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Notes on the tiger beetles (Coleoptera: Cicindelidae) from the Galápagos Islands

(Studies of tiger beetles. CXCVIII.)

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Abstract

The Galápagos tiger beetle fauna is presently made up of three different species of *Cicindelidia* RIVALIER, 1954, including the recently arrived *C. trifasciata latioresignata* (MANDL, 1967). Based on examination of the inner sac of the aedeagus of several male specimens of *galapagoensis* W. HORN, 1920 collected at Marchena Island on March 1988 and *vonhageni* MUTCHLER, 1938 from Santa Cruz Is. and Floreana Is. collected by N. & J. Leleup in 1964-1965, as well as from Genovesa Is., it is confirmed that both species are different from each other, and, moreover, that both species belong to the genus *Cicindelidia*, contrary to the opinion of LEFFLER (2000) who ascribed them to *Habroscelimorpha* DOKHTOUROFF, 1883.

Key words: Galápagos Islands, Ecuador, *Cicindelidia galapagoensis*, *Cicindelidia vonhageni*, species discrimination.

Zusammenfassung

Die Sandlaufkäferfauna der Galápagos-Inseln besteht derzeit aus drei Arten der Gattung *Cicindelidia* RIVALIER, 1954, einschließlich des Neankömmlings *C. trifasciata latioresignata* (MANDL, 1967). Nach Untersuchungen am Aedeagus-Innensack mehrerer Männchen von *galapagoensis* W. HORN, 1920, gesammelt 1988 auf der Insel Marchena, sowie von *vonhageni* MUTCHLER, 1938, gesammelt 1964-1965 von N. & J. Leleup auf Santa Cruz und Floreana sowie von Genovesa, wird bestätigt, dass es sich um unterschiedliche Arten handelt. Außerdem gehören beide in die Gattung *Cicindelidia*, im Gegensatz zur Meinung von LEFFLER (2000), der sie in die Gattung *Habroscelimorpha* DOKHTOUROFF, 1883 stellt.

Riassunto

La fauna a Cicindele delle Isole Galápagos comprende oggi tre specie distinte di *Cicindelidia* RIVALIER, 1954, contando anche il recente arrivo di *C. trifasciata latioresignata* (MANDL, 1967). Sulla base dell'esame del sacco interno dell'edeago di diversi esemplari sia di *galapagoensis* W. HORN, 1920, raccolti a Marchena nel Marzo 1988, sia di *vonhageni* MUTCHLER, 1938 raccolti a Santa Cruz e Floreana nelle Isole Galápagos da N. e J. Leleup nel 1964-1965, come pure di Genovesa, viene confermato che si tratta di due specie distinte, e inoltre che entrambe appartengono, contrariamente all'opinione di LEFFLER (2000), che le aveva situate nel *Habroscelimorpha* DOKHTOUROFF, 1883, al genere *Cicindelidia*.

Introduction

The Galápagos Islands have long been thought to be the home of just one tiger beetle species (Cicindelidae), the endemic *Cicindela galapagoensis*, first mentioned by Walther HORN (1915) and formally described by him in 1920 (HORN 1920). This taxon is based on specimens collected in 1906 by F.X. Williams at Banks Bay, Albemarle Is. (= Isabela Is.) (WILLIAMS 1907, HORN 1926, 1936, 1938: pl. 84, fig. 9). MUTCHLER (1938) described a second species, *Cicindela vonhageni*, based on a small sample collected by H. von Hagen at Tortuga Bay, Santa Cruz Is. (MUTCHLER 1938, VAN DYKE 1953). Furthermore, *C. galapagoensis* ssp. *discolorata* was described by MANDL (1967a) from a single male specimen collected in 1963 at Genovesa I. [“östlichen Insel Tower”] (LINSLEY 1977). REICHARDT (1976), on the basis of two large samples collected in 1964–1965 by N. & J. Leleup on Santa Cruz Is. and Floreana Is., synonymized both forms under *C. galapagoensis*. He thought that *C. discolorata* completely overlaps with *C. vonhageni* (which is confirmed by my results) and that *vonhageni* is actually a *C. galapagoensis* form with fully testaceous elytra, falling within the range of *galapagoensis* (which does not agree with my results).

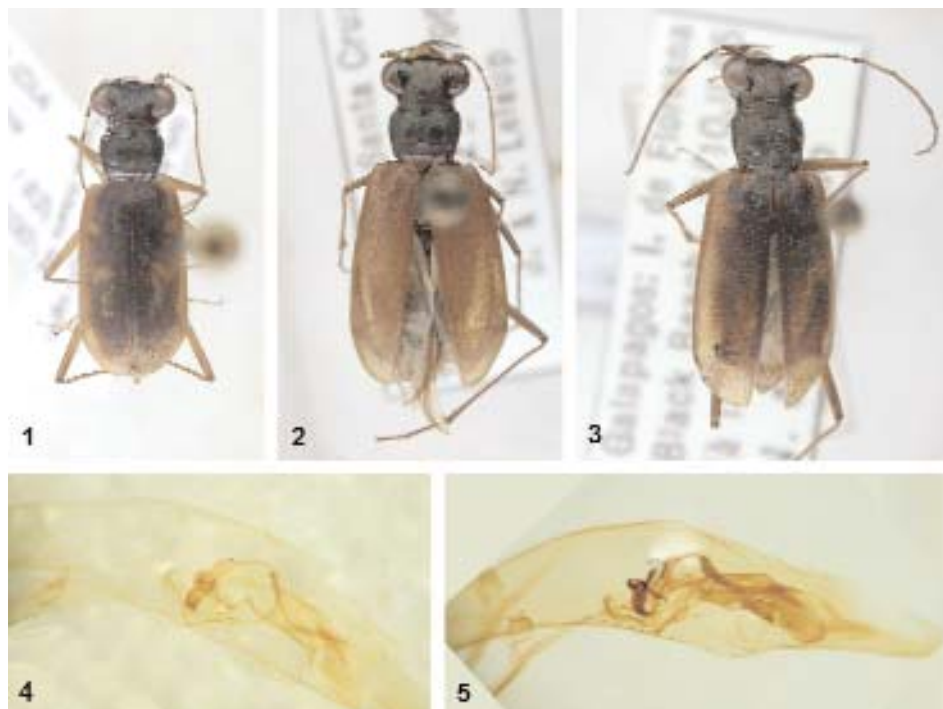
Collections

To date, Galápagos tiger beetles were collected on the following islands and sites: Isabela: Banks Bay (type locality of *Cicindela galapagoensis*): HORN (1920), DESENDER et al. (1989, 1990, 1999 pers. comm. to author); Tagus Cove or Playa Tortuga Negra: DESENDER et al. (1992a); Playa Bachas (North Coast): DESENDER et al. (1990). – Fernandina: Cabo Hammond: DESENDER et al. (1990, 1992a). – Punta Espinosa: Desender (pers. comm. to author). – Santa Cruz: Tortuga Bay (type locality of *Cicindela vonhageni*): MUTCHLER (1938), REICHARDT (1976), DESENDER et al. (1989); Academy Bay and Darwin Station: REICHARDT (1976), DESENDER et al. (1989, 1990); Playa Bachas (Northern Coast): DESENDER et al. (1990, 1992a). San Cristobal: Caleta Sapho, 1996: Desender (pers. comm. to author). – Genovesa: Bahia Darwin: MANDL (1967a), DESENDER et al. (1990, 1992a). – Marchena: Playa Negra: DESENDER et al. (1990, 1992a). – Floreana: Black Beach: REICHARDT (1976), DESENDER et al. (1989, 1992a). – Punta Cormoran: DESENDER et al. (1989, 1992a).

All records refer to night collecting at light-traps (CASSOLA et al. 2000). The larva of *galapagoensis* was described by CASSOLA & ALBELO-ROQUE (2003), based on both larval and adult specimens from Marchena Island.

Classification

The taxonomic classification of tiger beetles is still disputed. The old-fashioned, nearly cosmopolitan, biogeographically meaningless giant genus *Cicindela* LINNAEUS, 1758 [type-species: *Cicindela campestris* LINNAEUS, 1758, from the Palaearctic region] was split into many distinct genera long ago by RIVALIER (1950, 1954, 1957, 1961, 1963). That author ascribed most Mexican and Central American species to his genus *Cicindelidia* RIVALIER, 1954. REICHARDT (1976) demonstrated *galapagoensis* to be related to *Cicindelidia* because of the typical ear-like conformation of the inner sac of the male genitalia. In contrast, however, WIESNER (1992) placed both *galapagoensis* and *vonhageni* as two distinct species in the genus *Habroscelimorpha* DOKTOUROFF, 1883 [type-species: *H. dorsalis* (DEJEAN, 1826) from coastal eastern United States], between the Central American species *H. schwarzi* (W. HORN, 1923) and *H. boops* (DEJEAN, 1831). Association to this genus was recently maintained by PEARSON et al. (1999) and LEFFLER (2000).



Figs. 1 - 5: *Cicindelidia* species from Galápagos Islands: (1 - 3) habitus, (4, 5) aedeagus and inner sac. (1, 4) *C. galapagoensis*, specimen from Marchena I.; (2, 5) *C. vonhageni*, specimen from Santa Cruz I.; (3) *C. vonhageni*, specimen from Floreana I.

Species diversity and identity

DESENDER et al. (1992a, b) reported the recent arrival to Santa Cruz Island of one further tiger beetle species, *Cicindelidia trifasciata* (FABRICIUS, 1781), a common, widespread, mainly subcoastal American species, with several subspecies described within its large distributional range. Specimens were identified as *C. trifasciata* ssp. *latioresignata* MANDL, 1967 (probably coming from mainland Ecuador). *Cicindelidia trifasciata* was first collected in Galápagos in 1983, following an extreme El Niño event (DESENDER et al. 1992b). Apparently, it rapidly reached higher numbers than the concurring endemic species. As is often the case, the newcomer, despite its smaller size, was able to out-compete the endemic species. At Tortuga Bay lagoon, light trapping sessions in 1986 and 1991 showed “*galapagoensis*” to have progressively been reduced to almost insignificant proportions in a very short time span, relative to the ever expanding *C. trifasciata* population (DESENDER et al. 1992b). In 1996 and 1998, the Belgian team observed, respectively, three and four “*galapagoensis*”, and 28 and 30 *trifasciata* in the same area (Desender, pers. comm. to author). Two further daytime visits to the same site (16 and 18 April 2000; CAS-SOLA et al. 2000) failed to yield any *galapagoensis* at all, while *trifasciata* occurred in the area by the hundreds (may be even thousands). Meanwhile, on 5th April 2000 a night light trapping session (Desender, pers. comm. to author) yielded five “*galapagoensis*” (more

probably: *vonhageni*) specimens amongst an overwhelmingly large *trifasciata* population (780 individuals counted at traps and partly sampled).

Unlike Santa Cruz Is., where *C. trifasciata latioresignata* now appears to be well-established, thus possibly driving the endemic tiger beetle (*C. vonhageni*) to extinction (CASSOLA et al. 2000), Marchena Is., as most of the other islands of the archipelago, still appears to be *trifasciata*-free, and consequently the local *C. galapagoensis* population has safely maintained itself so far. Consequently, efforts should be made for preventing the establishment of *C. trifasciata* on Marchena and other islands. Moreover, both adult and larval specimens were thus correctly identified and described (CASSOLA & ALBELO-ROQUE 2003).

Quite recently, Alain Drumont of the Royal Belgian Institute of Natural Sciences (Bruxelles, Belgium) submitted to me the specimens collected by N. & J. Leleup at Floreana and Santa Cruz in 1964 and 1965, which enabled me to repeat REICHARDT's (1976) investigations. I was able to examine a total of 110 specimens from Santa Cruz I. [88 from Turtle (=Tortuga) Bay, seven from the south-eastern coast, and 15 from the Darwin Station], two from Genovesa I. (Fabio Cassola Collection = FCC) and 20 from Floreana I. (Black Beach), and to compare all these specimens with six specimens from Marchena I. (in FCC). All Santa Cruz and Floreana specimens, as well as the two specimens from Genovesa, were determined as belonging to *C. vonhageni*, while the six specimens from Marchena (in FCC) were *C. galapagoensis*. The specimens from Floreana, which were found on black sands, are darker. The two species are obviously distinct: *C. vonhageni* (12 - 14 mm) is much larger than *C. galapagoensis* (9.5 - 10 mm) (Fig. 1), is almost immaculate with yellowish elytra (Fig. 2), has a wide, nearly flat interocular area, and moreover has a more or less evident basal spot (Fig. 3) (all external features which in fact are strongly reminiscent of *Habroscelimorpha*). Moreover, *C. galapagoensis* has a more evident bump on the ventral side of the male aedeagus (Fig. 4), while the respective inner sacs are similar (Figs. 4, 5). *Cicindelidia vonhageni* was illustrated and consequently erroneously called "*Cicindelidia galapagoensis* (Mutchler) m. *vonhageni*" by CASSOLA et al. (2000: fig. 1).

LEFFLER (2000) reviewed the whole affair and quite correctly treated *galapagoensis* and *vonhageni* as two different species – as also stated by WIESNER (1992) and CASSOLA & ALBELO-ROQUE (2003). However, he again considered *discolorata* (erroneously called *decolorata*) as a valid subspecies of *galapagoensis*. In my opinion the Galápagos tiger beetle fauna is presently made up by three different species, including the recently arrived *Cicindelidia trifasciata latioresignata*. LEFFLER's (2000) placement of both *galapagoensis* and *vonhageni* in the genus (or subgenus, in his system) *Habroscelimorpha* is not acceptable.

As a matter of fact, LEFFLER (2000) did not examine the inner sac of the aedeagus. REICHARDT (1976) already correctly placed *galapagoensis* in *Cicindelidia* because of the very characteristic ear-like conformation of this structure. I examined several male specimens of both *galapagoensis* collected at Genovesa on March 1988, and *vonhageni* from Santa Cruz, Floreana and Genovesa. According to the inner-sac structures (Figs. 4, 5) both species proved to belong to *Cicindelidia*, despite some unusual characters especially of *vonhageni* (such as the large protruding eyes, the wide flattened vertex, the poorly micro-serrated elytra, the relatively long legs, and especially the presence (in *C. vonhageni*, unlike in *C. galapagoensis*) of a basal spot in the elytral markings. All these characters are in fact strongly reminiscent of *Habroscelimorpha*. Thus REICHARDT (1976) was perfectly correct in stating that *galapagoensis* – at the time thought to be the only Galápagos tiger beetle – is a *Cicindelidia*.

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