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# Description of larvae of the tiger beetle genera *Lophyra*, *Habrodera* and *Neolaphyra* (Coleoptera: Cicindelidae) from Africa

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**Coleoptera, Cicindelidae, larvae, descriptions, key, Africa**

**Abstract.** Larvae of 4 species of *Lophyra*, 2 species of *Habrodera* and one species of *Neolaphyra* are described. A key to the determination of 2nd and 3rd instars of known larvae of the genus *Lophyra* is given, and morphological details are discussed in comparison with other *Cicindela* (sensu auctorum) groups. Larval morphological characters of *Cicindela* (s. auct.) are variable and often overlapping in different groups. However, it is possible to distinguish the taxa mentioned, which are regarded as separate genera in recent taxonomical concepts.

## INTRODUCTION

Descriptions of larval morphology of Cicindelini of the Palaearctic and Nearctic Regions have been published (van Emden, 1943; Hamilton, 1925; Knisley & Pearson, 1984; Putchkov, 1990, 1991, 1993; Putchkov & Cassola, 1994), but little is known about larvae from Africa and other tropical and subtropical regions of the world (Serrano 1985, 1987; Zikan, 1929).

The aim of this paper is to describe the larvae of 3 genera hitherto unknown in larval stage, apart from a description of *Lophyra flexuosa* (F.) in the thesis of Serrano (1990). Two of these genera are widespread in Africa; the 6 species of the genus *Habrodera* Motschulsky and 44 of the 61 known species of *Lophyra* Motschulsky occur in Africa south of the Sahara, one *Lophyra* species (*L. flexuosa*) in North Africa. The genus *Neolaphyra* Bedel, with 4 species, is restricted to North Africa (Wiesner, 1992).

The description of the larvae of these groups not only increases our knowledge of cicindelid larval morphology, but also can be used to test the validity of some taxonomical concepts proposed by Rivalier (1971). Therefore, a short discussion about the character states is given beside the description and key to the larvae.

## MATERIAL AND METHODS

The description is based on larvae collected by the senior author during several trips to Africa. Only larvae for which there is little doubt about their determination were used for the description. In most cases only one species could be found in the habitat (*Lophyra flexuosa, L. neglecta, L. brevicollis*) or the syntopic species were so different in size that the identification of these larvae was facilitated (*Habrodera nilotica*). The syntopic species *Habrodera capensis* and *Lophyra candida* were seperated through generic characters. The larvae were killed in boiling water and preserved in 70% ethanol. Some speciemens were cleared in KOH and transferred to glycerin before the examination. Larvae of 18 other genera of Cicindelidae were studied in comparison. All larvae are deposited in the collections of the authors.

Nomenclature follows Rivalier (1971), terms of morphology and chaetotaxy follow Knisley & Pearson (1984) and Putchkov & Cassola (1994), except that the term "coronal suture" is used instead of "epicranial suture". The following terms require explanation:

- elevations of pronotum: relief-like structures of the disc of pronotum;
- type I hypopleuron: hypopleuron consisting of several small sclerites;
- type II hypopleuron: hypopleuron consisting of a single, large sclerite.

Abbreviations: FW – width of frontal area between antennae, HW – head width, PNL – length of pronotum, PNW – width of pronotum.

Measurements are in mm, data in parenthesis are averages.

## Genus *Lophyra* Motschulsky, 1859

### *Lophyra flexuosa* (F., 1787)

Instar III

Measurements: HW – 2.88–3.22 (2.96); FW – 1.74–1.98 (1.84); PNW – 2.81–3.14 (2.89); PNL – 1.59–1.79 (1.68) (n = 10).

Colouration. Head dark brown to black-brown, with a bright copper bronze lustre, in part with blue-green shade; antennae brown with bronze or green lustre apically, light brown basally; mandibles brown to black apically; rest of appendages light brown to brown apically; pronotum dark brown with copper bronze lustre, in part with blue-green shade; mesothorax and legs except trochanters brown, tergites and hooks of hump light brown, rest of abdominal sclerites yellow brown; setae of head and pronotum white, those of abdomen red.

Head. Most setae long and thin; U-shaped ridge with 2 setae; coronal suture very short; antennomere I with 6–7 setae, antennomere II with 8–10 setae; stipes not longer than galea; length of maxillary palpus equal to that of galea.

Pronotum. Setae thin, on disc and anterior area of pronotum in part bifurcate (Fig. 1); cephalolateral angles relatively small, directed forward, but do not rise above the slightly prominent anterior margin of pronotum; pronotum with 35–45 setae on each half, beside median suture with 8–16 setae, in the area of cephalolateral angles with 5–6 setae.

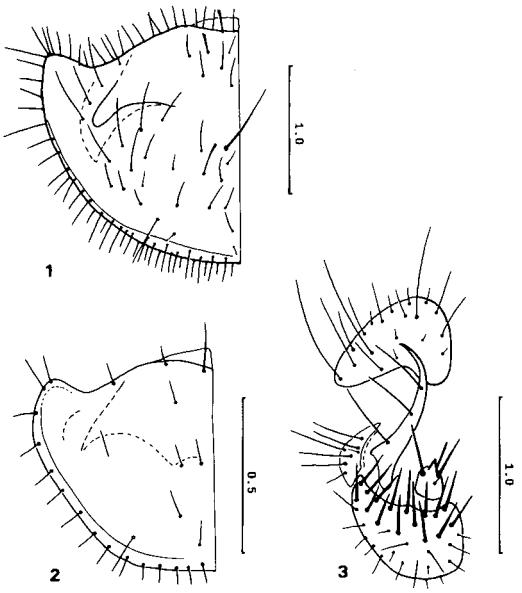
Abdomen. Sclerotized areas slightly distinct; tergite III with 16–22 setae; type I hypopleuron; tergites of abdominal segment V (Fig. 3) large but well separated; caudal tergite with 26–38 stout setae; caudolateral tergite with 7–8 long setae; median hook with 2–4 setae; top of median hook reaching the middle of distal tergite V; total length of median hook more than 3.5 times that of inner hook, inner hook with 3–4 long setae and 0–3 additional thin setae on anterior side; central spine very distinct, 2.5–3 times shorter than lateral setae; sternite IX with 2 groups of 3 long setae on caudal margin; apical margin of pygopod with 20–23 setae.

Instar II

Measurements: HW – 1.71–1.97 (1.87); FW – 1.10–1.20 (1.17); PNW – 1.63–1.90 (1.76); PNL – 1.05–2.20 (1.13) (n = 10).

Head. Antennomere I with 5 setae; antennomere II with 7 setae.

Pronotum. Cephalolateral angles small, shorter than prominent anterior margin of pronotum; pronotum with 30–35 setae on each half, along median suture with 10–12 setae.




Figs 1–3. *Lophyra flexuosa* (F.): 1 – pronotum half, $L_3$; 2 – $L_1$, 3 – half of abdominal tergite V with hooks, $L_3$.

Abdomen. Tergite III with 11–13 setae; caudal part of tergite V with 20–24 setae, caudolateral part with 3–4 setae; median hook with 2 setae, slightly displaced; total length of median hook 3–3.5 times that of inner hook; inner hook with 3 lateral setae; central spine very strong and only 2–2.5 times shorter than lateral setae; apical margin of pygopod with 19–21 setae.

Instar I

Measurements: HW – 1.13–1.23 (1.20); FW – 0.75–0.79 (0.76); PNW – 1.18–1.23 (1.21); PNL – 0.57–0.65 (0.63) (n = 3).

Colouration. Head, antennae and pronotum dark brown to black-brown with green-bronze lustre; rest of appendages light brown to brown apically; upper setae on antennomere II black.

Head. Antennomere I without setae, antennomere II with 2 setae; frontal suture very rounded in caudal part.

Pronotum. Cephalolateral angles very small; pronotum with 7 setae on each side (Fig. 2).

Abdomen. Tergite III with 3 setae; caudal part of tergite V without setae, caudolateral part with 1 seta, distal part with 3 setae, median hook with 1 seta, curved in apical half, central spine very strong, at most 1.5 times shorter than lateral setae of inner hook; pygopod with 10 setae apically and 6 setae dorsally.

MATERIAL EXAMINED: $3L_1$, $8L_2$, $14L_3$ Morocco-SW, 5 km S Essaouira, October/November 1990; $7L_3$ Morocco, Haut Atlas, Asni, October 1990; $9L_2$, $8L_3$ Tunisia, Hammamet, November 1991.

Ecology. Adults and larvae of *L. flexuosa* were captured in different habitats, from coastal dunes to gravel banks along rivers, in the Haut Atlas (Morocco).

*Lophyra neglecta* (Dejean, 1825)

Instar III

Measurements: HW – 2.39–2.77 (2.64); FW – 1.59–1.75 (1.67); PNW – 2.17–2.55 (2.40); PNL – 1.37–1.56 (1.47) (n = 5).

Colouration. Head dark brown to black with bright bronze lustre, dorsally, and brown to light brown in caudal part, ventrally; antennae light brown and with or without very light lustre; mandibles brown to black-brown distally; rest of the appendages light brown; pronotum brown to light brown, cephalolateral angles lighter with bronze lustre, in part with blue-green shade; rest of thoracic segments and legs light brown; tergites and hooks of segment V light brown; setae of head and pronotum white, those of thorax and abdomen red.

Head. Setae thin, most of them long; U-shaped ridge with 2 setae; antennomere I with 7–8 setae, antennomere II with 11–12 setae; length of stipes equal to that of galea; maxillary palpus not shorter than galea.

Pronotum. Setae of different length, but thin, some setae slightly bifurcate; ridges of cephalolateral angles and elevations distinct, the former widened, but do not rise above the anterior margin of pronotum, with 4–5 setae; 40–50 setae on each side of pronotum, and 10–14 setae along median suture (Fig. 4).

Abdomen. Abdominal sclerites slightly sclerotized; tergite III with 5 long and 5–9 shorter setae; type I hypopleuron; tergites of segment V well separated; caudal part of tergite V with 16–20 stout setae, caudolateral part with 6–8 setae; median hook slightly widened basally, with 3 long setae directed outwards, but most apical seta slightly displaced; total length of median hook about 2.5–3 times that of inner hook, the latter with 4–5 long setae around the large central spine; central spine about 0.33–0.4 times as long as lateral setae of inner hook; sternite IX with 2 groups of 3 long setae; apical margin of pygopod with 16–20 setae, dorsal and ventral part multisetose.

MATERIAL EXAMINED: $5L_3$ Central Africa, Burundi-W., Rusizi-Delta, February/March 1992.

Ecology. Larvae and adults of *Lophyra neglecta* were captured along roads and on sandy fields in waste land and savanna near Lake Tanganyika. Vegetation was very sparse or lacking near the larval holes.

*Lophyra brevicollis* (Wiedemann, 1823)

Instar III

Measurements: HW – 2.60–2.85 (2.74); FW – 1.60–1.86 (1.70); PNW – 2.43–2.68 (2.56); PNL – 1.41–1.63 (1.56) (n = 4).

Colouration. Head, antennae and pronotum dark brown to black-brown with bronze lustre and some portions with slight green-red shade; mandibles light brown to black-brown apically; rest of appendages yellow-brown to brown apically; ventral side of head light brown; mesothorax and legs brown; sclerites of hooks yellow-brown; setae of head and pronotum white, those of abdomen reddish.

Head. Setae thin and long; U-shape ridge with 2 setae; antennomere I with 7–10 setae, antennomere II with 10–12 setae; stipes slightly longer than galea; maxillary palpus not shorter than galea.

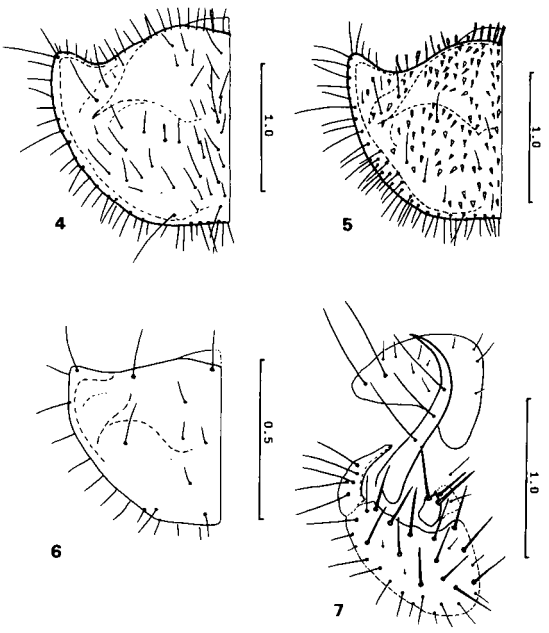



Fig. 4. *Lophyra neglecta* (Dejean), pronotum half, $L_3$.

Figs 5–7. *Habrodera nilotica* (Dejean). 5 – pronotum half, $L_3$, 6 – $L_1$, 7 – half of abdominal tergite V with hooks, $L_3$.

Pronotum. Setae of different length, thin, some setae bifurcate, especially on anterior margin and near the median suture; surface of pronotum with granular microsculpture; ridges of cephalolateral angles and elevations distinct, the former directed slightly laterally, slightly shorter than prominent anterior margin; pronotum with about 70 setae on each side, 15–18 setae along median suture, cephalolateral angles with 10–12 setae.

Abdomen. Abdominal sclerites slightly sclerotized; setae on first two tergites very long; tergite III with 13–15 setae; type I hypopleuron; tergites of abdominal segment V large and separated; caudal part of tergite V with 17–20 stout setae, caudolateral part with 5–7 long setae; median hook with 2–3 setae, apical seta slightly displaced upwards; median hook slender, slightly widened only basally, with top nearly reaching middle of distal part of tergite V; length of median hook 4 times that of inner hook, the latter with 3(4) long lateral setae; central spine of inner hook distinct, 0.33 times as long as lateral setae; sternite IX with 2 groups of 3 setae; apical margin of pygopod with 18–20 setae.

Instar II

Measurements: HW – 1.80–1.94 (1.84); FW – 1.10–1.19 (1.13); PNW – 1.63–1.73 (1.68); PNL – 0.95–1.03 (0.98) (n = 10).

Head. Antennomere I with 4–5 setae, antennomere II with 7 setae.

Pronotum. Surface with fine granular microsculpture; pronotum with 40–45 setae on each side, 12–14 setae beside median suture, cephalolateral angles with 5–6 setae.

Abdomen. Setae on the first 3 tergites long; tergite III with 12–14 setae; caudal part of abdominal tergite V with 16–18 stout setae, caudolateral part with 3–4 setae; median hook with 2 slightly displaced setae; median hook 2.5–3 times longer than inner hook; central spine of inner hook long, 0.33–0.40 times as long as lateral setae; apical margin of pygopod with 16–19 setae.

Instar I

Measurements: HW – 1.24; FW – 0.86; PNW – 1.16; PNL – 0.80 (n = 1).

Colouration. Sclerites of abdomen very light grey; tergite V and hooks light brown; setae of head, pronotum and antennomere II lucid white, those of thorax and abdomen with red tinge.

Head. Antennomere I without, antennomere II with 2 setae; coronal suture absent.

Pronotum. Anterior margin slightly prominent and almost even; cephalolateral angles slightly prominent; ridges on cephalolateral angles and elevations distinct; pronotum with 7 setae on each side; 2 setae on anterior margin very long and reaching frontal suture of head.

Abdomen. Tergite III with 3 setae; caudal part of tergite V without setae, caudolateral part with 1 seta, anterior part with 4 setae; median hook widened basally, considerably curved and thinner in apical half, with 1 seta; inner hook with 2 long setae slightly displaced laterally; central spine large, 0.5 times as long as lateral setae of inner hook; pygopod with 10 setae apically, 8 dorsally and without setae ventrally.

MATERIAL EXAMINED: $1L_1$, $10L_2$, $4L_3$, South Africa, Cape Prov., Cedarberg, April 1993.

Ecology. Larvae and adults of *L. brevicollis* were collected on sandy banks of a dry river in the mountains. Though larval holes were only found on sites lacking vegetation, shrubs and *Phragmites* in the vicinity prevent strong insolation in these localities.

*Lophyra candida* (Dejean, 1825)

Instar II

Measurements: HW – 2.16; FW – 1.33; PNW – 2.01; PNL – 1.98 (n = 1).

Colouration. Head and pronotum dark brown with copper bronze lustre; antennae brown; rest of appendages light brown to brown, mandibles black-brown apically; nota and legs brown dorsally; sclerites of abdomen and hooks yellow-brown; setae of head and pronotum white or very slightly red, those of abdomen with red tinge.

Head. Setae long and thin; U-shaped ridge distinct with 2 short setae; frontal suture wide in caudal part; coronal suture very short; antennomere I with 5, antennomere II with 7 setae; stipes slightly longer, but maxillary palpus slightly shorter than galea; labial palpomere I with 6 setae.

Pronotum. Setae long, some setae slightly bifurcated anteriorly; surface with small granular microsculpture; cephalolateral angles relatively small, not reaching the prominent anterior margin of pronotum; ridges of cephalolateral angles and elevations distinct; pronotum with 30–40 setae on each side, 8–10 setae beside median suture, with 4–5 setae in cephaloanterior angles.

Abdomen. Abdominal sclerites slightly sclerotized; tergite III with 11–13 setae; type II hypopleuron; caudal part of tergite V with 16–18 stout setae, caudolateral part with 2–3 setae; parts of tergite V well separated; median hook with 2 slightly displaced setae, hook curved, long and reaching the anterior margin of anterior part of tergite V; median hook 3.5–4 times longer than inner hook, the latter with 2 stout lateral setae and 2–3 thinner setae on anterior side; central spine large, 0.33–40 times as long as lateral setae; sternite IX with 2 groups of 3 long setae on caudal part; apical margin of pygopod with 21 setae.

MATERIAL EXAMINED: $1L_2$, South Africa, Cape Prov., Nature's Valley, March 1993.

Ecology. Adults and larvae of *L. candida* were collected among white sand dunes along the coast. The larval holes were found on moist sand near a small brackish lagoon.

## Discussion

Known larvae of the genus *Lophyra* are relatively similar to some other species of *Cicindela* (s. auct.), e.g. *C. hybrida* L., *C. restricta* (F.), and *Lophyridia sturmi* (Ménetriés). However, larvae of 2nd and 3rd instars of *Lophyra* may be distinguished from other taxa by the following character states: (i) numerous setae on pronotum, some of these slightly flattened and bifurcate, (ii) 3–6 long setae on the inner hook laterally, and (iii) slightly distinct sclerotized areas of abdomen. Furthermore, the number of stout setae on the caudal part of tergite V and on the top of pygopod as well as the specific colour of the head and pronotum are also distinctive. The determination of first instar larvae is difficult due to the paucity of comparative materials for *Cicindela* (s. auct.). Known larvae of *Lophyra* species are structurally very similar to each other, and their determination is difficult. Among known larvae, those of *L. brevicollis* are the most distinctive of the genus. Characteristic features of *L. brevicollis* are the very numerous setae and distinct granular microsculpture on pronotum. However, the number of stout setae on abdominal tergite III and caudal tergite V are similar to those of *L. neglecta*. A higher number of stout setae on caudal tergite V and the chaetotaxy of pronotum are two relatively reliable characters of *L. flexuosa*. Type II of hypopleuron distinguish the larva of *L. candida* from those of the other known species.

Serrano (1990) gives a description of the larva of *Lophyra flexuosa* which differs from the larval material examined here in some details (e. g. chaetotaxy of pygopod and sternite IX). The characters of our *L. flexuosa* material (caudal margin of sternite IX with two groups of 3 setae; apical margin of pygopod with 10, 19–21 or 20–23 setae in larval instar I, II and III) well correspond with other *Lophyra* species. The characters described by Serrano (caudal margin of tergite IX with two groups of 3 long and 1 short setae; apical margin of pygopod with 6, 10 or 10–12 setae in instar I, II and III) are similar to those of other *Cicindela* (s. auct.), e.g. *Cephalota,* and differ from our material, obviously. However, other character states typical for *L. flexuosa* (setae of antennomere II and pronotum) are in agreement between the material examined here and the description of Serrano (1990).

### Key to 2nd and 3rd instars of known larvae of the genus *Lophyra*

(Larval instar can be determined by the number of setae lying on galeomere I: 3 setae – $L_3$, 2 setae – $L_2$, 1 seta – $L_1$.)

1(2) Pronotum on each half with about 70 setae in $L_3$ and 40–45 in $L_2$; protonum with distinct granular microsculpture; most setae of tergite I and II very long, reaching at least the middle of the following tergite ..... *L. brevicollis*

2(1) Pronotum at most with 50 setae in $L_3$ (Figs 1, 4) or 40 setae in $L_2$ on each half; pronotum without or with indistinct granular microsculpture, usually nearly smooth.

3(4) Type II hypopleuron; abdominal tergite III with at most 14 setae on each half; caudal part of tergite V with about 20 stout setae (only instar II is known) ..... *L. candida*

4(3) Type I hypopleuron; abdominal tergite III with distinctly more setae or antennae yellow-brown.

5(6) Antennae yellow-brown, without distinct lustre, cephalolateral angles distinctly lighter than rest of pronotum; tergite III with only 10–14 setae on each half; caudal part of tergite V with at most 20 setae in $L_3$; (only instar III is known) ..... *L. neglecta*

6(5) Antennae brown to dark brown, cephalolateral angles of same colour as rest of pronotum; tergite III with 11–13 setae in $L_2$ and 16–22 setae in $L_3$ on each half; caudal part of tergite V in $L_2$ with more than 20, in $L_3$ with more than 25 setae (Fig. 3) ..... *L. flexuosa*

## Genus *Habrodera* Motschulsky, 1862

### *Habrodera nilotica* (Dejean, 1825)

#### Instar III

Measurements: HW – 2.39–2.58 (2.47); FW – 1.44–1.60 (1.51); PNW – 2.28–2.43 (2.35); PNL – 1.25–1.39 (1.32) (n = 10).

Colouration. Head and pronotum brown to dark brown with bronze copper or green lustre; head yellow to brown lateroventrally; first segment of antennae in part with light lustre; rest of appendages yellow-brown to brown apically; mesothorax anteriorly and legs in part light brown; sclerites of abdomen light yellow or yellow-grey; tergite V and hooks yellow-brown; setae of head and pronotum white, those of abdomen light red.

Head. Setae thin, some of them long; U-shaped ridge with 2 setae; antennomere I with 6–8, antennomere II with 8–10 setae; stipes longer than galea, length of maxillary palpus equal to that of galea.

Pronotum. Nearly 100 setae on each half, of which about 10 long and thin, the rest short, flattened, triangularly bifurcate; ridges of cephalolateral angles and elevations distinct; cephalolateral angles bearing 10 setae, widened and directed slightly laterally, not reaching the anterior margin of pronotum; about 20 setae along median suture (Fig. 5).

Abdomen. All sclerites slightly sclerotized; tergite III with 9–11 setae; type I hypopleuron; parts of tergite V well separated, caudal part with 14–20 stout setae, caudolateral part with 5–6 setae; median hook long, slender and considerably curved in apical third, with 3 long setae, directed outwards; top of median hook reaching at least anterior margin of distal part of tergite V, about 5–6 times longer than inner hook; the latter with 2 long setae apically and a very small central spine (Fig. 7); sternite IX with 2 groups of 3 long setae on caudal margin; apical magin of pygopod with 14–16 setae.

#### Instar II

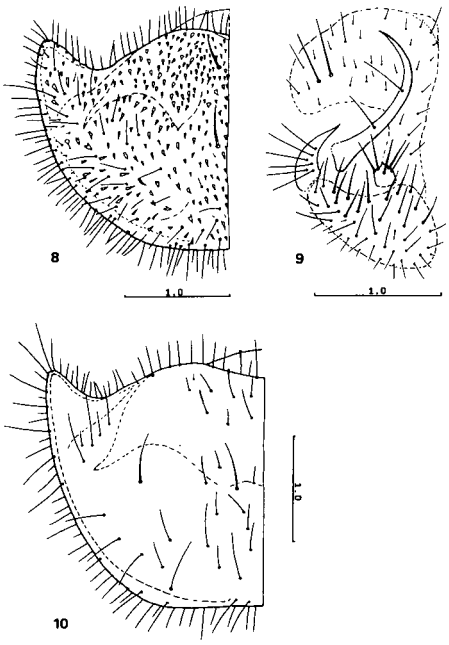
Measurements: HW – 1.50–1.69 (1.60); FW – 0.89–1.01 (0.97); PNW – 1.42–1.60 (1.51); PNL – 0.74–0.87 (0.82) (n = 10).

Colouration. Antennae brown to dark brown apically, other appendages of head light brown to brown apically, sclerites of abdomen light, tergite V and hooks light brown.

Head. Antennomere I with 5–6 setae, antennomere II with 6–7 setae.

Pronotum. Each side with about 50–60 setae of which more than 10 setae are long; 12–15 distinct setae beside median suture, 6–8 setae in cephalolateral angles.

Abdomen. Tergite III with 6–8 setae; caudal part of tergite V with 14–18 stout setae, caudolateral part with 3 setae; median hook with 2 setae medially; inner hook with 2, rarely 3 setae, central spine of inner hook longer and distinct; apical margin of pygopod with 14–15 setae.




Figs 8, 9. *Habrodera capensis* (L.): 8 – pronotum half, $L_3$, 9 – half of tergite V with hooks, $L_3$.

Fig. 10. *Neolaphyra ?leucosticta*, pronotum half, $L_3$.

Instar I

Measurements: HW – 1.06–1.12 (1.10); FW – 0.66–0.72 (0.68); PNW – 0.98–1.00 (0.99); PNL – 0.60–0.63 (0.61) (n = 5).

Colouration. Head and pronotum brown with green copper lustre; antennae brown, other appendages light brown to brown apically; thorax, legs, tergites and hooks brown; other abdominal sclerites light brown.

Head. Setae long and thin; antennomere I without, antennomere II with 2 setae; stipes and galea equal in length.

Pronotum. 7–8 setae on each half; the relatively small cephalolateral angles reaching anterior margin of pronotum; ridges of cephalolateral angles and elevations distinct; some setae on pronotum slightly bifurcate (Fig. 6).

Abdomen. Tergite III with 3 setae; caudal part of tergite V without, anterior part with 3 setae, caudolateral part and median hook with 1 seta; inner hook with 2 long setae, these 3–4 times longer than central spine; the latter distinct; apical margin of pygopod with 10 setae, dorsal part with 6 and ventral part without setae.

MATERIAL EXAMINED: $6L_1$, $21L_2$, $38L_3$, Central Africa, Burundi, Rusizi-Delta, February/March 1992.

Ecology. Adults and larvae of *H. nilotica* were collected from moist sand directly on the shore of Lake Tanganyika.

*Habrodera capensis* (L., 1764)

Instar III

Measurements: HW – 3.65; FW – 2.32; PNW – 3.50; PNL – 1.27 (n = 1).

Colouration. Head dorsally, antennae and pronotum dark brown to black-brown with bright red copper or green lustre; mandibles brown to black-brown apically; rest of the

appendages of head light brown to brown apically; anterior part of mesothorax and in part legs light brown; other sclerites of thorax and abdomen light yellow; hooks yellow to light brown apically; setae on head and pronotum white, those of abdomen with red tinge.

Head. Setae either long and thin or short, flattened to triangular, and bifurcate, those shorter located mostly caudally; U-shaped ridge with 2 setae; antennomere I with 13–15 setae, antennomere II with 13–16 setae; length of stipes equal to that of galea; labial palpomere I with 7(8) setae, palpomere II with 2 setae near the middle.

Pronotum. Setae similar to those on head, most setae very short, flattened and triangular; ridges of cephalolateral angles and elevations distinct; the latter widened, directed slightly laterally and nearly reaching prominent anterior margin of pronotum; more than 120 setae on each half of pronotum, about 30 of these long and thin (Fig. 8).

Abdomen. All sclerites slightly sclerotized; tergite III with 12–14 setae, only 3–4 of those long; type II hypopleuron; abdominal hump very high, tergites of segment V touching each other on inner margin; caudal part of tergite V with 20–24 stout long setae, caudolateral part with 5–6 setae; median hook very long and slender, with 2 setae directed outwards, its top reaching nearly anterior margin of distal part of tergite V; total length of median hook about 5 times more than that of inner hook, the latter with 4–5 long setae on distal part; central spine very short (Fig. 9); sternite IX with 2 groups of 3 long setae on caudal margin; apical margin of pygopod with 17–19 setae.

Instar II

Measurements: HW – 2.43, 2.47; FW – 1.48, 1.52; PNW – 2.36, 2.39; PNL – 1.33 (n = 2).

Character states are very similar to those of $L_3$, only the following differences in chaetotaxy were found:

Head. Antennomere I with 6–7, antennomere II with 8 setae.

Pronotum. More than 100 setae on each half.

Abdomen. Tergite III with 9–11 setae; caudal part of tergite V with 16–18 stout setae, caudolateral part with 4 setae; median hook with 2 slightly displaced setae; top of median hook reaching the anterior margin of distal part of tergite V; inner hook with 4 long setae; central spine about 0.4–0.5 times as long as lateral setae of inner hook; apical margin of pygopod with 14–16 setae.

Instar I

Measurements: HW – 1.77; FW – 0.85; PNW – 1.58; PNL – 0.72 (n = 1).

Head. All setae long; antennomere I without, antennomere II with 2 setae.

Pronotum. Most setae thin, some slightly bifurcate; cephalolateral angles small, slightly prominent; anterior margin of pronotum strongly prominent; ridges of cephalolateral angles and elevations distinct; 14–15 setae on each side of pronotum, along median suture 4 setae.

Abdomen. Tergite III with 3 setae; caudal part of tergite V without setae, caudolateral part with 1 seta, anterior part with 4 setae; median hook very long, in apical half distinctly thinner; top of median hook exceeding anterior margin of distal tergite V; inner hook with 3 long setae laterally; sternite IX with 2 groups of 3 setae; anterior margin of pygopod with 10 setae, dorsal part with 6 setae.

MATERIAL EXAMINED: $1L_1$, $2L_2$, $1L_3$, South Africa, Cape Prov., Nature's Valley, March 1993.

Ecology. Adults and larvae of *H. capensis* were collected among white sand dunes along the coast. The larval holes were found on moist sand at the edge of a small brackish lagoon. Larvae and adults occur together with those of *Lophyra candida*.

Discussion

Larvae of *Habrodera* have the following character states which distinguish them, in 2nd and 3rd instars, from larvae of other *Cicindela* (s. auct.): (i) numerous typical, very short, triangularly flattened and slightly bifurcate setae on pronotum and, more sparsely, on head, (ii) inner hook with small central spine and with 2–5 lateral setae, (iii) median hook long and thin, reaching anterior margin of anterior tergite of segment V, and (iv) slightly sclerotized areas. Other characters of importance include the number of setae on caudal tergite V, on the third tergite of abdomen, and on the top of the pygopod. However, these states are also present in species of *Lophyra* and some other representatives of *Cicindela* (s. auct.). Larvae of *H. capensis* are distinguished from those of *H. nilotica* by possessing 7 long setae on first labial palpomere and 2 setae on second labial palpomere. All other known larvae of Cicindelini have a single seta on the second labial palpomere.

## Genus *Neolaphyra* Bedel, 1895

### *Neolaphyra ?leucosticta* (Fairmaire, 1858)

Instar III

Measurements: HW – 3.53–3.91 (3.74); FW – 2.28–2.47 (2.40); PW – 3.46–3.84 (3.66); PL – 2.05–2.39 (2.21) (n = 4).

Colouration. Head dark brown to black with blue-green, in part copper or violet lustre dorsally, and brown to dark brown ventroanteriorly; antennae dark brown, first segment with light lustre; rest of the appendages brown to dark brown apically; pronotum dark brown with green-blue, laterally copper-green lustre; mesothorax and legs brown, coxa dark brown dorsally; sclerites of abdomen light brown, hook darker; setae of head and pronotum white, those of abdomen red; stipes dark brown on inner margin.

Head. Setae usually long and thin; U-shaped ridge wide with 2 setae; antennomere I with 7–8, antennomere II with 9–10 setae; coronal suture short; hind frontal angles wide; stipes and maxillary palpus slightly shorter than galea; labial palpomere I with 6 setae, palpomere II with 1 seta in middle.

Pronotum. Setae of different length, some of the shorter bifurcate; cephalolateral angles distinct, not reaching the anterior margin of pronotum, which is almost even medially; ridge of cephalolateral angles and elevation distinct; posterior edge relatively wide; pronotum with 20–30 setae on each half (Fig. 10), with 8–9 setae beside median suture, with 4–5 setae in cephalolateral angles.

Abdomen. Sclerites of abdomen distinct; tergite III with 24–26 setae, of these 6–8 setae longer; type I hypopleuron; caudal part of tergite V with 30–34 stout setae, caudolateral part with 7–8 long setae, all parts of tergites V distinctly separated from each other; median hook widened at base, with 3 setae, tops of setae reaching middle of anterior part of tergite V; total length of median hook at least 5 times that of inner; the latter with 4–5 long lateral setae and central spine short, at most 0.33 times as long as lateral setae; sternite IX with 2 groups of 3 long setae on caudal part; apical margin of pygopod with 24–28 stout setae, in part in double row, dorsal part of pygopod with 22–26 stout setae additionally to those on apical margin, ventral part with 10–12 stout setae.

MATERIAL EXAMINED: $4L_3$, Tunisia, Hammamet, November 1991.

Ecology. The larvae were found in sandy areas without vegetation of the small mountains of peninsula Cap Bone near Hammamet.

## Discussion

Though no adults were found with the larvae, there is little doubt that the larvae belong to *Neolaphyra* because of their size, faunistic data, and the following morphological character states. The larvae are similar to other genera of *Cicindela* (s. auct.), particularly to *Lophyra* (bifurcated setae on pronotum, similar tergites and hooks of segment V, similar structure of sternite IX of abdomen, etc.). Only *Neolaphyra leucosticta* is reported from the same locality (Korell & Cassola, 1987). Several characters separate *Neolaphyra leucosticta* from other genera: numerous setae on apical margin of pygopod and abdominal tergite III; distinct sclerotized areas of abdomen; 4–5 long lateral setae on inner hooks; arrangement and number of setae on the pronotum.

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