*, 4.VII.2020 [ASPER-YB]; 2 ♀, JAM18-272 and -273, *idem*, 12.VII.2020 [ASPER-YB]; 3 ♀, JAM18-274, -275 and -276, *idem*, 12.VII.2020 [ASPER-PL]; 2 ♀, JAM18-277 and -278, *idem*, 20.VII.2020 [ASPER-TJ]; 1 ♀ JAM18-288 and 1 ♂ JAM18-289, *idem*, 1.VIII.2020 [ASPER-YB]; 8 ♂, East-Jamaica: Holywell Park. Leg. Y. Bellanger VIII-IX.2019. OC-0542-2, -3, -4, -5, -6, -7, -8 and -9 [OC]; 4 ♀, *idem*, OC-0542-12, -13, -14 and -15 [OC]; 1 egg, 11.XI.2018, from ♀ JAM18-120 [ASPER-YB]; 20 eggs, 23.I.2020, elev. F1 Y. Bellanger [MNHN]; 10 eggs, *idem*, VIII.2019 [ASPER-PL]; 10 eggs, *idem* [ASPER-TJ]; 10 eggs, *idem* [ASPER-YB]; 20 eggs, 1.VIII.2020, elev. F2 ASPER - Y. Bellanger [NHMJ].

Diagnosis. – *Diapherodes hennemanni* is morphologically very close to *D. jamaicensis* (Drury, 1773), *D. achalus* (Rehn, 1904) and *D. laevicollis* Redtenbacher, 1908. Females of *D. hennemanni* are distinguished from *D. achalus* in the armed vertex (almost smooth in *D. achalus*), posteriorly armed pronotum (unarmed in *D. achalus*), anteriorly armed mesonotum (entirely unarmed in

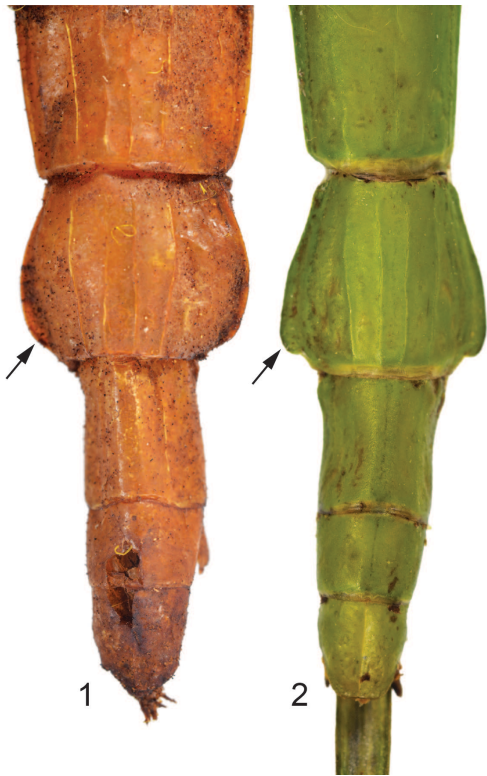


Fig. 1-2. – Comparison between the lateral expansions of tergite VII of females of *Diapherodes* Gray. – 1, *D. laeviscollis* Redtenbacher (“retained from old collection” [NHMJ]). – 2, *D. hennemanni* n. sp. (JAM18-242).

D. achalus) and in having more than two spines on the medioventral carina of meso- and meta-femora respectively; males are distinguished in the anteriorly armed mesothorax (entirely unarmed in *D. achalus*) and their tegmina without stripe (tegmina with a bold brown longitudinal median stripe in *D. achalus*).

Both sexes differ from *D. jamaicensis* in the more robust body; females differ in having the alae longer than the tegmina to the point of reaching or exceeding the posterior margin of median segment (alae slightly shorter than tegmina in *D. jamaicensis*); males are distinguished in the yellowish vertex, in having only two more or less sharp spines with black apex, and sometimes 1 or 2 blunt spines with black apex, on the anterior part of mesonotum (2 to 4 sharp spines in *D. jamaicensis*) and in the terminal hook of the vomer longer than its basal portion. Eggs differ in being much more angulate and in the operculum surrounded by a striking elevation.

Females differ from *D. laeviscollis* by the lateral expansions of tergite VII not rounded (fig. 1-2), the less transverse tergites II-IV (fig. 3-4), the less narrowed tergite VIII in comparison with VII, and the much more prominent vertex humps; differentiation criteria

involving morphometric values are given in table I for further study.

Differentiation with *D. laeviscollis* was made possible by examination of the pictures of the holotype female housed in NHMW (Phasmida Species File, Brock *et al.* 2019), and direct examination of four females in NHMJ. Unfortunately, three of them have a much-damaged abdominal extremity, as does the holotype, and one has a doubtful taxonomic position (see above). Comparisons with specimens in better condition will be required to confirm our argument.

Description of the female. – Fig. 5-22, table II. Medium-sized for the genus (body length including sub-genital plate 109.8-117.9 mm). General coloration light green; legs green to brown and darker ventrally; coloration maybe more variable as it is the case in *D. jamaicensis* (Hennemann *et al.*, 2016). Coloration of dead and not well-dried specimens can also turn brown.

Table I. – Comparison between females of *Diapherodes hennemanni* n. sp. and *D. laeviscollis* Redtenbacher for quantitative measurements.

	<i>Diapherodes hennemanni</i>	<i>Diapherodes laeviscollis</i>
Ratio width/length of tergite III	1.4 to 1.6× wider than long	1.7 to 2.0× wider than long
Ratio between width of tergites VI and VIII in their middle	Tergite VI 1.3 to 1.7× wider than VIII	Tergite VI 1.5 to 2.5× wider than VIII
Tergite X	Slightly shorter or as long as tergite IX	Slightly longer than tergite IX

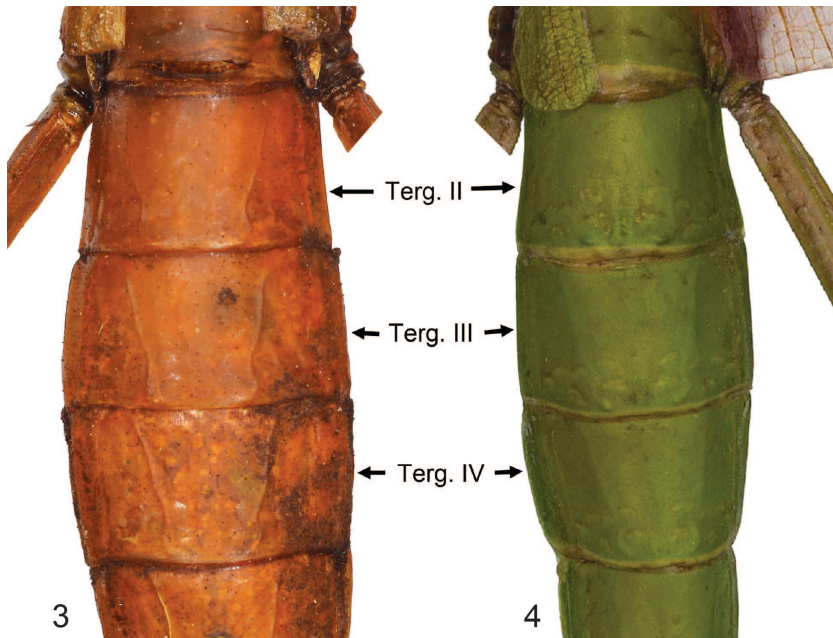


Fig. 3-4. – Comparison between the tergites II to IV of females of *Diapherodes* Gray. – **3**, *D. laevicollis* Redtenbacher (“retained from old collection” [NHMJ]). – **4**, *D. hennemanni* n. sp. (JAM18-242).

Table II. – Measurements of adult females and males of *Diapherodes hennemanni* [mm].

	♀ HT [MNHN]	♀ average (range) from 17 specimens *	♂ average (range) from 27 specimens *
Body	102.5	107.5 (95.5-115.0)	76.4 (69.0-84.2)
Body (including subgenital plate)	111.4	116.7 (102.0-128.0)	/
Antennae	43.0	47.8 (42.6-55.0)	40.6 (37.0-46.0)
Head	6.8	7.4 (6.0-8.4)	3.9 (3.4-5.1)
Pronotum	5.3	5.6 (4.6-7.3)	3.4 (2.8-4.3)
Mesonotum	18.0	18.3 (15.0-21.4)	12.2 (10.4-14.3)
Metanotum (including median segment)	19.2	15.4 (13.0-16.8)	12.7 (9.9-14.1)
Tegmina	10.0	10.7 (9.0-12.8)	10.3 (9.1-11.7)
Alae	13.0	12.4 (9.8-16.3)	42.7 (37.4-47.5)
Profemora	16.5	16.9 (14.1-19.1)	12.2 (10.9-14.4)
Mesofemora	13.1	14.7 (12.5-16.5)	10.9 (9.8-13.1)
Metafemora	18.7	20.4 (17.1-23.0)	14.8 (13.2-17.2)
Protibiae	14.4	15.7 (13.0-17.8)	11.6 (10.3-13.7)
Mesotibiae	10.9	12.8 (11.1-14.3)	9.0 (7.7-10.0)
Metatibiae	15.4	18.3 (15.0-21.0)	12.4 (11.0-14.4)

* including all studied specimens: paratypes and non-types specimens (measurements of the PT ♂ in FSCA are from HENNEMANN *et al.*, 2016).

Head slightly longer than wide with cheeks parallel-sided; with a yellowish strip in front of interocular area. Vertex convex with occiput elevated and two conical humps, the right one strikingly larger than the left one (fig. 6); covered with small tubercles between the humps, and with a transverse row of four spiniform tubercles near posterior margin. Cheeks (genae) with a line of two or three small tubercles in alignment with the eyes. Compound eyes hemispherical, orange-brown. Antennae projecting over fore legs and at least reaching anterior side of tergite II; scapus and pedicellus dark brown to blackish; scapus

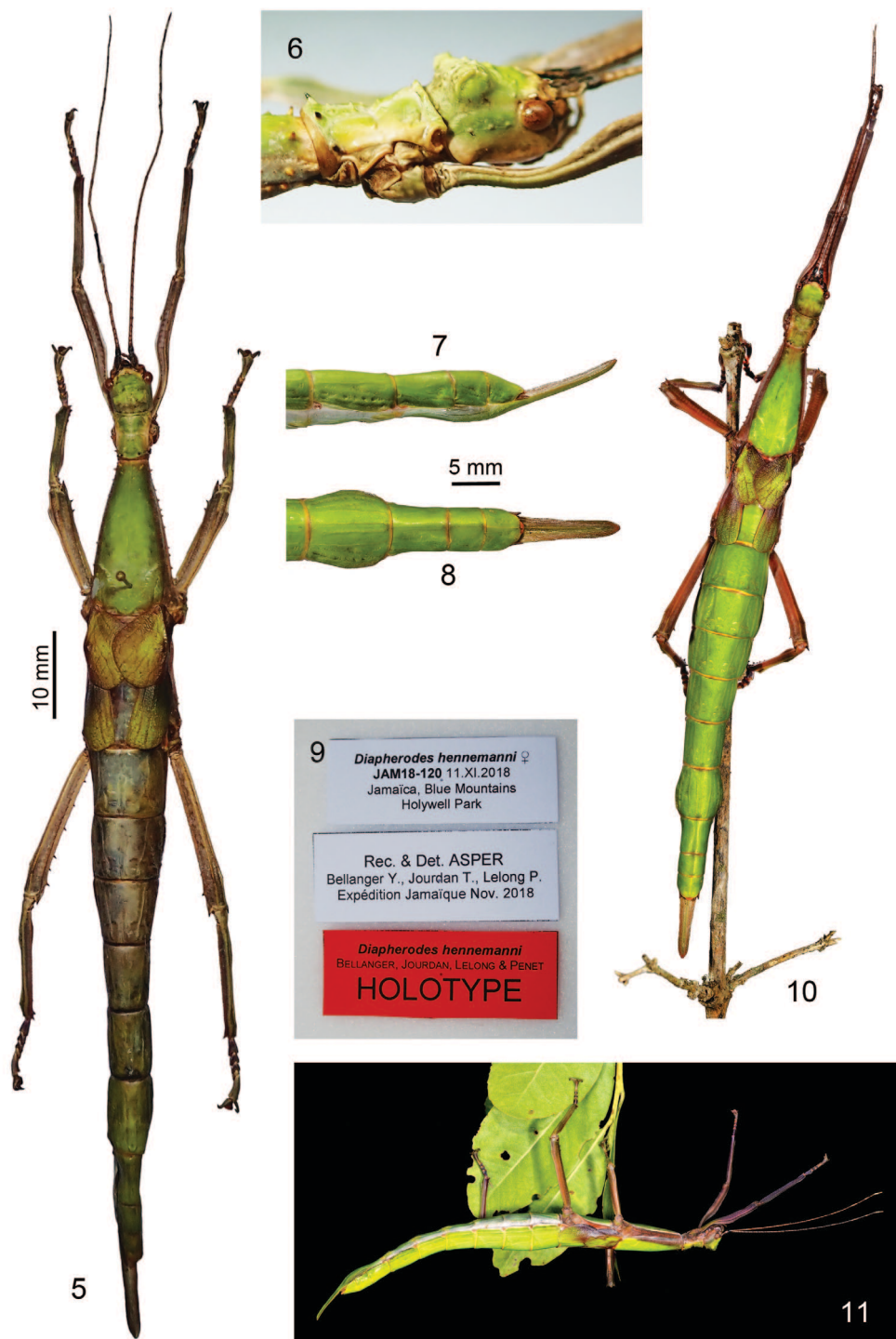


Fig. 5-11. – *Diaperoderes hennemanni* n. sp., ♀ holotype JAM18-120. – 5, Habitus. – 6, Close-up on the head. – 7, Abdominal extremity, *in vivo*, lateral view. – 8, Abdominal extremity, *in vivo*, dorsal view. – 9, Labels. – 10, *In vivo* dorsal view. – 11, *In vivo* lateral view.



Fig. 12-14. – *Diapherodes hennemanni* n. sp., ♀ JAM18-242, habitus. – 12, Dorsal view. – 13, Lateral view. – 14, Ventral view.

dorsoventrally flattened, with basal part narrower and edges slightly incurving from anterior to posterior side; pedicellus more than two times shorter than scapus, cylindrical and longer than wide; others antennomeres dorsally creamish to brown, ventrally blackish with apex creamish to orange (at least for the basal two thirds of antennomeres).

Thorax. Pronotum (fig. 16) almost as long as but often slightly shorter and narrower than head, slightly constricted medially; with a distinct median curved depression and almost reaching lateral margins; covered with a variable number of different sized tubercles and with a row of four to six minute blackish spines close to posterior margin. Mesonotum 2.4 to 3.1× longer than pronotum, anteriorly constricted and widened towards posterior, with lateral edges almost straight; dorsally smooth except for few very small and indistinct tubercles anteriorly and two to three small spines with black apex close to anterior margin; laterally with line of small tubercles, more visible and elevated towards anterior margin; with an indistinct medio-longitudinal carina; anterior three quarters of lateral border brown; mesopleurae orange with 11-16 spiniform tubercles roughly of same size and irregularly dispersed. Metanotum slightly shorter than median segment and wider than long; metapleurae orange and smooth, sometimes with four minute tubercles. Tegmina slightly shorter than alae, scale-shaped with rounded apex and a small medio-lateral hump sometimes brown, reaching anterior part of median segment; dorsally green sometimes marbled in brown, with exterior lateral part dark brown; ventrally reddish with the same exterior lateral dark brown part. Alae at least reaching posterior margin of median segment but often projecting over; costal area dark pink dorsally at basal quarter and green until apex, with exterior lateral part dark brown; ventral side of costal area reddish; anal area uniformly pink and translucent (fig. 21-22).

Abdomen entirely smooth. Median segment wider than long, as long as tergite II; tergites III to VII almost same length, slightly smaller than the two previous; tergite VIII about 0.6× as long as previous tergites and about 1.3× longer than IX and X which are almost of same length and also the smaller; tergites width very variable as the abdomen laterally inflate a lot due to eggs, but in a mature female tergite III is the widest and almost parallel-sided; tergite VII with lateral subtriangular outgrowths, wider posteriorly and more or less rounded at the posterior corner (fig. 2), and with four longitudinal carinae; anal segment (tergite X) longer than wide, narrower towards posterior, with a medio-longitudinal carina and a slightly indented apex; epiproct rounded and projecting over anal segment apex. Sternites II to VII with two latero-longitudinal carinae; sternite VII with depression on posterior part just after the praepopular organ, which is constituted of a dark brown hump more or less elevated (fig. 19). Cerci conical with a rounded apex, sometimes not visible from above and not projecting over epiproct. Subgenital plate elongated, lanceolate, keeled and strikingly projecting over abdomen apex by more than the length of tergite IX and anal segment combined; ventrally with two latero-longitudinal carinae from anterior margin to one third of its length and medio-longitudinal carina from a quarter of its length until apex; dorsally concave.

Legs robust. Mesofemora shorter than profemora and metafemora longer than remaining; metafemora at least reaching half of tergite IV. Medio-ventral carina of profemora with two small spines at anterior half and with disparate tubercles posteriorly; the ones of meso- and metafemora with five or six spines along their length, becoming more visible and sharper at anterior, often with blackish apex (fig. 20). Antero-ventral carina of meso- and metafemora with two subapical spines, postero-ventral carina with only one. Postero-dorsal carina of meso- and metafemora with a subapical small lobe, antero-dorsal carina with a subapical blunt lobe more or less distinct. Basal half of medioventral carina of meso- and metatibiae raised; mediodorsal carina of meso- and metatibiae more or less raised sub-apically and sometimes sub-basally (fig. 20). Probasitarsus raised dorsally and as long as the two following tarsomeres combined; mesobasitarsus slightly shorter than the two following tarsomeres combined and metabasitarsus as long as the two following tarsomeres combined.

Description of the male. – Fig. 23-29, table II. Robust body. A complete description is provided in HENNEMANN *et al.* (2016) under the name *D. laevicollis*. However, as it was with the single specimen in FSCA, it is herein completed and corrections recorded when necessary.

Head slightly longer than wide. Antennomere III slightly shorter than or as long as pedicellus.

Thorax. Pronotum as wide as head in its anterior margin but narrower towards posterior. Mesonotum 1.4-1.8× longer than head and pronotum combined. Alae reaching from posterior part of tergite VI to posterior of tergite VIII, but often the middle of VII.

Abdomen. Tergite VII sometimes with postero-lateral small lobes.

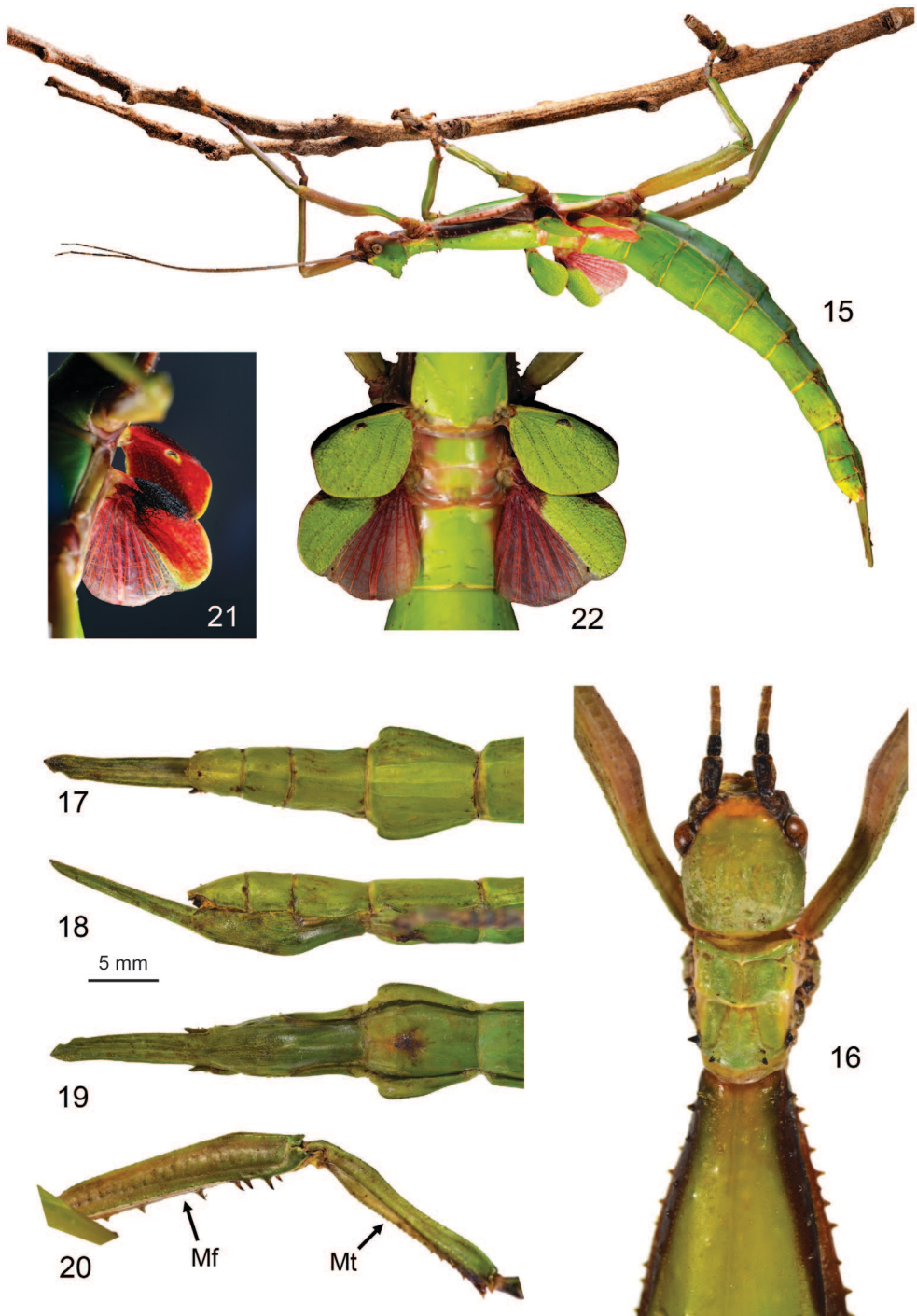


Fig. 15-22. – *Diapherodes hennemanni* n. sp., ♀ JAM18-242. – 15, *In vivo* lateral view. – 16, Close-up on the head and pronotum. – 17, Abdominal extremity, dorsal view. – 18, Abdominal extremity, lateral view. – 19, Abdominal extremity, ventral view. – 20, Close-up on the metafemur (Mf) and metatibia (Mt). – 21, Close-up on the alae *in vivo*, ventral view. – 22, Close-up on the alae *in vivo*, dorsal view.

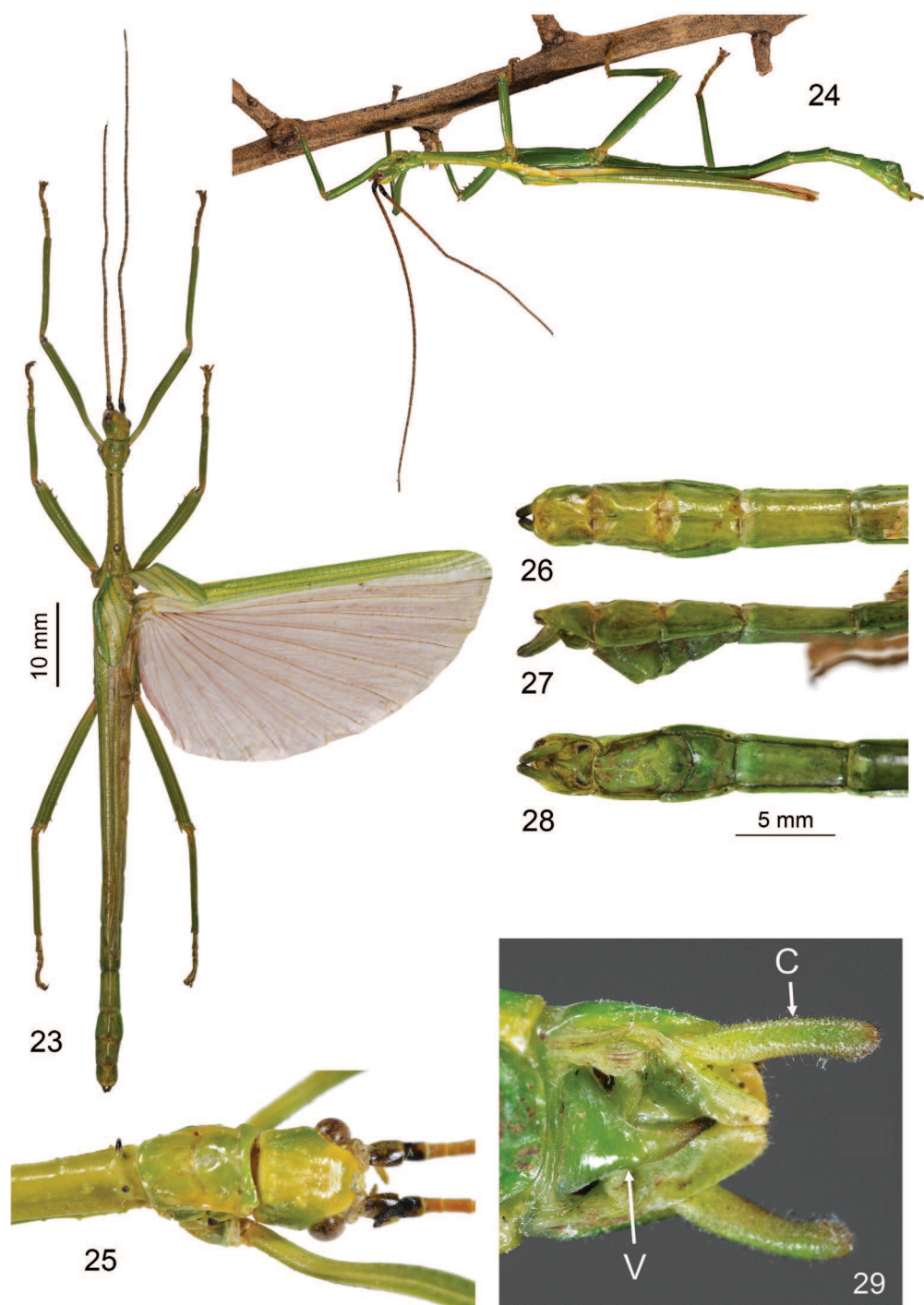


Fig. 23-29. – *Diapherodes hennemanni* n. sp., ♂ JAM18-241. – 23, Habitus, dorsal view. – 24, *In vivo* lateral view. – 25, Close-up on the head, pronotum and anterior of mesonotum. – 26, Abdominal extremity, dorsal view. – 27, Abdominal extremity, lateral view. – 28, Abdominal extremity, ventral view. – 29, Close-up on abdominal extremity, ventral view showing the vomer (V) and the cerci (C).

Description of the egg. – Fig. 30-33, table III. Egg uniformly dark grey or brown. Capsule 1.4-1.6× longer than high and 1.7-1.9× longer than wide; granulose and covered with irregular raised ridge-like structures; ventral surface almost straight, with distinct humps; dorsal surface elevated with flat and impressed area surrounding the micropylar plate; polar area impressed, with two granulose humps on ventral side and one on dorsal side.

Micropylar plate (fig. 33) small and roughly drop-shaped, about 0.3× as long as capsule length; border strikingly impressed but thin; central portion granulose, surrounded by a smooth stripe; micropylar cup distinct, elevated and placed in posteromedian border of the micropylar plate; median line more or less distinct and less than half as long as micropylar plate, extending in a large and rugose ridge until polar area where it forms a hump (see above: polar area of the capsule). Operculum with circular, thick (but narrower towards the apex which is indented) and elevated ridge; height about 0.5-0.6× the operculum diameter; central portion lowered, with central more or less elevated excrescence.

Etymology. – The species name is dedicated to our colleague and friend Frank Hennemann, who conducted the revision of the tribe Haplopodini.

Distribution. – Fig. 34. Currently only known from the Blue Mountains, and range is uncertain; most probably endemic to Jamaica.

Breedings. – *Diapherodes hennemanni* has been successfully bred in Europe using *Eucalyptus* sp. (Myrtaceae) and *Hypericum* spp. (Hypericaceae) as alternative food plants, which allowed obtaining more specimens. The second generation also accepted *Quercus* spp. (Fagaceae), *Rubus* spp. (Rosaceae), *Rosa* spp. (Rosaceae) and *Gaultheria shallon* Pursh (Ericaceae). Incubation time of the first generation was 174 days and hatching rate was about 65%, at a room temperature (between 20 and 25°C). Males became adult in about 76 days and females in about 83 days, at 20-25°C. Among the specimens hatched from the eggs collected in Jamaica, one developed as a gynandromorph. Nymphs can be green, brown and sometime green marbled in brown.

Table III. – Measurements of the eggs of *Diapherodes hennemanni*: **average** (range) [mm], from 10 eggs (MNHN).

Capsule total length (incl. operculum)	Capsule length	Capsule height	Capsule width	Operculum large diameter	Micropylar plate length
4.80 (4.5-5.2)	3.86 (3.7-4.1)	2.57 (2.4-2.8)	2.13 (1.9-2.2)	1.66 (1.4-1.8)	1.18 (1.1-1.2)

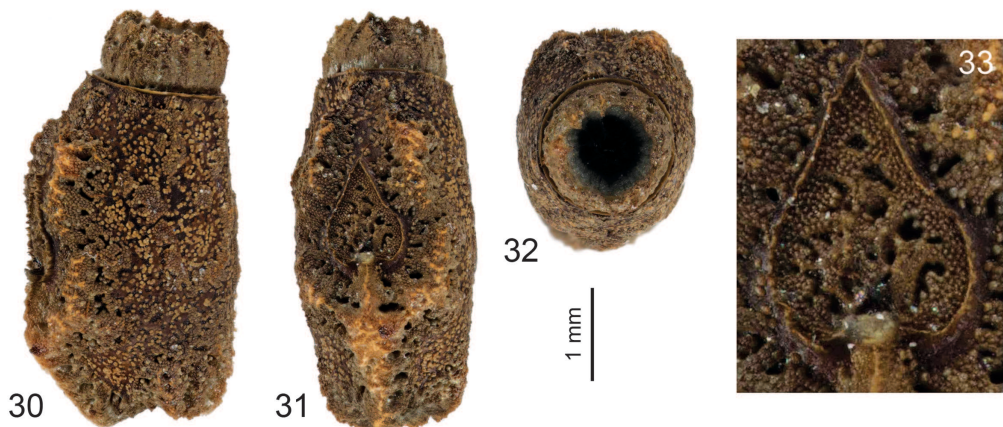


Fig. 30-33. – *Diapherodes hennemanni* n. sp., egg. – 30, Dorsal view. – 31, Lateral view. – 32, Apical view of operculum. – 33, Close-up on the micropylar plate.

DISCUSSION

The holotype female has been found on the Shelter Trail in Holywell Park (approximate geographical coordinates: 18°05'17.0"N 76°43'26.6"W), on a crest where the vegetation was mostly small trees and bushes due to the frequent hard wind exposure. It was found on a plant belonging to the Myrtaceae family, plausibly in *Eugenia* genus, at about 1200 meters above sea level. This was the unique specimen of this species sampled during the ASPER expedition, but culture was further established in Europe from the eggs laid, and allowed obtaining adult males via breeding. The male in FSCA was first considered by HENNEMANN *et al.* (2016) as the male of *Diapherodes laevicollis* Redtenbacher, 1908, but comparison with the F1 culture males demonstrated a perfect morphological fit with *D. hennemanni*. Furthermore, this male was collected in Hardwar Gap, very close to the Holywell Park where the holotype female was collected. Until further evidence is established, this species should be considered endemic to the Blue Mountains in Jamaica while the morphologically similar taxon *D. jamaicensis* is known to be well distributed throughout Jamaica (fig. 34).

Diapherodes hennemanni is very close to *D. jamaicensis* and *D. laevicollis*. In the area of the Blue Mountains and due to a locally rough relief, it is possible that speciation is still ongoing and there could be more *Diapherodes* species or quasi-species than actually known. Furthermore, due to the doubtful taxonomic position of the female in NHMJ identified by Moxey as *D. laevicollis* (see above) and as it is the only specimen with precise geographic information, the distribution of *D. laevicollis* could not be Blue Mountain Peak. Further sampling is needed for this genus in Jamaica, especially in the highest parts of the Blue Mountains, as there may still be very localized species to be discovered and described.

Another interesting fact is that the egg of *Diapherodes jamaicensis* collected in Cockpit Country differs slightly from the egg of the same species collected in the Blue Mountains. Indeed, capitulum structures are different and the micropylar plate of the eggs from the Blue Mountains is less elongated, and with a striking posterior indentation. Further studies including barcoding seem required to establish whether this is just an intraspecific variation or if there are actually two distinct species. Eggs demonstrably highlights important phylogenetic delineations (CLARCK SELICK, 1997, 1998), quite plausibly to species level differences within genus (SCALI *et al.*, 1987), so this observed polymorphism might yield evidence of the existence of quasi-species for species with broad geographical range.

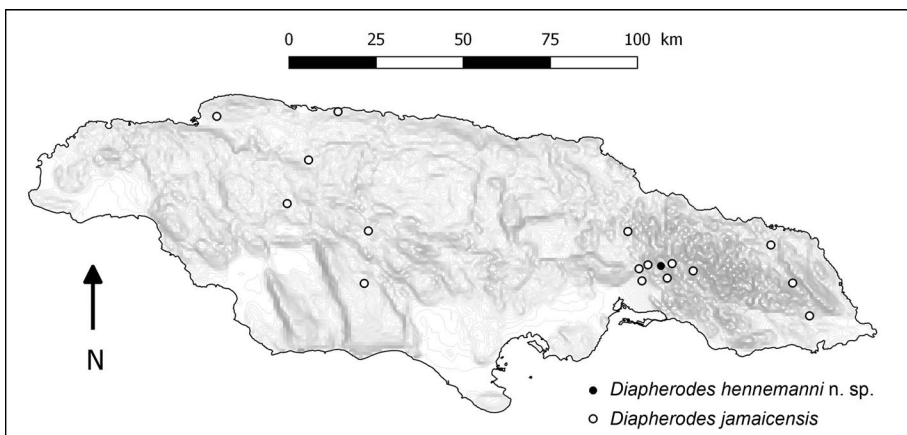


Fig. 34. – Distribution map of *Diapherodes hennemanni* n. sp. and *D. jamaicensis* (Drury); data from the ASPER expedition and HENNEMANN *et al.* (2016).

Our hypothesis is that given potential suspicions about naturalized specimens, the discovery of *D. hennemani* as a morphologically distinct taxon itself, and the observed variation in egg features in the Genus, combined with the regional diversity of niches due to natural distance and geographical barriers, elevation, natural biotopes, and potential diversity in food plants, it is plausible that *Diapherodes* recurrently evolved many differentiated ecotypes, subspecies and species themselves in its natural range span in Jamaica. If so, many potential discoveries are expected from improved range sampling in the Blue Mountains.

ACKNOWLEDGMENTS. – We thank the Natural Resources Conservation Authority of Jamaica for allowing us to manage this inventory and the National History Museum of Jamaica for their very kind collaboration, Mrs Dionne Newell and especially Mrs Elizabeth Morrison, whose kind help and support were greatly appreciated when the three first authors came in Jamaica. We warmly thank the *Société entomologique de France* for the Germaine Cousin grant awarded to Toni Jourdan. We thank Eric Francius for his help in food plant identification. We thank Frank Hennemann, Oskar Conle and Pablo Valero who provided pictures and measurements of their specimens; Frank Hennemann also kindly provided pictures and measurements of the paratype male in FSCA. Finally, we thank the two anonymous reviewers who suggested interesting corrections, and Antoine Mantilleri and Roger Roy for their suggestions.

REFERENCES

- BROCK P. D., BÜSCHER T. & BAKER E., 2019. – *Phasmida Species File Online*. Version 5.0/5.0. <http://phasmida.speciesfile.org>.
- CLARK SELICK J.T., 1997. – Descriptive terminology of the phasmids egg capsule, with an extended key to the phasmid genera based on egg structure. *Systematic Entomology*, **22** : 97-122. <https://doi.org/10.1046/j.1365-3113.1997.d01-30.x>
- CLARK SELICK J. T., 1998. – The micropylar plate of the eggs of Phasmida, with a survey of the range of plate form within the order. *Systematic Entomology*, **23** : 203-228. <https://doi.org/10.1046/j.1365-3113.1998.00056.x>
- HENNEMANN F. H., CONLE O. & PEREZ-GELABERT D. E., 2016. – Studies on Neotropical Phasmatodea XVI: Revision of Haplopodini Günther, 1953 (rev. stat.), with notes on the subfamily Cladomorphinae Bradley & Galil, 1977 and the descriptions of a new tribe, four new genera and nine new species (Phasmatodea: “Anareolatae”: Phasmatidae: Cladomorphinae). *Zootaxa*, **4128** (1) : 1-201. <https://doi.org/10.11646/zootaxa.4128.1.1>
- JOURDAN T., LELONG P. & BELLANGER Y., 2014. – Contribution à l’inventaire des Phasmatodea de Saül, Guyane. *Bulletin de la Société Entomologique de France*, **119** (4) : 487-498.
- KIRBY W. F., 1904. – *A synonymic catalogue of Orthoptera. I. Orthoptera Euplexoptera, Cursoria et Gressoria. (Forficulidae, Hemimeridae, Blattidae, Mantidae, Phasmidae)*. London : Trustees of the British Museum (Natural History).
- SCALI V., MANTOVANI B., MAZZINI M., NASCETTI G. & BULLINI L., 1987. – Intraspecific ootaxonomy of *Bacillus rossius* (Rossi) (insecta phasmatodea). *Bolletino di Zoologia*, **54** (1) : 41-47. <https://doi.org/10.1080/11250008709355554>
- ZOMPRO O., 2001. – A generic revision of the insect order Phasmatodea: the New World genera of the stick insect subfamily Diapheromeridae: Diapheromerinae = Heteronemiidae: Heteronemiinae *sensu* Bradley & Galil, 1977. *Revue Suisse de Zoologie*, **108** (1) : 189-255. <https://doi.org/10.5962/bhl.part.79626>
- ZOMPRO O., 2004. – A key to the Stick-Insect genera of the ‘Anareolatae’ of the New World, with descriptions of several new taxa (Insecta: Phasmatodea). *Studies on Neotropical Fauna and Environment*, **39** (2) : 133-144. <https://doi.org/10.1080/01650520412331333783>