# New or rare Madagascar tiger beetles 22. Some updates within the Madagascan endemic genera *Physodeutera* Lacordaire and *Pogonostoma* Klug

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MORAVEC J. 2021: New or rare Madagascar tiger beetles 22. Some updates within the genera *Physodeutera* Lacordaire and *Pogonostoma* Klug. *Acta Musei Moraviane, Scientiae biologicae* **106(2)**: 205–226. – New data within *Pogonostoma (Polypogonostoma) violaceum violaceum* Fleutiaux, 1902, and introduction of outstanding, anomalously green-coloured adults are presented. Only one recent specimen of *Pogonostoma (Polypogonostoma) violaceum fulgidipenne* Lesne, 1911 has been examined. A second known (previously only listed) female adult of *Physodeutera (Physodeutera) umbrosa* Rivalier, 1967 is introduced, male remains unknown. Supplemented differential diagnoses of these three taxa, as well as illustrations in colour photographs of their habitus and characters are presented. References to their detailed redescriptions and other illustrations published in the monographs of the two genera (MORAVEC 2002a, 2007), as well as essential maps of distributions, are given.

Keywords. Coleoptera, Cicindelidae, Pogonostoma, Physodeutera, taxonomy, new data, variability, distribution, Madagascar.

### Introduction

This paper is a continuation of the author's taxonomic revision of the Madagascan tiger beetles, which resulted in the monographs of the genera *Physodeutera* Lacordaire, 1842 and *Pogonostoma* Klug, 1835 (MORAVEC 2002a, 2007). The two revised genera belong to nine genera endemic to Madagascar (the main Madagascar territory which includes the near-shore islands of Nosy Be, Nosy Boraha (= Île Sainte Marie), Nosy Mangabe, and the Nosy Radama archipelago). A comprehensive revision of the other 17 genera (endemic or widespread) occurring in the Madagascan Region (which includes the archipelagos of the Comoros, the Seychelles, the Mascarenes and other islands) was also presented (MORAVEC 2010).

The taxonomy and nomenclature, as well as the number and distribution of Madagascan tiger beetles have significantly changed in comparison to the previous contributions such as by RIVALIER (1967, 1970), WIESNER (1992), CASSOLA & PEARSON (2000), CASSOLA (2003), MORAVEC 2002a,b, 2007, 2010) and subsequent, even more recent contributions by WIESNER (2020) and MORAVEC (in press).

Nine tiger beetle species (all endemic to the main Madagascan territory) were described as new to science subsequent to the above-mentioned concluding publications.

Two of them, *Physodeutera* (*Minideutera*) kamilmoraveci and *Physodeutera* (*Diarrhiza*) murzini, were described by the present author (MORAVEC 2004) subsequent to the monograph of the genus. Furthermore, one new monobasic genus, based on type species *Paraphysodeutera naviauxi* Moravec, 2002, was established (MORAVEC 2002b).

The continuation of the revision, which resulted in discoveries of other new taxa, is based on taxonomic research associated recently with two field research-projects conducted by several researchers. One of the two important projects of extensive field research has been managed by the University of Antananarivo and conducted by Michio Hori within the Japanese Research Team of Kyoto. The second field project has been conducted by Miloš Trýzna (Czech specialist in Anthribidae) and managed by the University of Antananarivo, Faculty of Sciences and Madagascar National Parks. The research conducted under the two projects has contributed to better knowledge of current distributions of tiger beetles and other insects throughout Madagascar and led to discoveries of a great number of taxa new for science.

Regarding Cicindelidae, the following seven species have been described recently within the two projects. *Physodeutera (Axinomera) horimichioi* by MORAVEC & RAZANAJAONARIVALONA (2015), *Pogonostoma (Microstenocera) noheli* by MORAVEC & VYBIRAL (2018), *Pogonostoma (Microstenocera) zombitsynense* by MORAVEC & VYBIRAL (2010), *Pogonostoma (Pogonostoma) natsuae* by MORAVEC *et al.* (2020), *Pogonostoma (Pogonostoma) ondravybirali* by MORAVEC & VYBIRAL (2020), *Pogonostoma (Bathypogonum) horimichioi* by RAZANAJAONARIVALONA *et al.* (2021) and *Physodeutera (Microlepidia) propripenis* by MORAVEC *et al.*(2021). Consequently, the tiger beetles of the Madagascan Region comprise presently 241 species and 21 subspecies (236 species and 16 subspecies of which occur in the main Madagascar territory). In addition, descriptions of two other new species, one of *Pogonostoma* and one of *Physodeutera*, are in two coauthored papers in press.

The aim of this paper is to present new unpublished data within the genera *Pogonostoma* and *Physodeutera*. The updates encompass new knowledge concerning *Pogonostoma* (*Polypogonostoma*) violaceum violaceum Fleutiaux, 1902 whose nominotypical subspecies is characterized by deep violaceous to violet-blue dorsal body coloration. Two unusually and quite exceptionally green-coloured adults (male and female) were caught recently inside the Special Reserve of Ankarana in Northern Madagascar. Nevertheless, despite a slight difference also in the shape of the male aedeagus apex, they are considered here green-aberrant adults of the nominotypical subspecies, particularly so because of only two examined adults. Notwithstanding, regarding the tremendous biodiversity in Madagascar, including the area of Ankarana, a possibility that these green adults may represent an undescribed species may be considered again after more specimens possessing the same body coloration and shape of the aedeagus have been confirmed. In any case, because of their sympatric (and probably also syntopic) occurrence with adults of the nominotypical subspecies, the two adults cannot represent a subspecies.

*Pogonostoma* (*Polypogonostoma*) violaceum fulgidipenne Lesne, 1911, described later by LESNE (1911) is considered a phytogeographical subspecies inhabiting Sambirano, but its exact range of distribution is not clear, particularly due to lack of recent specimens with exact locality labels, which is true also for the only recently caught male (MORAVEC & GILLETT 2009).

Furthermore, a second known female of *Physodeutera* (s. str.) *umbrosa* Rivalier, 1967 (previously only recorded by MORAVEC & GILLETT 2009) is introduced here with

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illustrations of its habitus and diagnostic characters which supplement the illustrations of the female holotype (by monotypy) in the monograph of the genus (MORAVEC 2002a); unfortunately, male remains unknown.

For the history of *Physodeutera* see MORAVEC (2002a) and briefly also MORAVEC *et al.* (2021). The genus was validly established by LACORDAIRE (1842) in a preprint which was widely distributed before the concluding publication by LACORDAIRE (1843); therefore, the date of the original description of the genus-group name is correctly cited as 1842 (see BOUSQUET 2016). Both papers by LACORDAIRE (1842 and 1843) are cited in "References" below.

# Material and methods

Body length is measured without labrum and represents the distance from the anterior margin of the clypeus to the elytral apex. The width of the pronotum includes the lateral margins of the proepisterna. The width of the head is measured across the eyes (the distance between their outer margins) and the labrum is measured without the clypeus. The length of the elytron is measured from the elytral apex to its visible basal portion (above humerus). The term "aedeagus" here refers to the median lobe of the organ (without parameres). All dimensions of aedeagi are primarily figured in their left lateral position where the basal portion (with basal orifice) points to the right and the left lateral outline (with dorsoapical orifice) faces dorsally, provided that the ventral outline of the median portion is settled in its vertical position, and the apex of the aedeagus is perfectly settled in its horizontal position. In contrast to other Madagascan genera, the internal sac is only poorly developed within the aedeagi of *Pogonostoma* and therefore is not used for identification (few exceptions are demonstrated by MORAVEC 2007). The morphological terminology largely follows the Torre-Bueno dictionary (NICHOLS 1989), terms describing the surface macrosculpture are partly after HARRIS (1979) but include many terms proposed by MORAVEC (2007). Sculpture of the body surface is recognized in two basic terms: sculpture (macrosculpture) and microsculpture (microtexture). As demonstrated by SCHULTZ & RANKIN (1985a, 1985b), the outermost cuticular layer (epicuticle) forms on the surface a complete microtexture of minute, mostly isodiametric pits readily obvious at high magnification and better observable in SEM microphotographs as demonstrated by MORAVEC (2007). Unlike the sculpture, the microtexture of the body surface is not often clearly defined and mostly not so important. However, microtubercles on elytral surface are diagnostic for several subgenera of Pogonostoma characterized by the ornamental setae arising not only from the punctures of the sculpture, but also irregularly from setigerous microtubercles with micropits on intervals between the punctures (see RIVALIER 1970, illustrations in MORAVEC 2007).

Labels are cited in the following manner: lines on the same label are separated by a slash /, separate labels are indicated by a double-slash //; each specimen or a series of specimens is separated by a full stop. The colour of the labels and mode of writing appear in square brackets (in type specimens only). Words printed on labels in full capital letters are transcribed as lower-case letters (capitals are used in abbreviations only).

The list (catalogue) under the species name in the descriptive part is selective. This means that it gives the original name combination, as well as the first publication of all subsequent taxonomic or nomenclatorial acts concerning the taxon. The list thus does not repeat the same name combinations subsequently published by authors who adopted them, except for the revisions by RIVALIER (1967, 1970) and MORAVEC (2002a, 2007) which are always cited.

The colour photographs of the habitus and diagnostic characters were taken with a Nikon Coolpix 990 digital camera through an MBS-10 stereo microscope.

The following abbreviations of type status are used in the captions below the illustrations: HT = holotype; LT = lectotype; PLT = paralectotype.

Abbreviations for the collections:

AMCB	Collection Alain Monfort, Bellaire, Belgium
APCA	André Peyrieras collection, Antananarivo (now mostly in MNHN)
BMNH	The Natural History Museum London, U.K.
ССЈМ	Collection Cicindelidae Jiří Moravec, Adamov, Czechia
CJVB	Collection Jan Vybíral, Židlochovice (u Brna), Czechia
CKWP	Collection Karl Werner, Peiting, Germany (now in SNSB-ZSMC,
	Zoologische Staatssammlung, Münich, Germany)
CMTD	Collection Miloš Trýzna, Děčín, Czechia
DBCN	Insect Collection of David W. Brzoska, Naples, Florida, U.S.A.
HSCA	Collection Hirofumi Sawada, Aomori, Japan
	(probably spread to various collections)
JWCW	Collection Jürgen Wiesner, Wolfsburg, Germany
MRAC	Musée Royal de l'Afrique Centrale, Tervuren, Belgium
MFNB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
MHCW	
MNHN	Muséum national d'Histoire naturelle, Paris, France
NHMB	Naturhistorisches Museum, Basel, Switzerland
NHMW	
NMPC	National Museum (Entomological Department), Prague, Czechia
PBZT	. Parc Botanique et Zoologique de Tsimbazaza, Antananarivo, Madagascar
SDEI	. Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
ZSMC	Zoologische Staatssammlung, Münich, Germany

# Systematics

*Pogonostoma (Polypogonostoma) violaceum violaceum* Fleutiaux, 1902 (Figs 1–2, 4–36, 43, including green-aberrant adults Figs 14–25, 34–36)

Pogonostoma violaceum Fleutiaux, 1902: 302.

Type locality. Montagne d'Ambre (presently the National park of Montagne d'Ambre), province of Antsiranana (previously Diego Suarez).

Pogonostoma (Pogonostoma) violaceum violaceum: JEANNEL 1946: 117.

Pogonostoma (Pogonostoma) violaceum violaceum: RIVALIER 1970: 276.

Pogonostoma (Pogonostoma) violaceum violaceum: MORAVEC 2007: 136, figs 438-448, 1689.

**Type material.** Lectotype ♀ (designated here) in MNHN: "Montagne d'Ambre" [handwritten] // "Muséum Paris / Coll. E. Fleutiaux" [blue, printed] // "Pogonostoma violaceum Fleut. / type / Fleutiaux det."

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[handwritten/printed] // "Type" [red, printed] // "Lectotype / Pogonostoma / violaceum Fleutiaux, 1902 / design. Jiří Moravec 2003" [red, printed]. Paralectotypes. 1 ♀ in BMNH: "Madagascar. / Diego Suarez / 1904–28" [yellow-brown-tarnished, printed] // "Pogonostoma / violaceum / ex type Fleut." [handwritten] // "NHMUCO14400128" [with linear code, printed]. 1 ♂ in BMNH: "Diego Suarez / Madagascar" [yellowish, handwritten] // "violaceum / Fleut: ex typ: ♂ / (Donckier)" [yellowish, handwritten] // "Bates Coll. / 1911–248" [printed] // "NHMUCO14400130" [with linear code, printed]. Both paralectotypes labelled: "Revision Jiří Moravec 2003: Paralectotype "Pogonostoma (s. str.) / violaceum Fleutiaux, 1902 / det. Jiří Moravec 2007" [printed].

**Other material examined.** Historical data. 15 spms  $(\mathcal{J}, \mathcal{Q})$  in MNHN, 1  $\mathcal{J}$  in SDEI: "Mt. d'Ambre". 1  $\mathcal{Q}$  in BMNH: "Mt. d'Ambre / Madagascar" // "Muséum Paris / Coll. A. Sicard 1930" // "Brit. Mus / 1947–246" // "Pogonostoma / violaceum / Fleut. / Dr. W. Horn det. 1927" // "NHMUCO14400133". 1  $\mathcal{Q}$  in BMNH: "Diego / Suarez" // "Andrewest / Bequest. / B.M. 1922–221" // "NHMUCO14400129". 1  $\mathcal{Q}$  in BMNH with same labels except for: "NHMUCO14400145". 1  $\mathcal{J}$  in BMNH with same labels except for: "NHMUCO14400145". 1  $\mathcal{J}$  in BMNH: "Diego / Suarez / Ambre Geb. / Madagascar" // "NHMUCO14400132". 1  $\mathcal{J}$  in BMNH: "Diego Suarez" // "violaceum Fleut. / Babault det.". 1  $\mathcal{J}$  in BMNH: "Diego / Suarez / Ambre Geb. / Madagascar" // "NHMUCO14400132". 1  $\mathcal{J}$  in BMNH: "Diego Suarez" // "violaceum" // "F. Bates Coll. / 1911–248" // "NHMUCO14400143". 1  $\mathcal{Q}$  in BMNH with same labels except for: "349" // "NHMUCO14400142". 1  $\mathcal{J}$ , 3  $\mathcal{Q} \mathcal{Q}$  in SDEI: "Nord Madagascar". 13 spms ( $\mathcal{J}, \mathcal{Q}$ ) in MNHN: "Sahafary (Diego Suarez)". 1  $\mathcal{J}$ , 1  $\mathcal{Q}$  in PBZT: "Madagascar-Nord / Dct. de Diego Suarez, / Montagne des Français". 1  $\mathcal{J}$  in MNHN: "Foret de Mahory". 1  $\mathcal{J}$  in CJM (ex APCA): "Madagascar-Nord / Andranofanjava / (35 km au S-O de Diego Suarez) / Mt. d'Ambre / 1998, leg. A. Peyrieras". 1  $\mathcal{J}$  in MNHN: "Foret de Rogez" (sic!). 1  $\mathcal{Q}$  in MFNB, 1  $\mathcal{J}$  in MHNB: "Foret de Rogez" (sic!). 1  $\mathcal{Q}$  in MFNB: "Imerina" (sic!). 1  $\mathcal{Q}$  in NHMB, 1  $\mathcal{Q}$  in CKWP: "Vohemar". 1  $\mathcal{J}$  in MFNB: "Madagascar".

Recent data. 2  $\Im$ , 1  $\bigcirc$  in MHCW: "Diego Suarez / Antsiranana / 23.I.1984, leg. Michio Hori". 1  $\bigcirc$  in CJVB: "N. Madagascar, 31.XII.2006 / Antsiranana env. Ramena / S12°17′10.8"; E49°17′38.3″ / J. Vybíral leg.". 3  $\Im$ , 26  $\bigcirc$   $\bigcirc$  in CJVB: "Madagascar N., Antsiranana prov. / Montagne d'Ambre N.P. / 3.I.2007 leg Jan Vybíral". 9  $\Im$ , 3  $\bigcirc$   $\bigcirc$  in JWCW, 5  $\Im$ , 5  $\bigcirc$   $\bigcirc$  in HSCA: "Mt. d'Ambre (near Ambohitra), 20–26.XII.2002, Ivo Jeniš leg.". 1  $\Im$ , 1  $\bigcirc$  in AMCB, 1  $\Im$  in CCJM: "Madagascar Nord / Mt. d'Ambre, 150–200 m / 2–4.I.2005, leg. A. Monfort". 9  $\Im$ , 7  $\bigcirc$   $\bigcirc$  in CCJM: "Madagascar Nord, Marotaolana, (Massif du Ankarana) // 7–9. II. 2000, leg. Jiří Moravec". 8  $\Im$ , 6  $\bigcirc$   $\bigcirc$  in CJVB: ibid.: "leg. Jan Vybíral". 1  $\Im$ , 1  $\bigcirc$  in CMTD: "N Madagascar, 21.–26.I.2016 / Ankarana N.P., "Circ. Benavony" / S12°57′30.8"; E49°07′10.5″ / 128 m, M. Trýzna leg.". Green-aberrant adults (Figs 14–25, 34–36). 1  $\Im$ , 1  $\bigcirc$  in DBCN: "Madagascar, Antsiranana Prov. / Special Reserve of Ankarana / "Benavony Circle"–12.960; 49.321 / 120 m, 10.I.2016, leg. D. Brzoska".

**Differential diagnosis.** The nominotypical subspecies of *P. (Pol.) violaceum* Fleutiaux, 1902 is immediately recognisable due to its very large body (length 18.5–22.6 mm, width 4.30–5.40 mm) with notably elongate, almost parallel-side elytra, deep violaceous or violet-blue dorsal body coloration usually with purple-violet reflections on elytra, rather dense elytral punctation and normally shaped, long aedeagus. The only exception is the green-coloured male and female introduced here (Figs 14–25, 34–36), the male possessing somewhat differently shaped aedeagus apex (both in its lateral, ventral and dorsal view as obvious in Figs 34–36). Moreover, the mandibles of these anomalously green-coloured adults are slightly wider in their median portions (Fig. 22). However, as all other characters are identical with *P. (Pol.) v. violaceum*, they are presently considered green-aberrant adults.

*Pogonostoma* (*Polypogonostoma*) *cyanescens* Klug, 1835 clearly differs from the two similarly green-coloured adults by a complex of other characters, immediately by its notably shorter, stout elytra with coarser punctation, semiglobose pronotal disc and shorter aedeagus. *Pogonostoma* (*Pol.*) *viridipenne* Jeannel, 1946 also has its elytra notably shorter and with much coarser punctation than P. (*Pol.*) *violaceum* (see relevant figures by MORAVEC 2007).



**Figs 1–3.** *Pogonostoma (Polypogonostoma) violaceum.* 1–2 – *P. (Pol.) v. violaceum* Fleutiaux, habitus: 1 – ♀, Montagne d'Ambre, LT (MNHN); 2 – ♂, Marotaolana (CCJM); 3 – *P. (Pol.) v. fulgidipenne* Lesne, elytral apex, ♂, "Marovoay", LT (MNHN). Bars = 1 mm.

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**Figs 4–8.** Pogonostoma (Polypogonostoma) v. violaceum Fleutiaux. 4–5 – elytron, Marotaolana (CCJM): 4 – ♂; 5 – ♀; 6–7 – elytral apices: 6 – ♂, Marotaolana (CCJM); 7 – ♀, Montagne d'Ambre (CCJM); 8 – lacinia with galea, ♂, Marotaolana (CCJM). Bars = 1 mm.



Figs 9–13. Pogonostoma (Polypogonostoma) v. violaceum Fleutiaux. 9–10 – pronotum: 9 – ♂, Marotaolana (CCJM); 10 – ♀, Montagne d'Ambre, LT (MNHN); 11 – mandibles, ♂, Marotaolana (CCJM); 12–13 – labrum: 12 – ♂, Marotaolana (CCJM); 13 – ♀, Montagne d'Ambre, LT (MNHN). Bars = 1 mm.

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**Figs 14–16.** *Pogonostoma (Polypogonostoma) v. violaceum* Fleutiaux (green-aberrant adults, Special Reserve of Ankarana, DBCN). 14 – habitus,  $\mathcal{J}$ , 19.5 mm; 15–16 elytron:  $15 - \mathcal{J}$ ;  $16 - \mathcal{Q}$ . Bars = 1 mm.



Figs 17–20. Pogonostoma (Polypogonostoma) v. violaceum Fleutiaux (Special Reserve of Ankarana, greenaberrant adults, DBCN). 17–18 – elytral apices: 17 – ♂; 18 – ♀; 19–20 – pronotum: 19 – ♂; 20 – ♀. Bars = 1 mm.

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**Figs 21–25.** *Pogonostoma (Polypogonostoma) v. violaceum* Fleutiaux (green-aberrant adults, Special Reserve of Ankarana, DBCN). 21 – head, ♂; 22 – mandibles, ♂; 23 –galea and lacinia, ♂; 24–25 – labrum: 24 – ♂; 25 – ♀. Bars = 1 mm.



Figs 26–37. Aedeagus or its apex. 26–36 – Pogonostoma (Polypogonostoma) v. violaceum Fleutiaux. 26 – Marotaolana (CCJM); 27 – ditto, ventral view; 28 – Andranofanjava (CCJM); 29 – ditto, dorsal view; 30 – Marotaolana (CCJM); 31 – ditto, dorsal view; 32 – Montagne d'Ambre; 33 – ditto, dorsal view; 34–36 – green-aberrant male, Special Reserve of Ankarana (DBCN): 34 – left lateral view, 35 – ditto, dorsal view; 36 – ditto, ventral view; 37 – P. (Pol.) v. fulgidipenne Lesne, Sambirano (BMNH); Bar = 1 mm.

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**Fig. 38.** *Physodeutera* (*Physodeutera*) *umbrosa* Rivalier, habitus, Q, Makira Forest (BMNH). Bar = 1 mm.





Figs 39–42. *Physodeutera* (*Physodeutera*) *umbrosa* Rivalier, ♀, Makira Forest (BMNH). 39 – elytron; 40 – pronotum; 41 – anterior part of head; 42 – labrum. Bars = 1 mm.

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*Pogonostoma* (*Polypogonostoma*) violaceum fulgidipenne Lesne, 1911, immediately differs from the nominotypical subspecies in having gold-bronze to reddish-cupreous elytra (Fig. 3).

The normally violaceous coloured adults may somewhat resemble violaceous adults of *Pogonostoma (Bathypogonum) levigatum levigatum* W. Horn, 1908 but are clearly distinguished by the regular arrangement of elytral ornamental setae (setae confined to punctures), different shape of the labrum and normally shaped lacinia and aedeagus. In contrast, adults of *P. (B.) l. levigatum* are immediately distinguished by their almost smooth and shiny pronotal disc and particularly by the diagnostic characters of the subgenus *Bathypogonum* Jeannel, 1946, e.g. the irregular elytral setal vesture (ornamental setae arising also from setigerous microtubercles on interspaces between punctures), lacinia with markedly dilated and distinctly inward-recurved apex, as well as uniquely shaped aedeagus, which is notably voluminous and almost straight (with very short basal portion), and constricted towards short, cylindric, rounded apex (see HORN 1908, JEANNEL 1946, RIVALIER 1970, MORAVEC 2007, RAZANAJAONARIVALONA *et al.* 2021).

**Biology and distribution.** The nominotypical subspecies *Pogonostoma (Pol.) v.* violaceum occurs in the northern province of Antsiranana (previously Diego Suarez), including its type locality where it is protected in the evergreen forest of the National Park of Montagne d'Ambre. Andranofanjava (its DD coordinates -12.4833,49.016) is situated in the region of Diana of the Antsiranana province, more southwest of the national park, while Foret de Sahafary lies 55 km south of Antsiranana (VIETTE (1991) and its DD coordinates are -12.550,49.280. One female (CJVB) from the area of the town of Ramena near the town of Antsiranana (= Diego Suarez) represents its northernmost occurrence of this nominotypical subspecies. It spreads eastwards through partly deciduous forest of Montagne des Français to evergreen, now nearly vanished forest in the region of Vohemar on eastern coast of northern Madagascar. However, as the region is large, the locality "Vohemar" meant probably a place far northwards of the town of Vohemar. It also occurs in northwestern deciduous forest of the Ankarana massif in the western part of North Madagascar. There it is rather common in deciduous yet partly humid forest near Marotaolana, 14 km north of the Special Reserve of Ankarana and about 13 km south of Anivorano North (DD coordinates: -12.82842,49.23514). However, it seems to be rare in the dry deciduous forest inside the Special Reserve of Ankarana which is situated 70 km south of Antsiranana (Diego Suarez), 20 km north of Ambilobe. There it was recently caught only in the area called Benavony Circle (its DD coordinates: -12.960,49.321) in a partly degraded dry deciduous forest with interspaced large trees (notably differing from the area of eroded limestone karst pinnacles in other parts of the reserve). Adults possess usual behaviour as other species of the genus and were found on trunks of larger trees. Both the normally violaceous and anomalously green adults live there syntopically, and also together with *Physodeutera* (Microlepidia) propripenis Moravec, Brzoska et Vybíral, 2021. The specimen (MNHN) bearing the label "Foret de Rogez" was probably mislabelled; doubtful are also the labels "Mandritsara".

**Remarks.** For detailed redescription and other illustrations see the monograph of the genus (MORAVEC 2007).

FLEUTIAUX (1902) did not clearly designate a type and did not note the number of specimens in the original description. Therefore, the female in MNHN labelled as type was designated as lectotype in the monograph of the genus (MORAVEC 2007). One male and one female in BMNH (both ex Coll. Fleutiaux – see "Type material" above) became paralectotypes (by a mistake the male was not listed in the monograph as paralectotype).

# *Pogonostoma (Polypogonostoma) violaceum fulgidipenne* Lesne, 1911 (Figs 3, 37, 44)

*Pogonostoma violaceum fulgidipenne* Lesne, 1911: 240. **Type locality.** "Marovoay", western Madagascar (but see the discussion in "Distribution and biology" below).

Pogonostoma violaceum fulgidipennis (sic!): HORN 1926: 9 (wrong gender). Pogonostoma (Pogonostoma) violaceum fulgidipenne: JEANNEL 1946: 118. Pogonostoma (Pogonostoma) violaceum fulgidipenne: RIVALIER: 1970: 276. Pogonostoma (Pogonostoma) violaceum fulgidipenne: MORAVEC 2007: 139, figs 449–456, 1690–1691.

**Type material.** Lectotype  $\overset{\circ}{\supset}$  (designated by MORAVEC 2007), labelled: "Muséum Paris / Madagascar / Env. de Marovoay / J. Descarpentries 1900" [green, printed, date illegible] // "Sur un manary / Avril 1910" [handwritten] // "Pogonostoma violaceum Fleut. / v. fulgidipennis Lesne / P. Lesne vid." // "Type" [red, printed] // "Lectotype / Pogonostoma / violaceum fulgidipenne / Lesne, 1911 / design. Jiří Moravec 2003" [red, printed]. **Other material examined.** 1  $\overset{\circ}{\supset}$  in MNHN: "Tananarive" (sic!). 1  $\overset{\circ}{\supset}$  in SDEI: "Ramena, Sambirano / N. W. Madagascar / III.33, Mellis". 6  $\overset{\circ}{\supset}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$   $\overset{\circ}{O}$  in SDEI: "Bejofo". 1  $\overset{\circ}{\bigcirc}$  in NHMW with illegible folded label. 2  $\overset{\circ}{\supset}$   $\overset{\circ}{O}$  in NMPC: "Haute Vallée de Sambirano". 1  $\overset{\circ}{\ominus}$  in ZSMC lacking locality label. 1  $\overset{\circ}{\supset}$  in BMNH: "BMNH(E) 67268" [caught in the area of Sambirano river, exact locality unknown].

**Differential diagnosis.** Pogonostoma (Pol.) violaceum fulgidipenne is immediately distinguished from the nominotypical subspecies by its gold-bronze to reddish cupreous elytra. Similarly coloured P. (Pol.) septentrionale auripenne W. Horn, 1909 clearly differs in having black setal vesture of whole dorsal surface. Another similarly coloured P. (Macropogonostoma) caeruleum cupripenne Lesne, 1911, differs in a complex of characters, particularly by its differently shaped labrum and elytral apices.

**Distribution and biology.** One of the largest and most beautiful tiger beetles yet very rare. Much like other taxa with similarly metallic bronze to cupreous coloured adults, also *P. (Pol.) v. fulgidipenne* is considered to be a phytogeographical subspecies inhabiting Sambirano (MORAVEC 2007). Nevertheless, it must be stated here that as no recently caught specimen with exact locality has been found in collections, the exact distribution of *P. (Pol.) v. fulgidipenne* remains merely at the level of speculations. It is particularly due to the unpleasant fact that tracing the exact places of occurrence in Madagascar is sometimes (and also in this case) complicated. Some specimen locality labels clearly disagree with the known occurrence of a given species and were evidently (some of them quite certainly) mislabelled, usually by insect dealers, as discussed recently (MORAVEC in press) and previously (MORAVEC 2002a, 2007, 2010). Some place names were misinterpreted or incorrectly transcribed by collectors or insect dealers, and

certain place names (also those on the labels of type specimens) are repeated across the island. Certain recorded locality names have variable spellings, as well as a shift from French names to those in Malagasy. This problem is in part addressed by VIETTE (1991), but many of the names, as well as the system of administrative division presented by Viette, have changed in the past years. Some of the problematic locality names are associated with type localities mentioned by historical authors in original descriptions and/or written on specimen labels.

This complicates also our knowledge of the distribution of P. (Pol.) v. fulgidipenne. The locality Bejofo lies 19 km north of Ambanja in Sambirano (the place must not be confused with other towns bearing the same name). The label "Haute Vallée de Sambirano" means the area of the Sambirano River. The labels "Antsabesianina" and "Antsabetsienne" (evidently distorted) mean probably Antsabe, now spelled as Antsaba, lying 20 km northeast of Ambanja, also in Sambirano. The label "Sambirano, Ramena R." means the Ramena river in Sambirano (the name of the river must not be confused with the town of Ramena in northernmost Madagascar). As discussed previously (MORAVEC 2007), because no other examined specimen comes from western Madagascar outside of Sambirano, it could happen that the name of the type locality, stated as Marovoay by LESNE (1911) and written on the label of the lectotype, was confused with the name of Marovato. While Marovoay lies in western Madagascar near the river Betsiboka west of the Ankarafantsika National Park with dry deciduous forest, the small town of Marovato is situated east of the Manongarivo Special Reserve covered with dense humid forest of Sambirano (the place must not be confused with a larger town of Marovato near Boriziny in western Madagascar). As interpreted by LESNE (1911), the label "Sur un manary" attached to the lectotype means that the specimen was caught on upper branches of a rosewood-tree (probably the deciduous legume tree Dalbergia baronii Baker, 1884, endemic to Madagascar). Surprisingly, LESNE (1911) mentioned that the type specimens of the three metallic bronze to cupreous-coloured subspecies, P. (Pol.) v. fulgidipenne, P. (Pol.) septentrionale auripenne W. Horn, 1909 and P. (Macropogonostoma) caeruleum cupripenne Lesne, 1911, were allegedly collected by Descarpentries at the same time (sic!) and in Ankarafantsika (now the National Park of Ankarafantsika east of Marovoay, covered with dry deciduous forest). The occurrence name "Marovoay" was adopted from Lesne also by OLSOUFIEFF (1934), HORN (1915, 1934), JEANNEL (1946) and RIVALIER (1970) yet these authors listed also places in Sambirano. Notwithstanding, none of the other examined specimens found in the relevant museum collections has "Marovoay" nor "Ankarafantsika" on its label. The type locality of P. (Pol.) septentrionale was mentioned by HORN (1909) as "Majunga" (= Mahajanga) which means any place in the very large province of Mahajanga including some areas of Sambirano, and all exactly labelled specimens of this taxon come from Sambirano (MORAVEC 2007).

The only recently caught male (BMNH) of *P. (Pol.) v. fulgidipenne*, previously recorded by MORAVEC & GILLETT (2009), comes also from Sambirano; unfortunately, its exact locality is uncertain because of confused list of specimens, which were originally stored in ethanol as DNA samples.

The label "Tananarive", commonly labelled as such usually by historical insect dealers, means "Madagascar" (MORAVEC 2002a, 2007, 2010).

**Remarks.** For detailed redescription and other illustrations including the lectotype see the monograph of the genus *Pogonostoma* (MORAVEC 2007).

It is noteworthy that LESNE (1911) compared the bright colour of the adults of the three above-discussed *Pogonostoma* taxa to similarly coloured adults of the Neotropical tiger beetle genus *Cheilonycha* Lacordaire, 1842, whose one species *Cheilonycha chalybea* (Dejean, 1825) is violet-blue, while *C. auripennis* (Lucas, 1857) is metallic bronze. Nevertheless, the comparison by Lesne is quite inadequate, because except for the superficial similarity in coloration, the termitophilous genus *Cheilonycha*, which presently comprises four taxa and belongs to the tribe Cicindelini Latreille, 1802, subtribe Odontocheilina W. Horn, 1910 (sensu MORAVEC 2012), see MORAVEC (2019, 2020).

# *Physodeutera (Physodeutera) umbrosa* Rivalier, 1967 (Figs 38–42, 45)

*Physodeutera (Physodeutera) umbrosa* Rivalier, 1967: 290 (figs 21b, 24). *Physodeutera (Physodeutera) umbrosa*: MORAVEC 2002a: 238, figs 629–632, 792. **Type locality.** "Antakotako, Maroantsetra".

**Type material.** Holotype  $\mathcal{Q}$  (by monotypy) in MNHN, labelled: "Antakotako" [handwritten] // "Madagascar / Maroantsetra / Vadon!" [printed] // "Type" [red, printed] // "Holotype (by monotypy) / Physodeutera (s. str.) / umbrosa Rivalier, 1967 / design. by J. Moravec, 2000" [red, printed].

**Other material examined.** Recent data. 1 $\bigcirc$  in BMNH: "Madagascar NE / Toamasina Prov. / Makira Forest / Bivontro R. / -15.398°S,49.451°E / c. 650 m. / 14/12.XII.2002 / Collector D.C Lees".

Differential diagnosis (supplemented for characters of the additional female presented here, male is unknown). Body (Fig. 38) comparatively large, 11.1-12.0 mm long, 3.30–3.40 mm wide; dorsal body coloration unique within the nominotypical subgenus: elytra (Fig. 39) chatoyant green to green-blue, elytral disc possessing large, velvety black zone covering large median area from suture towards epipleuron and obliquely extending towards humerus and running laterally towards apex in form of a narrow black stripe; shiny green anteapical-apical area is in HT interrupted with velvety black shadowy zone, while in the other female possesses chatoyant cinnamon-ochre zone passing to velvety black shadowed apical area (changeable under different light angles); elytral maculation consists of small, cinnamon-ochre humeral macula that is only partly visible from above, small shiny-green or bronze-mirrored sublateral-median spot, and irregularly rounded (in HT almost triangular) central macula, which is cinnamon-brown to cinnamon-reddish with yellowish centre. Labrum (Fig. 42) uniquely metallic-coloured, possessing large, shiny chatoyant-green central area which may be prevailing except for dark brown lateral areas (and anterior area in HT) or with bronze anteromedian limited area (in the female from Makira); palpi testaceous with blackish distal palpomeres. Legs metallic violaceous-brown, metatarsi brownish.



Madagascar tiger beetles 22. Physodeutera and Pogonostoma

Figs 43–45. Maps of distribution. 43 – Pogonostoma (Polypogonostoma) v. violaceum Fleutiaux; 44 – Pogonostoma (Polypogonostoma) v. fulgidipenne Lesne; 45 – Physodeutera (Physodeutera) umbrosa Rivalier.

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**Distribution and biology** (Fig. 45). *Physodeutera* (*Ph.*) *umbrosa* is obviously extremely rare species, known only from two females. The female holotype (MNHN) was described by RIVALIER (1967) from the village of Antakotako lying 15 km northeast of Maroantsetra in Baie d'Antongil (DD coordinates -15.316,49.800). The here introduced additional female (BMNH), previously listed by MORAVEC & GILLETT (2009), was caught in the Makira Forest (area of the Bivontro River) at the altitude of about 650 m (DD coordinates -15.398,49.451). Male remains unknown and the same is true about the exact biotope, behaviour of adults and developmental stages of this species.

**Remarks.** *Physodeutera* (*Ph.*) *umbrosa* is maintained here as a member of the nominotypical subgenus. However, as noted previously (MORAVEC 2002a), because the male is unknown, the subgeneric classification of this outstanding species cannot be determined definitely.

For detailed redescription and illustrations of the female holotype, as well as the key to species, see MORAVEC (2002a). Nevertheless, it must be emphasized here that the colour photograph of the holotype in the monograph of the genus (MORAVEC 2002a, fig. 792) is mistakenly marked as a male, although in fact it figures the female.

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