



An illustrated identification key to four different species of adult *Dinoderus* (Coleoptera: Bostrichidae), commonly attacking dried cassava chips in West Africa

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Abstract

Bostrichids of the genus *Dinoderus* are commonly found as pests of dried cassava chips in West Africa. An illustrated key facilitating the identification of the four most frequent African species, i.e. *D. bifoveolatus* (Wollaston), *D. minutus* (Fabricius), *D. porcellus* Lesne, and *D. oblongopunctatus* Lesne is presented. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: *Dinoderus bifoveolatus*; *D. minutus*; *D. porcellus*; *D. oblongopunctatus*; Bostrichidae; Stored products; Taxonomy

1. Introduction

Cassava (*Manihot esculenta* Crantz, Euphorbiaceae) constitutes one of the main staple foods in sub-Saharan Africa and is consumed in a variety of forms. In West Africa, cassava is mainly stored as dried sliced parts of the root, the so-called cassava chips. For instance, in Togo 120,000 to 150,000 t of cassava chips are produced annually (Adam, 1988), and most are stored. The bostrichids *Dinoderus* spp and *Prostephanus truncatus* (Horn) are important storage pests of cassava chips in tropical Africa (Nyakunga, 1982; Hodges et al., 1985). In Tanzania losses of 73% on fermented and of 52% on unfermented cassava chips were recorded after a

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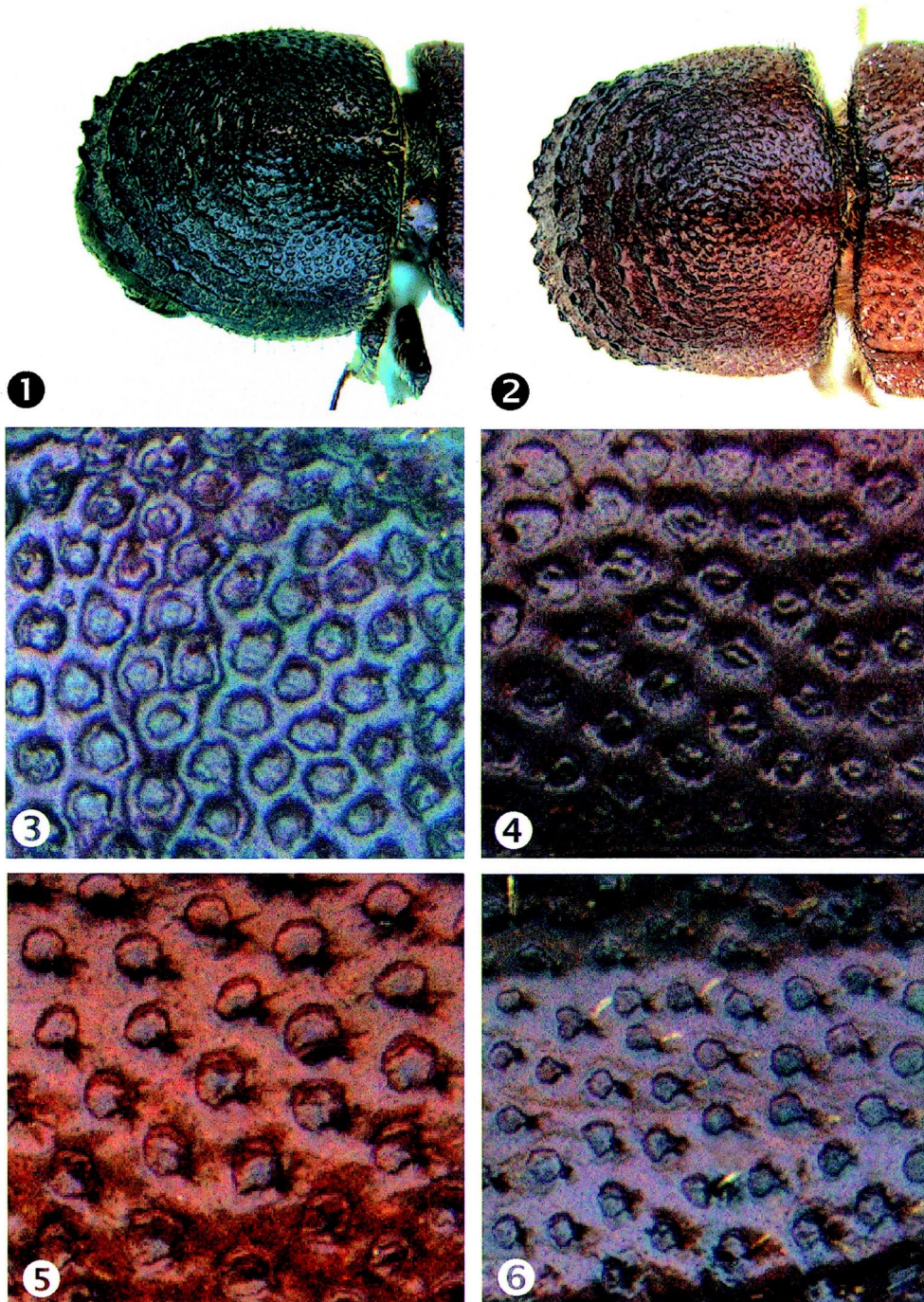
four-month storage period (Hodges et al., 1985). In Ghana, both *Dinoderus* spp and *P. truncatus* have been found attacking stored products on farms (Rees, 1991). However, due to the difficult taxonomy of *Dinoderus* spp, in most field studies no information is given at species level (e.g., Wright et al., 1993). Sampling of cassava chips at local markets in Cotonou, Republic of Benin, and the subsequent identification of the pest complex found, revealed that *Dinoderus* spp were predominant. Four different species were identified, namely *D. bifoveolatus* (Wollaston), *D. minutus* (Fabricius), *D. porcellus* Lesne, and *D. oblongopunctatus* Lesne (Schäfer, 1998). An illustrated identification key, which will enable field workers to distinguish these four *Dinoderus* spp in West Africa, is presented.

1.1. Genus *Dinoderus* Stephens, 1830

Diagnosis: short bodied species. Frons very short with fronto-clypeal suture indistinct. Second antennal segment shorter than 1st. Antenna with 9–11 segments; all known African species with 10 antennal segments. Last visible abdominal segment curved to receive the pygidium. Lateral margin of pronotum with a carina present becoming sometimes indistinct at the anterior corner. Anterior margin of pronotum with a row of teeth occasionally interrupted medially. Posterior surface of the pronotum punctured. Elytra lacking subapical carina. Foretarsus with fifth segment sub-equal in length to segments one to four together.

2. Key to common West African *Dinoderus* species

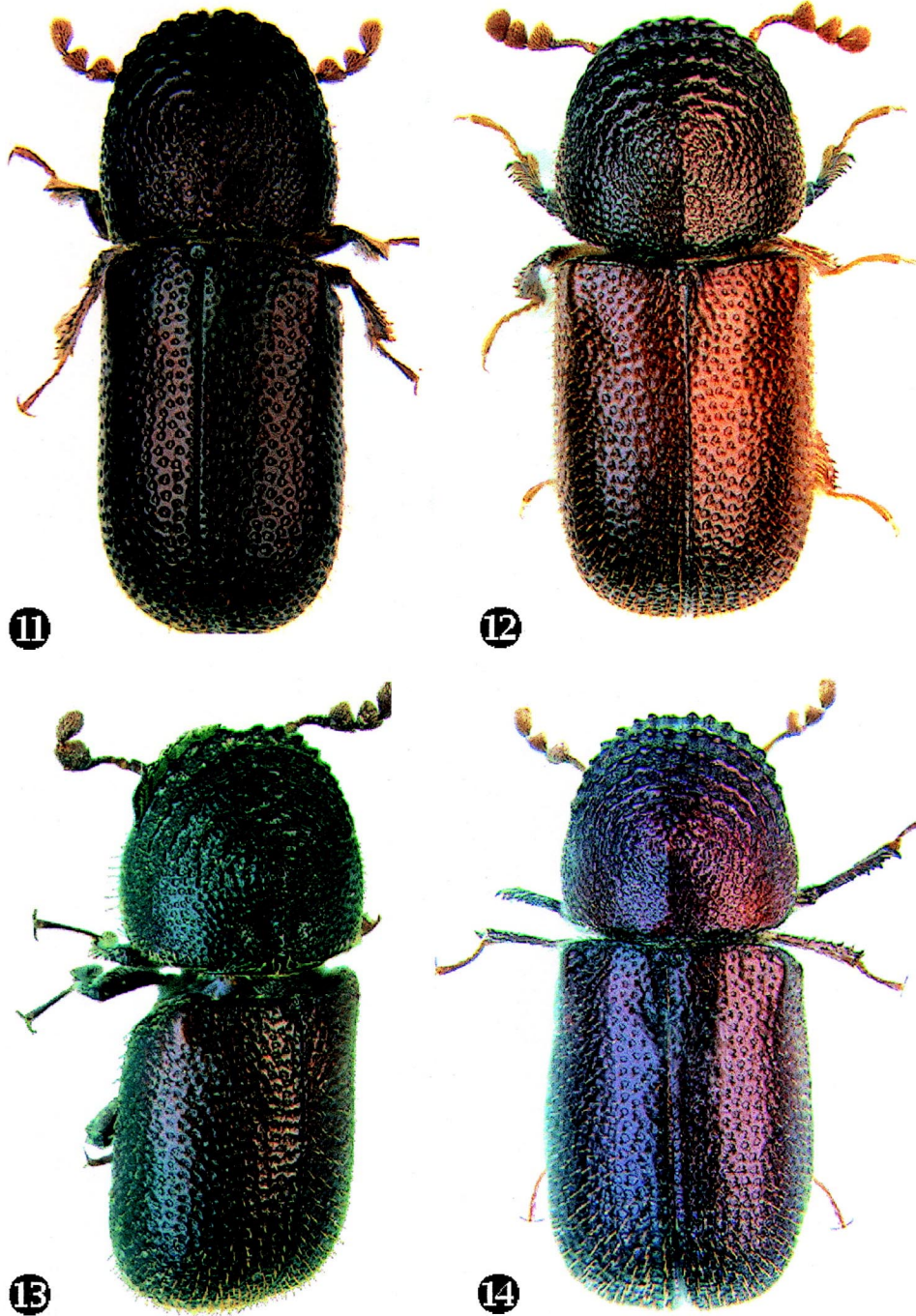
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|---|-------------------------|
| 1. Pronotum with an obvious pair of fovae (depressions) near base (Figs. 1, 11 and 13); elytra with or without ocellate punctures (see below) | 2 |
| — Pronotum without fovae (Figs. 2, 12 and 14); elytra without ocellate punctures | 3 |
| 2. Elytra, including apical declivity, with simple punctures (base flat) (Fig. 3); anterior part of elytra bare (Fig. 7); pronotum appearing longer (Fig. 11) (2–3.3 mm) | <i>bifoveolatus</i> |
| — Elytra with ocellate punctures (middle of base raised) (Fig. 4), particularly obvious on apical declivity; elytra pubescent throughout (Fig. 8) although pubescence may be missing in rubbed specimens; pronotum appearing shorter (Fig. 13) (2–3.7 mm) | <i>minutus</i> |
| 3. Pronotum with posterolateral carina reaching first row of marginal teeth (Fig. 9); dorsal puncturation of elytra consisting of large round punctures (Fig. 5) (2.7–3.5 mm) | <i>porcellus</i> |
| — Pronotum with posterolateral carina ending distinctly below first row of marginal teeth (Fig. 10); dorsal puncturation of elytra narrow and oblong (Fig. 6) (2.7–3.3 mm) | <i>oblongopunctatus</i> |



Figs. 1–6. 1, *D. minutus*, top view of the pronotum with shallow depressions; 2, *D. oblongopunctatus*; top view of the pronotum; puncturation of apical declivity; 3, *D. bifoveolatus*; 4, *D. minutus*; puncturation of elytra; 5, *D. porcellus*; 6, *D. oblongopunctatus*.



Figs. 7–10. 7, *D. bifoveolatus*, dorsal surface of elytra; 8, *D. porcellus*, dorsal surface of elytra; 9, *D. porcellus*, head lateral view with pronotal carina; 10, *D. oblongopunctatus*, head lateral view showing interrupted pronotal carina.



Figs. 11–14. 11, Habitus pictures: *D. bifoveolatus*; 12, Habitus pictures: *D. porcellus*; 13, Habitus pictures: *D. minutus*; 14, Habitus pictures: *D. oblongopunctatus*.

2.1. *Dinoderus bifoveolatus* (Wollaston) Figs. 3, 7, 11

Rhyzopertha bifoveolata Wollaston, 1858

Dinoderus perpunctatus Lesne, 1895

Dinoderus bifoveolatus (Wollaston): Lesne, 1897

Material examined: BENIN: Allada, IX. 1995, on dried teakwood, $n = 1$ G. Goergen; BENIN: Cotonou, IX. 1997, on cassava chips, $n = 65$, K. Schäfer; BENIN: Tchaourou, XI. 1997, on yam chips, $n = 1275$, P. Vernier; CAMEROON: Mengomo, II. 1997, on cassava chips, $n = 8$, G. Goergen.

2.2. *Dinoderus minutus* (Fabricius) Figs. 1, 4, 13

Apate minutus Fabricius, 1775

Dinoderus substriatus Stephens, 1830

Bostrichus vertens Walker, 1859

Rhyzopertha sicula Baudi, 1873

Dinoderus japonicus Matsumura, 1915

Dinoderus minutus (Fabricius): Lesne, 1897

Material examined: BENIN: Cotonou, IX. 1997, on cassava chips, $n = 6$, K. Schäfer; BENIN: Parakou, X. 1995, on dried yam, $n = 5$, P. Vernier; GHANA: Kpeve, X. 1994, on bamboo, $n = 16$, K. Acquaye; NIGERIA: Ibadan, I. 1997, stored maize, $n = 3$, B. R. Critchley, TOGO: Kloto forest, VII. 1995, on tree bark, $n = 1$, K. G. Goergen.

2.3. *Dinoderus oblongopunctatus* Lesne Figs. 2, 6, 10, 14

Dinoderus oblongopunctatus Lesne, 1923

Material examined: BENIN: Cotonou, X. 1997, on cassava chips, $n = 10$, K. Schäfer; BENIN: Cotonou, IX. 1995, on dried yam, P. Vernier; BENIN: Parakou, X. 1995, on dried yam, $n = 25$, P. Vernier.

2.4. *Dinoderus porcellus* Lesne Figs. 5, 8, 9, 12

Dinoderus porcellus Lesne, 1923

Material examined: BENIN: Cotonou, X. 1997, on cassava chips, $n = 509$, K. Schäfer; BENIN: Tchaourou, XI, 1997, on yam chips, $n = 1742$, P. Vernier; BENIN: Tchatchou, IV. 1994, on cassava chips, $n = 17$, S. Saizonou.

3. Discussion

The genus *Dinoderus* comprises, to date, 26 recognised species of which three are endemic to

tropical Africa (*D. oblongopunctatus*, *D. porcellus* and *D. gabonicus*) and two being of pan-tropical distribution (*D. minutus* and *D. bifoveolatus*) (Lesne, 1938; Vrydagh, 1955). Since the major taxonomic work of Lesne (1924) there has been one particularly useful study on *Dinoderus* by Vrydagh (1955). This is largely based on Lesne's contributions (1897, 1924) and includes a key to all presently known species with descriptive notes on them. The most recent study on tropical storage beetles by Delobel and Tran (1993) refers to Lesne's publications and those of Vrydagh in the chapter of Bostrichidae, and fully describes *D. minutus* and *D. bifoveolatus* but *D. oblongopunctatus* and *D. porcellus* are only briefly mentioned. Other keys such as the ones by Beiriger and Sites (1996), Spilman (1982) or Fisher (1950) cover mainly the North American bostrichid fauna. Since the Spilman (1982) and Fisher (1950) keys also include most species found in imported commodities, they are, with some limitations, also useful for the identification of species commonly occurring on stored products in tropical Africa. The key presented here includes all known African species with the exception of *D. gabonicus*, which has a distribution area limited to southern Gabon. The characters utilised here refer to those used by Lesne, Vrydagh and the authors mentioned above. The common occurrence of four bostrichid species in the market of Cotonou is possibly due to the confluence of a large array of commodities and woody material that are often conveyed from long distances within the whole sub-region. The authors hope that the present key will greatly facilitate the identification of *Dinoderus* spp, and will help field workers, for instance during surveys, to collect more detailed information on the pest fauna of cassava stores and of other commodities (Osuji, 1980) in West Africa.

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