

**Taxonomy of the Cape Verde endemic weevil
genus *Dinas* (Coleoptera: Curculionidae: Entiminae).
Part I: Description of a new subgenus, and two new species
from São Nicolau Island**

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Abstract. An extensive material of the Cape Verde endemic weevil genus *Dinas* Wollaston, 1867 (Curculionidae: Entiminae) is revised. Two subgenera are recognized based on the external morphology and biology of adults. *Microspina* subgen. nov. is established for the group with smaller-sized adults which are flower-eaters adapted to habitats with Macaronesian endemic flora; 10 species are transferred to the subgenus: *D. (M.) angusticeps* Roudier, 1957, *D. (M.) angustula* Wollaston, 1867, *D. (M.) elliptipennis* Wollaston, 1867, *D. (M.) heckeli* Geisthardt, 1995, *D. (M.) micans* Roudier, 1957, *D. (M.) obsita* Wollaston, 1867, *D. (M.) pallipes* Roudier, 1957, *D. (M.) punctipennis* Roudier, 1957, *D. (M.) sitonaeformis* Wollaston, 1867, and *D. (M.) viridisquamea* Roudier, 1957. Contrary, adults of *Dinas* s. str. were found on the ground and under stones only. The *Dinas* fauna of São Nicolau Island is studied in detail. *Dinas (Microspina) afonsoi* sp. nov. and *D. (Dinas) strakai* sp. nov. are described from the eastern part of the island. The types and new material of the remaining two species from the western part of the island, *D. (Microspina) angusticeps* and *D. (Microspina) sitonaeformis*, are reviewed, and lectotype for the latter is designated. An identification key to all species known from São Nicolau is provided. The origin of *Dinas* and its biogeographic affinities are discussed. Distributional pattern of the genus within the archipelago, particularly in São Nicolau are commented. An updated list of all known *Dinas* species is provided.

Key words. Coleoptera, Curculionidae, Entiminae, *Dinas*, new subgenus, new species, new combination, check-list, adaptive radiation, insularity, Macaronesia, Cape Verde Islands

Introduction

Insular assemblages of organisms have attracted the attention of naturalists for more than 150 years because they offer model examples for the study of colonization, speciation and other evolutionary processes in restricted areas under more or less understandable natural conditions. Among such archipelagos we count the volcanic Cape Verde Islands, that have been visited by Charles Darwin (DARWIN 1859) and the organisms of which have been studied since his visit there. The archipelago is located in the Atlantic Ocean, some 600 km west of Senegal, and biogeographically belongs to the insular part of the Macaronesian subregion, comprising further the Azores, Madeira, Selvages and Canary Islands (OROMÍ 2004). Inclusion of the Cape Verde Islands into Macaronesia is generally accepted by zoologists (e.g. MIRALLES et al. 2011; VASCONCELOS et al. 2010, 2012) and botanists (BROCHMANN et al. 1997), although the opposite opinion also exists (NICOLÁS et al. 1989, VANDERPOORTEN et al. 2007). Although Cape Verde harbors a high proportion of Afrotropical species, aside from its numerous endemic taxa, its insect fauna is poor both in endemic forms and in total number of species (ARECHAVALETA et al. 2005) in comparison, for example, with the northerly situated Canary Islands (IZQUIERDO et al. 2004).

The junior author, together with Jakub Straka (Charles University in Prague, Praha) performed two short expeditions focused on collecting and studying Cape Verde native arthropods in the years 2009 and 2011. Both field trips surprisingly resulted in the discovery of numerous undescribed endemic species of Coleoptera and Hymenoptera, including some remarkable new genus records for the archipelago. Part of the results have already been published (BATELKA & STRAKA 2011, HERRMANN & HÁVA 2012, STRAKA & ENGEL 2012), but more material remains to be corroborated in several other studies. Among the most interesting discoveries, are two new species of the only Cape Verde endemic weevil genus *Dinas* Wollaston, 1867.

The genus *Dinas*, aside from the less speciose endemic genera *Melanocoma* Wollaston, 1867 (three single island endemics) and *Trichopodus* Mulsant & Rey, 1859 (three single island endemics) (both Coleoptera: Tenebrionidae), is the only case of a Cape Verde endemic insect genus with a remarkable island radiation (ARECHAVALETA et al. 2005). So far, all described *Dinas* species are regarded as single-island endemics. Each island usually hosts one, but sometimes two or three species may be present (ROUDIER 1957, GEISTHARDT 1995).

Only three authors have dealt with the taxonomy of the genus so far. *Dinas* was established by WOLLASTON (1867) to harbor five newly described endemic species. He pointed out that the type-species of the genus, *D. rugicollis* Wollaston, 1867 from São Vicente, is very dissimilar to the remaining four species (WOLLASTON 1867: p. XX). Ninety years later, an additional five new species and one variety were described by ROUDIER (1957). Similar to WOLLASTON (1867), he also noted that *D. rugicollis* differs from the remaining nine species, and that two subgenera within the genus should be established. The last paper about *Dinas* was that by GEISTHARDT (1995), with one new species described and accompanied by a check-list of all the known species.

In this paper we describe two new species of *Dinas* from the eastern part of São Nicolau Island, each belonging to one of the previously recorded *Dinas* morphotypes. This increases the total number of described species of *Dinas* to 14. A new subgenus is established for members of the smaller flower-eating *Dinas* morphotype in accordance with the previous

observations of WOLLASTON (1867) and ROUDIER (1957), and the external morphology of adults.

The weevil genus *Dinas* undoubtedly represents one of the most interesting Cape Verde insect genera. Its putative antiquity, adaptive radiation, distribution corresponding with certain geological units/events and its survival capability are making this genus a prime example of insular organism whose study may remarkably enhanced our understanding of the natural history of the Cape Verde Islands and volcanic archipelagos in general.

Material and methods

Specimen depositories and citations. Specimens are deposited in the following museums and private collections:

- BMNH Natural History Museum, London, United Kingdom (Maxwell V. L. Barclay);
- FMNH Finnish Museum of Natural History (Olof Biström);
- JSKC Jiří Skuhrovec private collection, Praha, Czech Republic;
- RBOC Roman Borovec private collection, Sloupno, Czech Republic;
- SMNS M. Geisthardt collection of Cape Verde Coleoptera in Staatliches Museum für Naturkunde, Stuttgart, Germany (Wolfgang Schawaller).

Label data are cited in the description, separate lines on labels are indicated by “/” and separate labels by “//”.

Taxonomy and photographic documentation. Body length of all types were measured without the rostrum. All measurements were measured in dorsal view. Dissected male and female genitalia were studied in glycerine and thereafter mounted on the same card as the respective specimen. Photos of genitalia were made using an Olympus BX40 microscope and combined in Zerene Stacker and GIMP2 software. Photos of adults were done with a Camera Canon Powershot A640 and Canon EOS 550D with a macroobjective MP-E 65 mm and combined using CombineZM and GIMP2 software.

Remarks on geology of Cape Verde/São Nicolau. Geological history of the Cape Verde Archipelago and each of the particular islands is one of the most important factors for understanding the distribution and speciation processes of the native organisms. In order to provide the proper comments on some of the geological features important in the biogeography of Cape Verde organisms, we introduce several terms in this paper.

All islands within the archipelago were generated by a hot-spot volcanism (similarly to Galápagos, Hawaii or Canary Islands) and have never been connected with Africa. Cape Verde Islands (Fig. 5A) are grouped geologically into two island chains (RAMALHO 2011). São Nicolau is the easternmost island within the east-west oriented chain (called the *Northern Chain*), including further Santo Antão and São Vicente, plus three small islets of Santa Luzia, Branco and Raso (also known as Desertas). The longer north-south oriented chain (called the *Southern Chain*) includes flat desert islands of Sal, Boavista and Maio, and the mountainous islands of Santiago, Fogo and Brava. Both proposed terms do not correspond with the local division of the archipelago into the so called ‘Barlavento’ (includes all islands of the Northern Chain together with Sal and Boavista) and ‘Sotavento’ (includes remaining islands of the Southern Chain) (ANONYMOUS 2001).

The oldest islands within the archipelago (i.e. the three northernmost islands of the Southern Chain: Sal, Boavista and Maio) are dated to about 20–18 Mya (BERNOULLI et al. 2007). The Northern Chain islands are much younger. The oldest subaerial volcanic strata in São Nicolau is dated back to 6.2 Mya for the eastern part of the island, while the western part seems to be younger (>5.7 Mya) (DUPRAT et al. 2007). The present mass of São Nicolau (343 km²) is made of two previously separated islands connected by subsequent eruptions of the Morro Bràs formation (<3.5 Mya) (DUPRAT et al. 2007). Consequently, the eastern part of São Nicolau (including Tope de Chuva) we hereinafter call the *Former Eastern Island* and the western part (including Monte Gordo) the *Former Western Island*.

Taxonomic part

Genus *Dinas* Wollaston, 1867

Type species. *Dinas rugicollis* Wollaston, 1867: 132 (by original designation).

Diagnosis. Body length 3.2 to 9.3 mm; epistome narrow, long and separated from frons by visible decreased line; frons glabrous or scarcely squamose, not separated from epifrons by any distinct carina; epifrons wide, with lateral margin moderately laterally projecting, with median longitudinal furrow of variable length (from short, present only on part of epifrons, to long, reaching occiput); head and rostrum in the same level in lateral view; scrobe in dorsal view visible only in apical half of rostrum as very narrow furrows, in lateral view furrow-shaped, obliquely directed below eye, not reaching eye or lower margin of rostrum; scape exceeding posterior margin of eyes; elytra without humeral angles; all femora with a short median spine; claws connate at base; suture between abdominal ventrites 1 and 2 sinuose, fine and shallow, other sutures straight and deep; abdominal ventrites 1 and 2 of the same length, but twice the length of each abdominal ventrites 3 and 4; sternite VIII in females with moderately long apodeme, terminated just inside of plate, plate subtriangular, with somewhat slender point, with slender apical margin and ill-defined basal margin, feebly sclerotised, with setae at apical part; gonocoxites of ovipositor with short apical styli bearing setae; tergite VIII in males with tongue-like process.

Taxonomic assignment of the genus. Lacordaire, in his personal communication to Wollaston, compared voucher specimens of *D. obsita* Wollaston, 1867 with the Palearctic genera *Foucartia* Jacquelin du Val, 1854 and *Platyarsus* Schoenherr, 1840 (= *Brachysomus* Schoenherr, 1823) (WOLLASTON 1867). VAN EMDEN (1936) presented tribal and generic keys to the Brachyderinae, where he listed the genus *Dinas* within the tribe Brachyderini Schönherr, 1826, which included the tribes Brachyderini and Sciaphilini. ROUDIER (1957) placed *Dinas* in close proximity to the genus *Sciaphilus* Schoenherr, 1823. Recently, ALONSO-ZARAZAGA & LYAL (1999) listed the genus in the tribe Sciaphilini Sharp, 1891, together with all three genera mentioned above. Generic relationships within this tribe and its position within the subfamily Entiminae are unknown. Inclusion of molecular data for *Dinas* into a comprehensive phylogeny of the Old World Entiminae, appears necessary to resolve its phylogenetic position.

The subfamily Entiminae is especially represented in the Macaronesian subregion by representatives of the tribe Laparocerini Lacordaire, 1863. Based on MACHADO's (2010) diagnosis

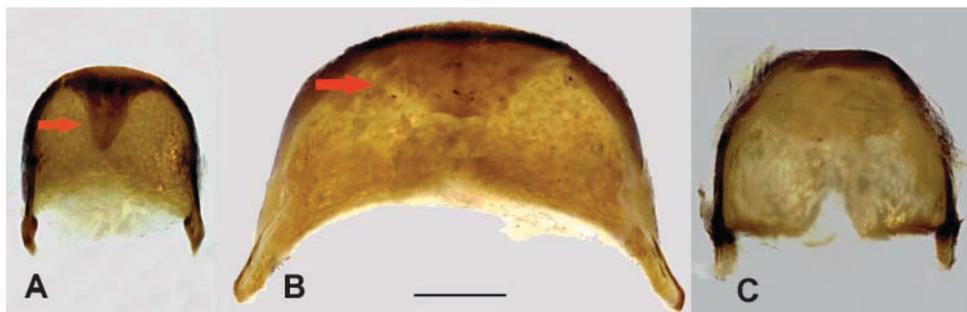


Fig. 1. Tergit VIII in males of Entiminae: A – *Dinas (Microspina) afonsoi* sp. nov. and B – *Dinas (s.str.) strakai* sp. nov. with tongue-like process; C – *Barypeithes interpositus* Roubal, 1920 without tongue-like process. Scale: 1 mm.

of the tribe Laprocercini, most representatives of the tribe differ from *Dinas* in two important characters: the femora are unarmed and the spiculum relictum is present, whereas members of *Dinas* have the femora armed each with one distinct spina and the spiculum relictum is absent. In addition, male members of *Dinas* also have a special tongue-like process on tergite VIII (Figs 1A–B), which has never been observed in other Entiminae (Fig. 1C) including Laprocercini (MACHADO 2010). A similar tongue-like process on the tergite VIII of males has only been mentioned for several brentoid groups (WANAT 2007).

***Microspina* subgen. nov.**
(Figs 2A, 2C, 2E, 2G, 3A–I, 7A–D)

Type species. *Dinas sitonaeformis* Wollaston, 1867: 137.

Differential diagnosis. See in Table 1.

Etymology. The name of the new subgenus refers to the distinct spina at midlength of the femora and also represents the opposite to *Macrospina* Mateu, 1956, the only Cape Verde endemic genus of longhorn beetles (Cerambycidae).

Comparative notes. We follow WOLLASTON (1867) and ROUDIER (1957) in recognizing two distinct groups of *Dinas* based on the adult morphological characters given above. In spite of that, we do not consider any of the diagnostic characters as adequate to delimit separate genera. Characters used for delimiting genera in the Entiminae (i.e. size and shape of the epistome, presence/absence of a carina separating the frons from the epistome, presence of the median longitudinal furrow on the epifrons, shape and length of the scrobe, shape of tibial apex, corbels and claws, position of sutures and ratio of length of abdominal ventrites) (R. Borovec, pers. comm.) are identical for all *Dinas* species. This is a reason why we assign the subgeneric rank to both groups recognized in this study.

Length of the scape and its ratio to the length of the funicle is sometimes used as a generic character (R. Borovec, pers. comm.). Species of *Microspina* subgen. nov. have a long scape, which overlaps the eyes distinctly more than in *Dinas* (s. str.) species. The length of the scape compared to the funicle, in *Microspina* subgen. nov. species, is identical (ratio =



Fig. 2. Differential diagnosis of the subgenera of *Dinas*: *Dinas* (*Microspina*) *afonsoi* sp. nov.: A – head, dorsal view; C – pronotum; G – elytra, dorsal view; *Dinas* (*Microspina*) *sitonaeformis* Wollaston, 1867: E – spina on profemora; *Dinas* (s. str.) *strakai* sp. nov.: B – variability of rostrum of *Dinas* (s. str.) *strakai* sp. nov., dorsal view; D – pronotum; F – spina on profemora; H – elytra, male, dorsal view.

Table 1. Differential diagnosis of the subgenera of *Dinas*.

<i>Microspina</i> subgen. nov.	<i>Dinas</i> s. str.
Body length 3.2–6.0 mm.	Body length 7.0–9.3 mm.
Epistome small but distinct, epistomial keel slightly developed, but visible.	Epistome large and distinct, epistomial keel distinctly developed.
Median longitudinal furrow on epifrons small but distinct, shallow and present only on part of epifrons; epifrons without transverse striae along the furrow (Fig. 2A).	Median longitudinal furrow on epifrons distinct, deep and well developed in the whole length of epifrons, reaching vertex and occiput; epifrons with transversal striae along the furrow in males (Fig. 2B).
Pronotum punctate, not tuberculate, showing at most traces of the median groove (Fig. 2C).	Large tubercles on whole pronotum, punctuation and median groove only slightly noticeable (Fig. 2D).
Spina on femora large and distinct (Fig. 2E).	Spina on femora small, but noticeable (slightly bigger than erect setae) (Fig. 2F).
Elytral striae distinct and well recognizable, deeply punctured (Fig. 2G).	Elytral striae small and only slightly noticeable, shallowly punctured (Fig. 2H).
Scales present on whole elytra (Fig. 2G).	Scales on elytra sparsely present: base, sides and apex of elytra with very few scales (Fig. 2H).

1; ratio of scape vs. funicle and club together = 1.5); whereas *Dinas* (s. str.) species have a longer funicle than scape length (ratio = 0.85; ratio of scape vs. funicle and club together = 1.2). This difference may possibly be explained by the different life styles of the adults. Adults of *Microspina* subgen. nov. were observed on shrubs eating flowers and pollen grains. On the contrary, *Dinas* (s. str.) species have so far only been found on the ground and under stones, which may explain their shortened antennae, characteristic of ground-living Entiminae. Whether members of *Dinas* (s. str.) are nocturnal or diurnal is not known, but diurnal activity of *Microspina* species is of note, because Laparocerini in the Macaronesian region are nocturnal (MACHADO & AGUIAR 2005) as are many other Entiminae (e.g. the majority of *Otiorrhynchus* Germar, 1822 species).

The *Microspina* subgen. nov. may be further subdivided into two subgroups. The characters defining these subgroups are as follows: *Microspina* species from the Northern Chain islands have narrow elytra, elongated in males and much wider and more oval in females, and their rostrum is concave in the middle on the sides. On the contrary, *Microspina* species from the Southern Chain islands have broadly ovate elytra which only slightly differ in shape between males and females, and they have the rostrum parallel-sided in the middle.

Dinas (Microspina) afonsoi sp. nov.

(Figs 2A, 2C, 2G, 3A–B, 3E–I, 7A–C)

Type locality. Cape Verde Isl., E of São Nicolau, Tope de Chuva, 16°36'6.05"N, 24°7'26.8"W.

Material examined. HOLOTYPE: ♂: 'ON FLOWERS OF / EUPHORBIA / TUCKEYANA // CAPE VERDE Isl. / SAO NICOLAU, E, Tope / de Chuva, 10.xi.2011, / 16°36'6.05"N, 24°7'26.8"W / J. Batelka & J. Straka lgt. [printed label]' (SMNS). PARATYPES: 22 ♂♂ 19 ♀♀, same as holotype (all SMNS; 2 ♂♂ 2 ♀♀ JSKC). Specimens of the newly described species are provided with one red printed label: 'Holotype [or Paratype] / *DINAS (MICROSPINA)* / *AFONSOI* sp. nov. / Jiří Skuhrovec & / Jan Batelka design. 2013'.

Description (Figs 2A, 2C, 2G, 3A–B). Body dark reddish, brown to black, antennae, tibiae and all tarsi light reddish to brownish. Head, rostrum and antennae with sparse pale very short erect setae. Club dark reddish with dense pale short adjacent setae. Head and rostrum except epistome with circular small whitish scales with feeble green or brown lustre.

Pronotal vestiture dark reddish, brown to black with pale very short erect setae (distinctly shorter than claws) and circular small whitish scales with feeble green or brown lustre. Elytral vestiture black (brown) covered with small circular to slightly oval scales. Scales present on whole elytra, sometimes varying in color (from white with feeble green or brown lustre to brown or black), highly variable and without any distinct pattern on whole elytra except the basal third of interval 1 and part of interval 2, where they are always dark or absent. Elytral intervals with pale, short, slightly erect setae (shorter than claws). Apical third of elytra with pale, stout, distinctly erect setae, which are distinctly longer than claws. Scutellum bald. Femora black with pale setae and circular small whitish scales with feeble green or brown lustre. Tibiae reddish to brownish with pale setae and circular small whitish scales. Tibiae bearing stout, yellowish bristles apically. Tarsi light reddish with pale setae. First three segments on all tarsi with sparse small projecting scales (“soles”). Claws reddish.

Abdomen black to brownish covered with circular whitish scales sometimes with feeble green lustre.

Head (Fig. 2A). Eyes elliptical to oval; distinctly convex; ventral apex narrower than dorsal. Narrowest vertex distance slightly narrower or as wide as width of rostrum base. Rostrum as wide as length (ratio = 0.95–1.05), enlarged anteriorly, tapered to medial part and then enlarged posteriorly. Epistome small, but distinct; epistomial keel slightly developed, but visible. Frons not separated from epifrons by any distinct carina, but only with almost unrecognizable protuberances. Epifrons narrowest in medial part; with median longitudinal shallow furrow along almost whole epifrons; area along shallow longitudinal furrow flat without any striae. Scrobes distinct and deep; in dorsal view visible for more than two third of length, well visible in whole length; in lateral view curved, enlarged posteriorly, dorsal border directed towards below eyes and not reaching them; ventral border directed below eyes; in front of antennal insertion broad, short and well visible. Occiput distinct, behind eyes almost unrecognizable shallow striae.

Antennae inserted one-third of rostrum from rostrum apex. Scape narrow and elongated (ratio to funicle = 1; ratio to funicle and club together = 1.5), distinctly extended behind posterior margin of eyes, slightly sinuous and abruptly widened apically. Funicle as long as scape; first funicle segment longer than second, funicle segments 1 and 2 twice as long as 3 and 4; 3 and 4 one and half as long as 5 to 7; 5 to 7 having approximately equal lengths and widths. Club elongated.

Pronotum (Fig. 2C) as wide as its length (ratio = 0.9–1.1), widest near middle; anterior margin nearly straight in dorsal view; sides slightly rounded; posterior margin showing equal width to anterior margin; basal constriction noticeable, lacking distinct protuberances, markedly bent, not flat and well visible from lateral and dorsal views; distinct punctures on whole surface, and slightly noticeable shallow furrow in middle.

Elytra (Fig. 2G) elongate and slightly oval, distinctly longer than wide (ratio = 1.35–1.75, see *Sexual dimorphism*) with base that slightly wider than widest part of pronotum, without

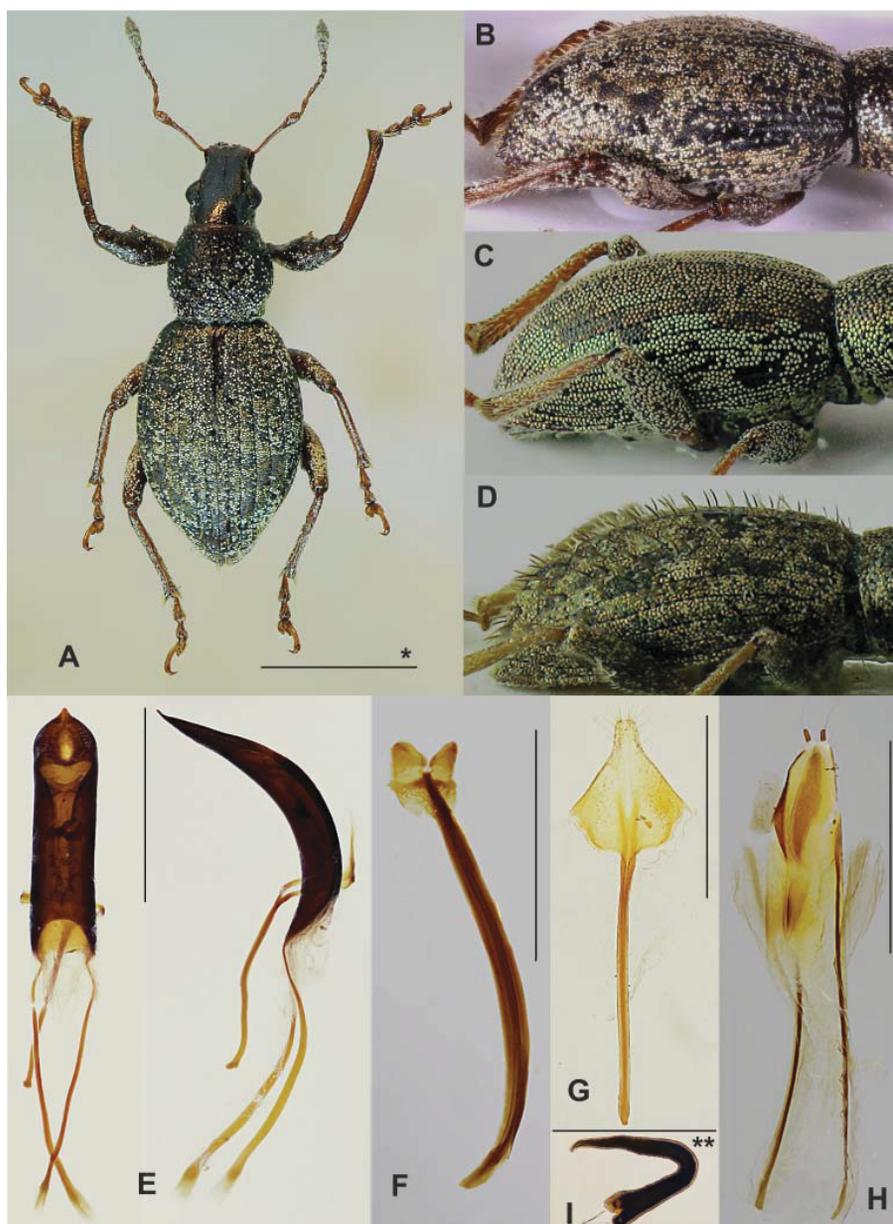


Fig. 3. *Dinas (Microspina) afonsoi* sp. nov., holotype, male (A–B, E–F), female (G–I): A – habitus, dorsal view; B – elytra, lateral view; C – elytra of *Dinas (Microspina) sitonaeformis* Wollaston, 1867, lateral view; D – elytra of *Dinas (Microspina) angusticeps* Roudier, 1957, lateral view; E – aedeagus, dorsal and lateral view; F – spiculum gastrale; G – female sternite VIII; H – ovipositor; I – spermatheca. Scales: 1 mm, scale with ‘*’=2 mm, scale with ‘**’=0.5 mm.

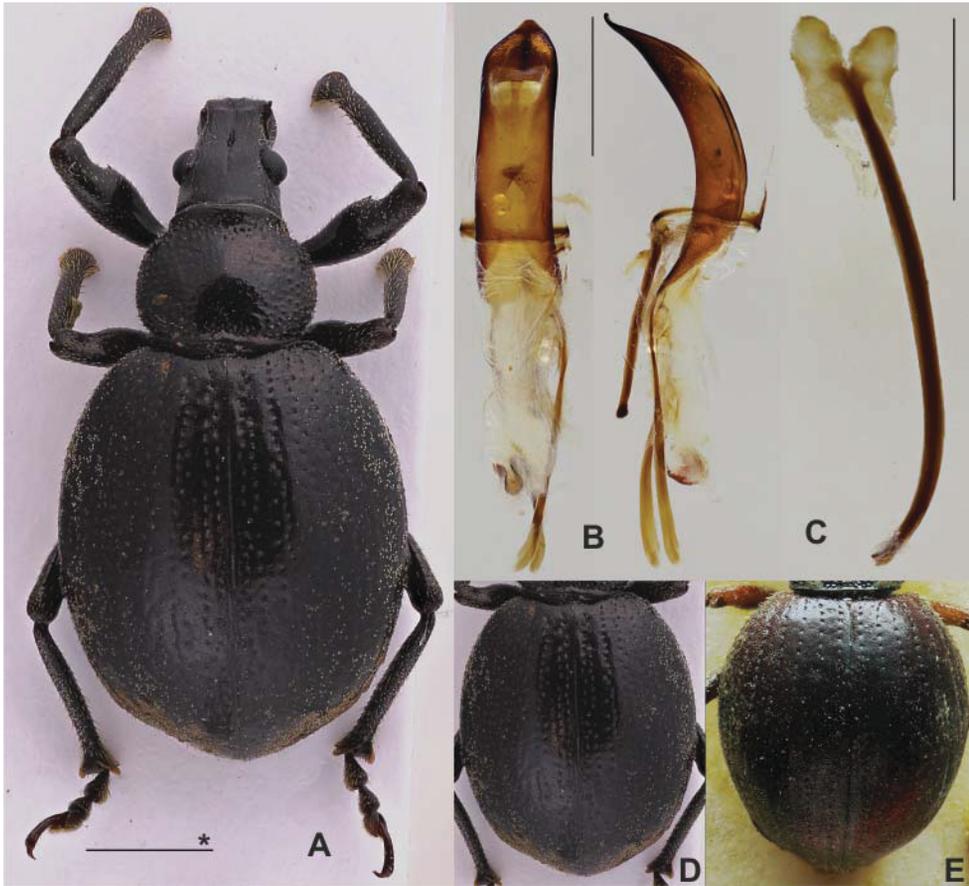


Fig. 4. *Dinas* (s. str.) *strakai* sp. nov., holotype, male (A–D): A – habitus, dorsal view; B – aedeagus, dorsal and lateral view; C – spiculum gastrale; D – elytra, dorsal view; E – elytra of *Dinas* (s. str.) *rugicollis* Wollaston, 1867, dorsal view. Scales: 1 mm, scale with ‘*’=2 mm.

humeral angle; convex sides. Elytral striae distinct and well recognizable; slightly deep punctures, striae in well distinct row. Elytral intervals slightly prominent, and slightly wider than striae.

Legs. All femora with distinct spina. All tibiae apically widened. Tarsi with first tarsal segment distinctly longer than second, third distinctly bilobed, fifth twice as long as first.

Abdomen. Suture between abdominal ventrites 1 and 2 slightly but distinctly sinuose and shallow; next sutures straight and deep. Abdominal ventrites 1–2 approximately of the same width, but twice the length of each abdominal ventrites 3 and 4.

Sexual dimorphism. Females are distinctly larger with more oval elytra ($\text{♀} = 1.35\text{--}1.55$) than males ($\text{♂} = 1.55\text{--}1.75$). Protibiae incurved in males and nearly straight in females. Abdominal ventrite 1 bears distinct depression in males but not in females. Last abdominal

ventrite with shallow medial impression in males. No differences in the ratios of rostral and pronotal lengths.

Male genitalia. Penis (Fig. 3E) in dorsal view gradually slightly narrowed from base to basal 1/4, then parallel-sided. Ventral plate distinctly and triangularly narrowed towards top. Apodeme of penis slightly longer than median lobe. Penis in lateral view strongly curved in basal third, then less strongly curved until subapically (Fig. 3E). Spiculum gastrale (Fig. 3F) stick-formed, curved and of subequal length as median lobe of penis.

Female genitalia. Apodeme of sternite VIII relatively long, lateral arms and plate starting near apical fifth of apodeme, in termination Y-shaped (Fig. 3G); plate short, not very well sclerotized and bearing a few short setae. Ovipositor long and slender, tapered apicad (Fig. 3H); styli long, cylindrical and well sclerotized, apex bears 3–5 erect setae. Spermatheca C-shaped with long and slender cornu; apex of cornu sharp; nodulus and ramus relatively short, ramus slightly wider and as long as nodulus (Fig. 3I).

Variation. *Dinas afonsoi* sp. nov. is variable in body length: 4.6–6.0 mm. Coloration of the scales on the pronotum and elytra vary mainly in luster (see Description). The elytral coloration varies as in other *Dinas* (*Microspina*) species, and could not be used for differential diagnosis. Erect setae on the apical third of the elytra also vary in their thickness, but are ever distinct.

Differential diagnosis. The species belongs to the subgenus *Microspina*. *Dinas afonsoi* sp. nov. has narrow and elongate elytra in the male, much wider and more oval elytra in the female; and the rostrum is distinctly narrowed in the middle (Fig. 2A), in which it differs from the *Microspina* species from the Southern Chain (Table 2). The body length is 4.6 to 6.0 mm (Fig. 3A) (in contrast to *D. obsita* Wollaston, 1867 and *D. angustula* Wollaston, 1867 which are smaller than 4.5 mm). *Dinas afonsoi* sp. nov. has stout, apically pointed, not flattened, long erect setae only on the apical third of the elytra (Fig. 3B) (in contrast to *D. sitonaeformis* and *D. pallipes* Roudier, 1957 which lack erect setae (Fig. 3C), and to *D. angusticeps* in which more stout, apically widened and flattened, long setae are present on the whole elytra (Fig. 3D)).

Etymology. The new species is named after Diogo Afonso, the Portuguese sailor and navigator, and discoverer of all islands belonging to the Northern Chain of the Cape Verde Islands.

Bionomics. *Dinas afonsoi* sp. nov., from Tope de Chuva, was collected exclusively on flowers of *Euphorbia tuckeyana* (species endemic to Cape Verde) (Figs 6, 7A–C). Specimens were observed eating flowers and pollen grains, so inflicted plant damage could be easily seen upon first inspection and presence of the beetles could be expected.

Distribution. Cape Verde Islands – São Nicolau (eastern part), circa 550–600 m a.s.l.

Dinas (*Microspina*) *angusticeps* Roudier, 1957

(Fig. 3D)

Type locality. Cape Verde Isl., W of São Nicolau, Mte Gordo.

Type material examined. HOLOTYPE: ♂, ‘Ins. Cabo Verde / Nicolau Mte Gordo / 9,15.12.1953 / Lindberg // 33 // TYPE // *Dinas* / *angusticeps* n. sp. / Harald Lindb. det. // C12 6634’ (FMNH). PARATYPES: 3 ♀♀ (FMNH), ‘Ins. Cabo Verde / Nicolau Mte Gordo / 9,15.12.1953 / Lindberg // TYPE // C12 6635-7’; 6 spec. (FMNH), ‘Ins. Cabo Verde / Nicolau Mte Gordo / 9,15.12.1953 / Lindberg // PARATYPE // <http://id.luomus.fi/> / HT.2040, 2042 / *Dinas* / *angusticeps* x / Roudier, 1957 / unknown det. // C13 501-502’; 3 spec. (FMNH), ‘Ins. Cabo Verde / Nicolau Mte Gordo / 9,15.12.1953 / Panelius // PARATYPE // <http://id.luomus.fi/> / HT. 2041 / *Dinas* / *angusticeps* x / Roudier, 1957 / unknown det. // C13 503’.

sumably attached later by the collection curators, and has no significance. Since the existence of other syntypes cannot be excluded, we designate one male as a lectotype to stabilize the nomenclature in the group.

Bionomics. *Dinas sitonaeformis* was collected by J. Batelka & J. Straka on flowers of *Periploca laevigata chevalieri* (a subspecies endemic to Cape Verde, Asclepiadaceae) (Figs. 7D–E) and also on flowers of *Euphorbia tuckeyana* (Euphorbiaceae). WOLLASTON (1867) reported that the type series was brushed off introduced *Malva parviflora* (Malvaceae).

Distribution. Cape Verde Islands – São Nicolau (western part). The type locality is not given in WOLLASTON (1867), he only mentioned altitude 2.000 feet (approx. 600 m). Material collected by H. Hölzel, W. Lobin & P. Ohm (see also GEISTHARDT 1982) and by J. Batelka & J. Straka proved that this species seems to occur in elevations between 600–1.000 m just around the massive of Monte Gordo.

Dinas (s. str.) *strakai* sp. nov.

(Figs 2B, 2D, 2F, 2H, 4A–D)

Type locality. Cape Verde Isl., E of São Nicolau, Tope de Chuva, 16°36'6.05"N, 24°7'26.8"W.

Type material examined. HOLOTYPE: ♂, 'CAPE VERDE Isl. / SAO NICOLAU, E, Tope / de Chuva, 10.xi.2011, / 16°36'6.05"N, 24°7'26.8"W / J. Batelka & J. Straka lgt. [printed label]' (SMNS). PARATYPES: 4 ♂♂, the same as holotype (SMNS, 1 ♂ JSKC). Specimens of the newly described species are provided with one red printed label: 'Holotype [or Paratype] / *DINAS* (s. str.) / *STRAKAI* sp. nov. / Jiří Skuhrovec & / Jan Batelka design. 2013'.

Additional material examined. 7 elytra, the same as holotype (6 SMNS, 1 JSKC). Specimens are provided with one white printed label: '*DINAS* (s. str.) / *STRAKAI* Skuhrovec & Batelka, 2013 / Jiří Skuhrovec & / Jan Batelka det. 2013'.

Description (Figs 2B, 2D, 2F, 2H, 4A). Body black, scape, distal part of tarsal segment III and last tarsal segment with claws reddish to brownish. Frons, whole rostrum and scape with sparse pale short erect setae. Coloration and presence of setae on the remaining antennal segments unknown, all studied specimens missed all antennal segments except scape.

Pronotal vestiture black with pale, short, slightly erect setae, which are distinctly shorter than claws; circular small whitish scales sometimes with feeble green lustre on upper margin, lateral sides and bottom of pronotum, dorsal surface of pronotum without scales. Elytral vestiture black, covered with small circular to slightly oval whitish scales with feeble green lustre. Scales present on following parts of elytra: from 4(5) interval to lateral sides along whole elytral length and apical third of 1–4(5) intervals; basal two third of elytra of 1–4(5) intervals very rarely with few scales, normally without scales. Elytral intervals and apex of elytra with pale, very short, slightly erect setae, which are distinctly shorter than claws. Scutellum bald. Femora black with pale setae and rarely small, oval whitish scales with feeble green lustre. Tibiae black with pale setae and distinct small, oval scales. Tibiae bearing stout, yellowish to slightly brownish bristles apically. Tarsi dark reddish to brown (black) with pale setae. First three segments on all tarsi with small projecting scales ("soles"). Claws reddish to brownish.

Black abdomen covered with whitish scales sometimes with feeble green lustre.

Head (Fig. 2B). Eyes elliptical, distinctly convex, ventral apex narrower than dorsal. Narrowest vertex distance distinctly shorter than base of rostrum. Rostrum slightly narrower than its length (ratio = 0.85–0.95) enlarged anteriorly, tapered to medial part and than enlarged

posteriad. Epistome large and distinct; epistomial keel distinctly well developed. Frons not separated from epifrons by any distinct carina, but with distinct protuberances. Epifrons enlarged from the medial part, strikingly anterior and also posterior; with distinct median longitudinal deep furrow in the whole length of epifrons, which reaches to vertex and also occiput, or only distinct deep pit in line with anterior margin of eyes; along median longitudinal deep furrow before eyes with a few transversal shallow striae (Fig. 2B). Scrobes distinct and deep; in dorsal view visible for more than two thirds of length; in lateral view curved, strikingly enlarged posterior, dorsal border directed towards ventral border of the eyes and almost reaching them, ventral border directed below eyes; in front of antennal insertion broad, short and well visible. Occiput distinct, behind eyes distinct shallow striae.

Antennae inserted in one-third of rostrum from rostrum apex. Scape (as long as rostrum) narrow and elongated, extended behind posterior margin of eyes, slightly bent and widened apically. Funicle and club unknown, all known specimens lacking it, ratio of scape and funicle is unknown.

Pronotum (Fig. 2D) more wide than long (ratio = 1.2–1.3) and widest near middle; anterior margin nearly straight in dorsal view; sides distinctly rounded; posterior margin showing equal width to anterior margin; basal constriction noticeable and lacking distinct protuberances, markedly bent, not flat and well visible from lateral and dorsal views; tubercles distinct on whole surface except middle part, where form flat angle V, in middle with slightly noticeable furrow.

Elytra (Fig. 2H). Slightly subglobose elytra that is longer than wide (ratio = 1.05–1.15) with base as wide as widest part of pronotum, without humeral angle; very slightly convex sides. Elytral striae small and only with shallow but distinct punctures, mainly along elytral suture, elytral striae closed to apex and elytral sides almost not recognizable. Elytral striae line in two not well distinct rows, striae in apical third in zig-zag arrangement, than in two parallel rows and sometimes still in zig-zag arrangement. Elytral intervals slightly prominent, but narrower than line of elytral striae.

Legs. All femora with small but distinct spina (Fig. 2F), distinctly widest near middle. All tibiae apically distinctly widened and incurved. Tarsi with first tarsal segment distinctly longer than second, third distinctly bilobed, fifth twice as long as first.

Abdomen. Abdominal ventrite 1 bearing distinct depression (typical character of males). Suture between abdominal ventrites 1 and 2 slightly but distinctly sinuose and shallow; next sutures straight and deep. Abdominal ventrites 1–2 approximately of same width, but twice the length of abdominal ventrites 3 and 4 each. Last abdominal ventrite with shallow impression medially.

Sexual dimorphism unknown because only male specimens has been reported.

Male genitalia. Penis (Fig. 4B) gradually slightly narrowed from base to basal 1/5 in dorsal view, then parallel-sided. Ventral plate distinctly and triangularly narrowed toward top. Apodeme of penis as long as median lobe. Penis in lateral view strongly curved in basal third, then less strongly curved until subapically. Spiculum gastrale (Fig. 4C) stick-formed, slightly curved and of subequal length with median lobe of penis.

Variation. *Dinas strakai* sp. nov. is extremely variable in body length: 7.2–9.3 mm. The median longitudinal furrow on epifrons also vary, especially in the length (it reaches to vertex

or up to occiput) and also in the number of striae along furrow (Fig. 2B). Shape of pronotum and elytra may slightly differ, mainly in specimens that are not completely sclerotised. No variability was observed in colouration or the structures of male genitalia. The majority of specimens is not in good condition, because all specimens were found dead under stones and we did not find any complete specimen.

Differential diagnosis. The new species is the second known species of the subgenus *Dinas* (s. str.), aside from the type species *D. rugicollis*. *Dinas strakai* sp. nov. differs from the latter species by elytral striae being divided at the elytral base (or slightly more posteriorly) in two arranged rows (Fig. 4D), while *D. rugicollis* has the elytral striae only in one row (Fig. 4E). Although only males of *D. strakai* are available, the state of this character has never been observed as a sexual dimorphism in weevils.

Comments. The length of the median longitudinal deep furrow and presence of striae along this furrow on the epifrons in *Dinas strakai* is variable, and we only know the character state for the male (females are unknown). In *D. rugicollis* the situation is opposite, because we know of only one female. Thus we cannot compare such variable characters as the median longitudinal furrow on the epifrons or the genitalia. The coloration is also useless because the type of *D. rugicollis* may be partially immature.

Etymology. The new species is named in honour of Jakub Straka (Czech specialist in Hymenoptera), one of the collectors.

Bionomics. *Dinas strakai* sp. nov. from Tope de Chuva was collected exclusively under stones close to the top of the rim of the old caldera.

Distribution. Cape Verde Islands – São Nicolau (eastern part), circa 600 m a.s.l.

Key to *Dinas* species of São Nicolau Island

1. Body length 7.2 to 9.3 mm (Fig. 4A). Epifrons with deep median longitudinal furrow in its whole length and reaching to the vertex or the occiput, and with transversal striae in males (Fig. 2B). Pronotum with large tubercles (Fig. 2D). Elytra subglobose; integument black covered sparsely with small circular scales (Fig. 2H). *Dinas* (s. str.) *strakai* sp. nov.
- Body length 3.6 to 6.0 mm (Fig. 3A). Epifrons with shallow median longitudinal furrow only in part of its length, and without any transversal striae in males (Fig. 2A). Pronotum punctate, not tuberculate (Fig. 2C). Elytra elongated and slightly oval; integument black (brown) covered densely with small circular to slightly oval scales (Fig. 2G). 2
2. Elytra without stout, long, erect setae (Fig. 3C). *Dinas* (*Microspina*) *sitonaeformis* Wollaston, 1867
- Elytra with distinct stout, long, erect setae at least in apical third of elytra (Figs 3B, 3D). 3
3. Stout, apically widened and flattened, long, erect setae on whole elytra (Fig. 3D). *Dinas* (*Microspina*) *angusticeps* Roudier, 1957
- Stout, apically pointed, not flattened, long, erect setae only on apical third of elytra (Fig. 3B). *Dinas* (*Microspina*) *afonsoi* sp. nov.

Biogeography of *Dinas*

Distribution of the genus. In addition to the taxonomic studies of the genus *Dinas*, only four papers with simple faunistic notes have been published. Few specimens of *D. angustula* were reported from Santo Antão by ALLUAUD (1936) and GEISTHARDT (1982), two short series of *D. elliptipennis* Wollaston, 1867 were reported from Fogo by FRANZ (1987) and GEISTHARDT (1982), and five specimens of *D. sitonaeformis* were recorded from São Nicolau by GEISTHARDT (1982). Much controversy was introduced to the distribution of *Dinas* by incorrect identifications by ALVES (1973). She published new records from Fogo, Maio and Santiago, but those from Santiago she incorrectly associated with *D. punctipennis* Roudier, 1957 and with *D. elliptipennis*, as was already pointed out by GEISTHARDT (1995). She also mistakenly proposed possible synonymy of *D. micans* and *D. viridisquamea* Roudier, 1957 (although with a question mark) with *D. elliptipennis*. Those apparent identification errors were, irrespective of the refusing statement in GEISTHARDT (1995), adopted by ARECHAVALETA et al. (2005). So far we know, all species of *Dinas* are single-island endemics (Table 2.) (Fig. 5A).

The Northern Chain is characterized by a higher number of single-island endemics per all islands (i.e. 2–4 per island), in comparison with those of the Southern Chain, where only one single-island endemic is known per each island (with the exception of Sal, where *Dinas*, like *Tarentola* Gray, 1825 (Vertebrata: Squamata), is absent because of a lack of suitable habitat

Table 2. A check-list of *Dinas* arranged by subgenera and geographic groups. The variety 'anomala' from ROUDIER (1957) is treated here as a subspecies in accordance with the article 45.6.4 of the Code (ICZN 1999).

Subgenus/Species	Island
<i>Dinas</i> Wollaston, 1867	
<i>D. rugicollis</i> Wollaston, 1867	São Vicente
<i>D. strakai</i> sp. nov.	São Nicolau (Former Eastern Island)
<i>Microspina</i> subgen. nov.	
Northern Chain lineage	
<i>D. afonsoi</i> sp. nov.	São Nicolau (Former Eastern Island)
<i>D. angusticeps</i> Roudier, 1957	São Nicolau (Former Western Island)
<i>D. angustula</i> Wollaston, 1867	Santo Antão
<i>D. angustula</i> ssp. <i>anomala</i> Roudier, 1957	Santo Antão
<i>D. obsita</i> Wollaston, 1867	São Vicente
<i>D. pallipes</i> Roudier, 1957	Santo Antão
<i>D. sitonaeformis</i> Wollaston, 1867	São Nicolau (Former Western Island)
Southern Chain lineage	
<i>D. elliptipennis</i> Wollaston, 1867	Fogo
<i>D. heckeli</i> Geisthardt, 1995	Boavista
<i>D. micans</i> Roudier, 1957	Santiago
<i>D. punctipennis</i> Roudier, 1957	Maio
<i>D. viridisquamea</i> Roudier, 1957	Brava

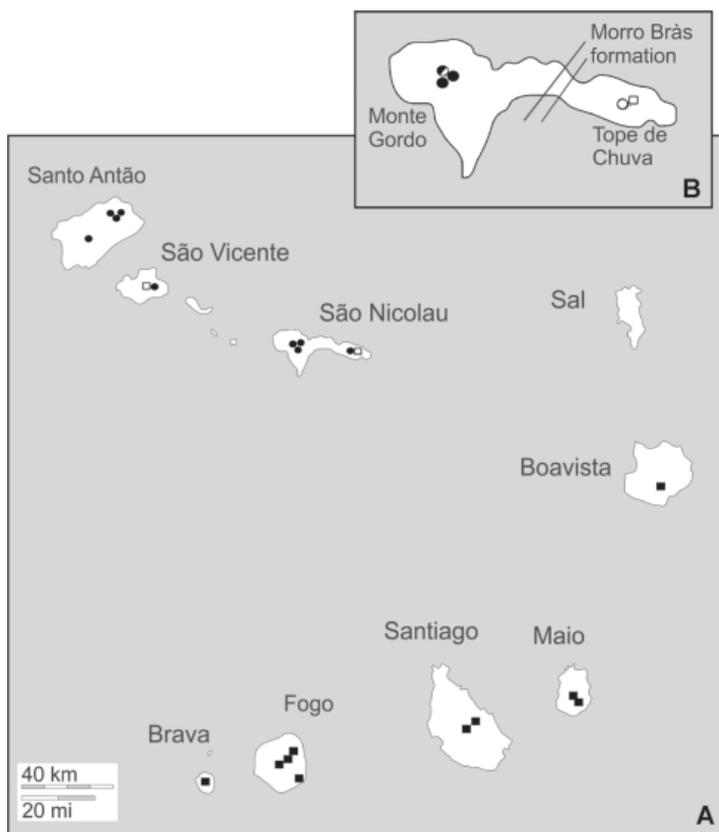


Fig. 5. The map of Cape Verde Islands: A – distribution of *Dinas* in the Cape Verde Islands: white square – *Dinas* (s. str.); black circle – northern lineage of *Dinas* (*Microspina*); and black square – southern lineage of *Dinas* (*Microspina*). B – distribution of *Dinas* in São Nicolau: white square – *Dinas* (s. str.) *strakai* sp. nov.; white circle – *Dinas* (*Microspina*) *afonsoi* sp. nov.; black and white circle – *Dinas* (*Microspina*) *angusticeps* Roudier, 1957; and black circle – *Dinas* (*Microspina*) *sitonaeformis* Wollaston, 1867.

(VASCONCELOS et al. 2010, 2012)). We can only speculate about the mode of dispersal of flightless *Dinas* between islands or island chains, but we have to consider that, for example, *Dracaena* trees were much more abundant before the arrival of the first human settlers and therefore there was a good chance for beetles to attach themselves to some drifting wood. Higher diversity of *Dinas* in islands of the Northern Chain may also be positively influenced by the short distance between São Nicolau and Desertas (about 17 km) and between São Vicente and Santo Antão (about 15 km). Connection of São Vicente with all three Desertas, which are separated from each other by ocean depths of less than 50 m (ARNOLD et al. 2008, CUNHA et al. 2008), is to be expected at least during the Pleistocene glacial periods Mindel (-75 m, 440.000–320.000), Riss (-100 m, 180.000–120.000) and Würm (-90 m, 70.000–10.000).

Distribution of *Dinas* (s. str.). Both species of the nominate subgenus *Dinas* are distributed exclusively on the islands of the Northern Chain (Fig. 5A). This might be a sampling artifact, but this is unlikely as this corresponds with biogeographic data available for some other native Cape Verde organisms. Three endemic and flightless genera of Opatrini (Coleoptera: Tenebrionidae) are also distributed exclusively either within the Northern Chain (*Trichopodus*, the unique record, given by ALVES (1973) with a question mark, from Santiago is apparently a misidentification), or within the Southern Chain (*Melanocoma* and *Platyprocnemis* Español & Lindberg, 1963) (ARECHAVALETA et al. 2005). Totally different species composition between the Northern and Southern Chain is also characteristic in the speciose radiation of the flightless tenebrionid genus *Oxycara* Solier, 1835 (occurrence of *O. compacta* (Motschulsky, 1845) in São Nicolau is a misinterpretation of a record given by GEISTHARDT (1982), who only compared his unidentified specimen from São Nicolau with *O. compacta* from Santiago) (ARECHAVALETA et al. 2005). Even some excellent bird fliers like the kestrel, *Falco tinnunculus* Linnaeus, 1758, have in Cape Verde two endemic subspecies distributed accordingly to these two geological units (HILLE et al. 2003). It is hypothesized that the barrier responsible for such a strong genetic difference between both island chains is the northeastern trade winds, which impede effective gene flow between populations (HILLE et al. 2003). In some terrestrial vertebrates these trade winds allow only unique ‘one way’ colonization events from the northerly situated islands towards the south (VASCONCELOS et al. 2010).

Distribution of *Dinas* in São Nicolau (Fig. 5B). *Dinas strakai* sp. nov. and *D. afonsoi* sp. nov. were collected from the locality belonging geologically to the Former Eastern Island of São Nicolau, while *D. sitonaeformis* and *D. angusticeps* are known only from localities situated on the area of the Former Western Island. This distributional pattern corresponds with the presence of two different species of *Tarentola* geckos in São Nicolau, where one is restricted to the western part of the island and one only lives easterly of the Morro Brás formation. Allopatric speciation of these two *Tarentola* species native to São Nicolau is expected (VASCONCELOS et al. 2010, 2012). It should in this case, however, be investigated if the presence of two species of *Microspina* subgen. nov. in the Former Western Island is a result of two independent colonization events or if the species evolved from a common ancestor in São Nicolau. A possibility also exist that one of the three São Nicolau species of *Microspina* subgen. nov. will be discovered on the opposite part of the island, and may reveal itself as a species evolved and spread in São Nicolau after unification of both former islands.

Biology of *Dinas*

Available data indicate that the biology of both *Dinas* subgenera are quite different. Since WOLLASTON (1867), members of the *Microspina* subgen. nov. were considered to be associated mainly with the stands of *Euphorbia tuckeyana* Steud., although the type series of *D. obsita* was collected on flowers of endemic *Tornabenea insularis* (Parl.) Parl. *Dinas sitonaeformis* was reported by WOLLASTON (1867) from *Malva parviflora* Linnaeus (an introduced species of Malvaceae; ARECHAVALETA et al. 2005) and *D. micans* Roudier, 1957 was collected on one occasion, in more specimens on the introduced *Cajanus cajan* (L.) Millsp. (Fabaceae) (specimens examined in SMNS). *Dinas afonsoi* sp. nov. from Tope de Chuva was collected



Fig. 6. Habitat of *Dinas* species: Summit of Tope de Chuva, São Nicolau – the type locality of *Dinas* (s. str.) *strakai* sp. nov. and *Dinas* (*Microspina*) *afonsoi* sp. nov.

exclusively on flowers of *Euphorbia tuckeyana* (Figs 6, 7A–C), while *D. sitonaeformis* from Chã de Caldeira was collected mainly from flowers of *Periploca laevigata chevalieri* (Browicz) G. Kunkel (Asclepiadaceae) (Figs 7A–B), but several specimens of this species were collected also on flowers of the nearby growing *Euphorbia tuckeyana*. Both *Euphorbia* and *Periploca* species are shrubs endemic to the archipelago – which are able to survive under a great variety of conditions (GOMES et al. 1999). Specimens of *D. afonsoi* sp. nov. and *D. sitonaeformis* were observed eating flowers and pollen grains of *Euphorbia*.

On the contrary, adults of the nominate subgenus apparently have a different biology. Both species of *Dinas* s. str. were found only under stones on the extreme summits of Monte Verde (São Vicente) (WOLLASTON 1867) and Tope de Chuva (São Nicolau). Both summits simultaneously represent the highest point of the particular island/former island. This similarity in the habitats of both species is most probably not coincidental. A similar type of distribution is found in the tenebrionid genus *Melanocoma*, which is assumed to be the most relictual tenebrionid beetle element in Cape Verde (GEISTHARDT 2003). Three species of this genus are restricted to the summits of three islands of the Southern Chain. It is supposed that all three species are surviving in these high-altitude places following a period of more humid climate, when they were also present in lower altitudes, and were able to spread to other islands

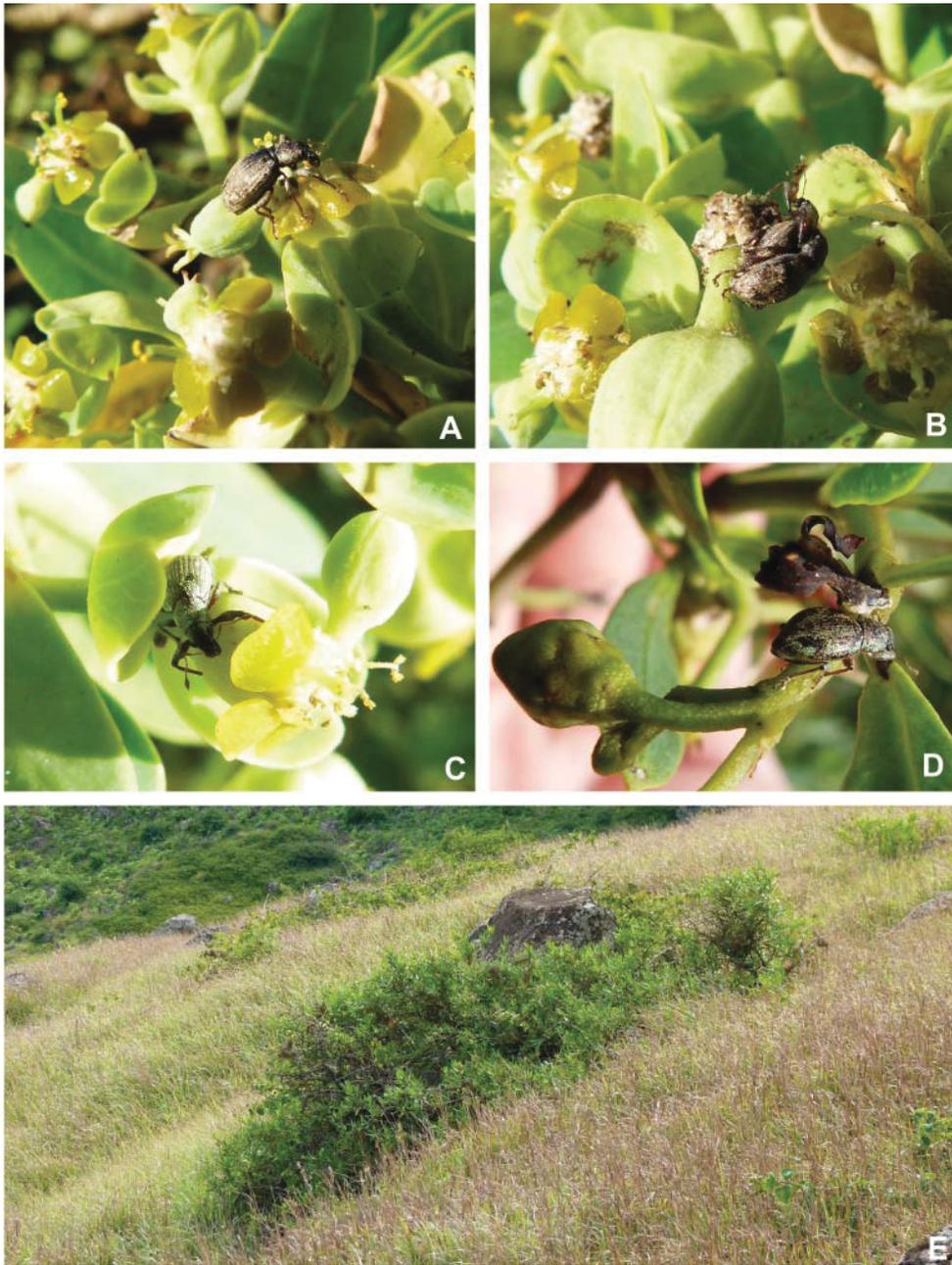


Fig. 7. Habitats and biology of *Dinas* species: A–C – *Dinas (Microspina) afonsoi* sp. nov. on flowers of *Euphorbia tuckeyana*; D – *Dinas sitonaeformis* Wollaston, 1867 on twig of *Periploca laevigata chevalieri* in Chã de Caldeira; E – grassy slopes of Chã de Caldeira, São Nicolau with scattered *Periploca laevigata chevalieri* – locality of *Dinas sitonaeformis*. (Photos by Jakub Straka).

of the archipelago (GEISTHARDT 2003). Adults of *Dinas* s. str. moreover correspond well to some ground-dwelling Entiminae (e.g., Trachyphloeini) in antennal morphology: the scape is shorter than the scrobe, and at the same time it is as long as or shorter than the funicle. This indicates that, unlike the species of *Microspina* subgen. nov., the species of *Dinas* s.str. do not visit the blossoms of flowering plants. Moreover, both species of *Dinas* s.str. were collected syntopically with species of *Microspina* subgen. nov. which also supports the idea of differentiation in habitat preference in these two subgenera.

Acknowledgements

The study of Jiří Skuhrovec was supported by a grant from the Ministry of Agriculture (Mze ČR) RO0414 and a grant from the Alexander von Humboldt Foundation. We thank Roman Borovec for his useful remarks and suggestions on generic characters of Entiminae. We are also obliged to all curators for the loan of *Dinas* specimens.

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