

***Deroplax silphoides* (Hemiptera: Heteroptera: Scutelleridae): A new plant pest in Israel**

TANIA NOVOSELSKY¹, DAVID G. FURTH², JOSEPH E. EGER, JR.³ & YORAM ZVIK^{4,5}

¹The Steinhart Museum of Natural History and National Research Center, Department of Zoology,
The George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel Aviv, 69978 Israel

²Department of Entomology, National Museum of Natural History Smithsonian Institution,
Washington, D.C., 20013-7012 USA

³Dow AgroSciences LLC, 2606 S. Dundee St., Tampa, FL 33629 USA

⁴Hoopoe Ornithology & Ecology Center, 1 Nahal Mamshit St., Yerocham, 8051545 Israel

⁵Ben-Gurion University of the Negev, POB 653, Be'er Sheva', 84105 Israel

E-mail: tania@post.tau.ac.il, furthd@si.edu, jeeeger@dow.com, yzvik65@gmail.com

ABSTRACT

This is the first report of the invasive scutellerid bug *Deroplax silphoides* (Thunberg, 1783) from Israel. The species is a pest of ornamental plants, whose immature stages and life history were previously unknown. Information on its nymphs, life history and distribution is provided and its association with *Dodonaea viscosa* (Sapindaceae) is reported for the first time.

KEYWORDS: Scutelleridae, Hoteinae, *Dodonaea*, biology, life history, morphology, Sapindaceae, Middle East.

INTRODUCTION

The Scutelleridae (Shield or Jewel Bugs) are a cosmopolitan family of terrestrial bugs belonging to the superfamily Pentatomoidea and comprising about 81 genera and over 450 species (Cassis and Vanags 2006; Henry 2009). The family is most diverse in the tropical and subtropical regions. The genus *Deroplax* Mayr, 1864 was included in the subfamily Pachycorinae until Carapezza (2009) created the subfamily Hoteinae for the genera *Hotea* Amyot & Serville, 1843 and *Deroplax* based on their unique genitalia.

The Hoteinae are a relatively small subfamily with less than 20 described species in three genera occurring mainly in the Afrotropics. They are characterized by having stridulatory patches on the abdominal venter, the vesica prolonged into a penisfilum that is coiled multiple times, and an elongate convoluted spermathecal duct (Carapezza 2009). The genus *Deroplax* is known primarily from the Palearctic, Oriental and Afrotropical regions; this bug is a pest in areas where it is invasive but not where it is native.

In the Oriental Region, the genus is known from Bangladesh (Ahmad *et al.* 1988; Scott 1990); in the Palearctic from Pakistan (Ahmad *et al.* 1988), Iran (Iranipour *et al.* 2010), and Saudi Arabia (Göllner-Scheiding 2006); in the Afrotropics, it has been reported from Madagascar and South Africa north to Somalia, Ethiopia, and Senegal (Schouteden 1903; Kirkaldy 1909; Göllner-Scheiding 2006). *Deroplax silphoides* is known primarily from the Afrotropics (South Africa; Leston 1953)

and Palaearctic Region (Saudi Arabia; El-Hawagry 2013). In Israel *Deroplax silphoides* was first discovered in the southern Negev (Elat) in 2002, Central Negev (Yeroham) in 2010, and in 2013 it spread to Be'er Sheva'.

The Israeli scutellerid fauna is relatively poor, being represented until recent by only three subfamilies (Eurygastrinae, Odontoscelinae, Odontotarsinae), eight genera and 24 species (Avidov and Harpaz 1969; Bodenheimer 1937; Hoberlandt 1951; Linnavuori 1960, 1961, 1973; Göllner-Scheiding 2006).

Some scutellerids are economically important, primarily in the Old World; these include *Eurygaster austriaca* (Schrank, 1776), *E. integriceps* Puton, 1881, *E. maura* (L., 1758), and *E. testudinaria* (Geoffroy, 1785). One of the most important insect pests of cereals (wheat and barley) is *E. integriceps*, well known as a serious limiting factor for the production of wheat grain with strong gluten in the Near and Middle East, Eastern and Southern Europe, and North Africa (Kostyukovsky *et al.* 2010). Wheat damaged by bugs contains enzymes, which degrade gluten proteins, cause rapid relaxation of dough and result in the production of bread with low volume and inferior texture. *Eurygaster integriceps* is an economically important species in Israel as well (Kostyukovsky and Zohar 2004), and *Deroplax silphoides* can now be added as a second scutellerid pest species in the Israeli fauna. *Deroplax silphoides* is a potential biological control agent of devil's weed *Tribulus terrestris* L. and was found in southern Africa feeding on this plant's green and dry burrs (Scott 1990).

MATERIALS AND METHODS

This study is based on the Scutelleridae collection housed at the Steinhardt Museum of Natural History and National Research Center at Tel Aviv University (TAUI). Measurements have been taken on ten females and ten males and are given in millimeters. The terminology follows Pendergrast (1957), Scudder (1959), and McDonald (1966). Photographs were taken with a Canon PowerShot G9 camera, mounted on a Zeiss Stereo Discovery V20 microscope and processed using the CombineZP software. Transliterated names of localities in Israel follow the *Israel Touring Map* (1:250,000) and *List of Settlements*, published by the Israel Survey, Ministry of Labor (2009).

RESULTS

Deroplax silphoides (Thunberg, 1783)

(Figs 1–12)

Cimex silphoides Thunberg, 1783.

Cimex stigma Fabricius, 1798.

Tetyra stigma: Fabricius, 1803.

Pachycoris stigma: Burmeister, 1835.

Odontotarsus silphoides: Dallas, 1851.

Odontotarsus coquerelii Signoret, 1861.

Sergia silphoides: Stål, 1865.

Sergia coquerelii: Stål, 1865.

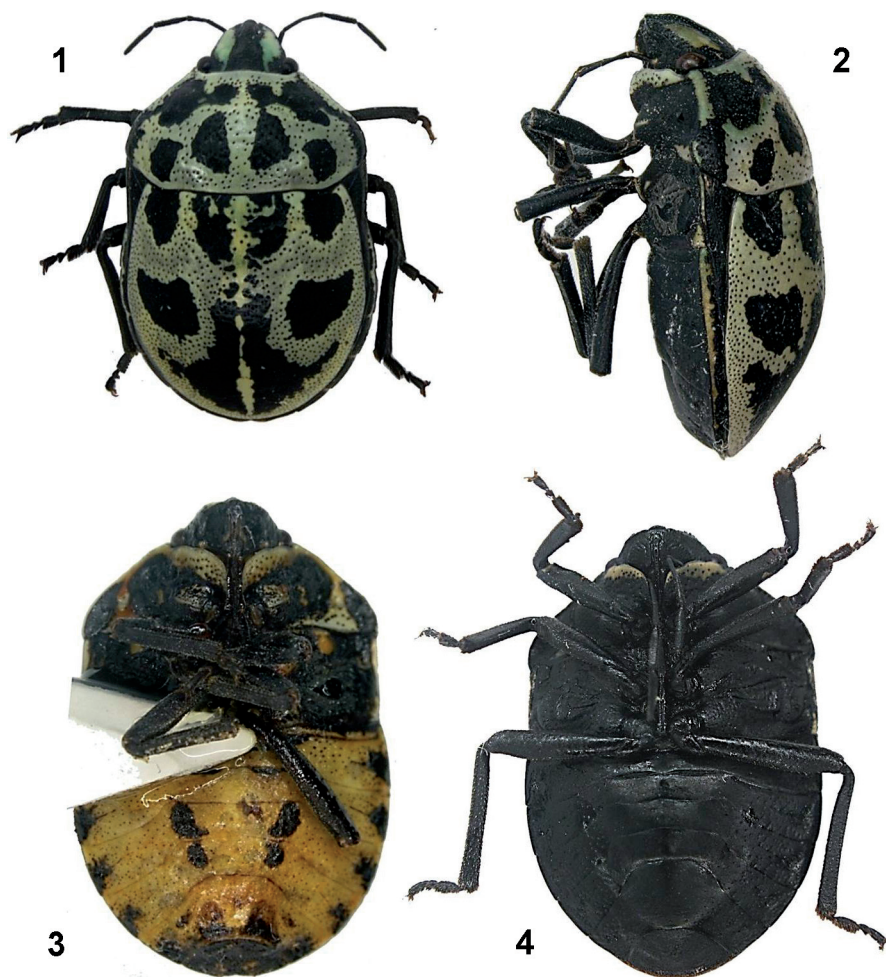
Deroplax silphoides var. *coquerelii* Kirkaldy, 1909.

Deroplax silphoides var. *schoutedeni* Kirkaldy, 1909.

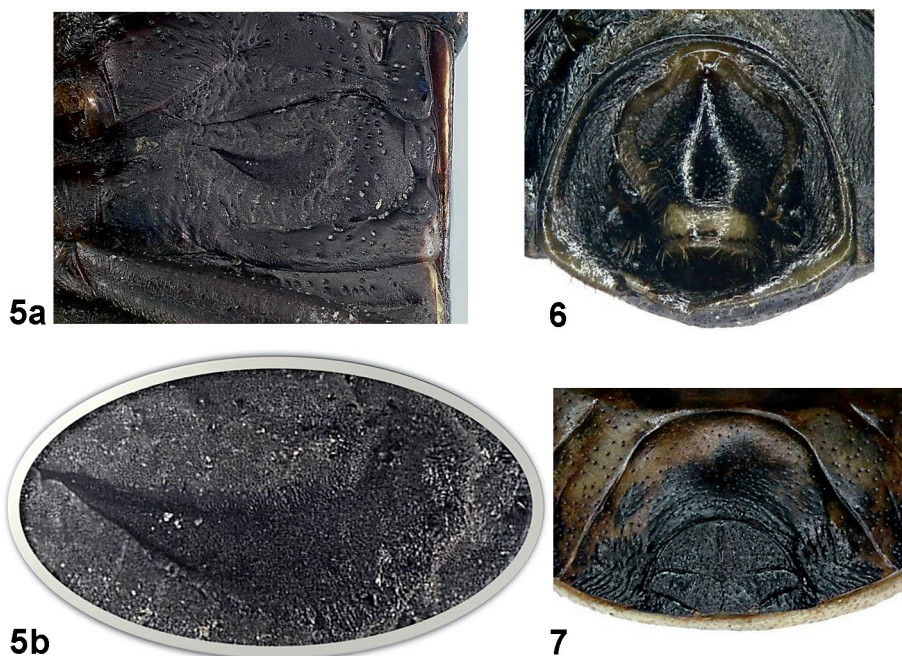
Deroplax silphoides var. *stigmata* Kirkaldy, 1909.

Diagnosis: Adults of *D. silphoides* differ from other Scutelleridae in Israel by following combination of characters: head with central lobe, not acuminate produced; lateral pronotal angles not produced; body convex both dorsally and ventrally, broadly oval; metathoracic scent auricles absent; spermatheca with median dilation.

Description: General appearance (Figs 1–4). Color varies considerably (Leston 1953). Dark yellow with greenish and black spots dorsally; antennae, labium,



Figs 1–4: *Deroplax silphoides*, adult: (1, 2, 4) male, dorsal (1), lateral (2) and ventral (4) views; (3) female, ventral view.

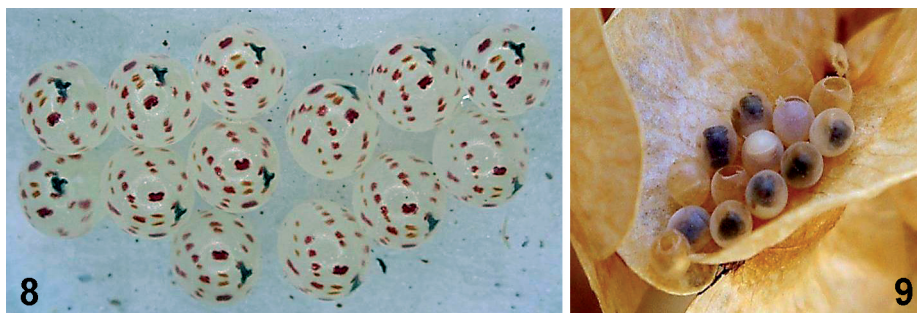


Figs 5–7: *Deroplax silphoides*, adult: (5) metapleuron, general view (5a) and enlarged (5b); (6) male genital capsule, dorsal view; (7) underside of female abdomen showing genital plates.

thorax and abdominal sterna, femora, tibiae and all tarsomeres black; coxa, trochanter, claws brown; venter of abdomen yellowish green with black markings in females, black in males. Male length 10.4–11.3 mm, width 6.2–6.6 mm; female length 11.2–12.0 mm, width 6.8–7.4 mm.

Head (Figs 1–4) declivous; a little wider than long; lateral margins mostly straight or slightly curved; clypeus barely surpassing mandibular plates; dorsum of head black with elongate yellow spots extending from ocelli onto each jugum; eyes protruding laterally. **Antenna** five-segmented, attached ventrally near eyes; first antennomere 0.87 mm long, never reaching beyond apex of head, second 0.66 mm, third shortest, <0.57 mm, fourth 1.08 mm, fifth longest 1.26 mm, total length of antenna 4.44 mm. **Labium** four-segmented, reaching to just past mesocoxae, total length 4.58 mm.

Thorax. Anterior margin of pronotum straight mesally, but shallowly concave in general (Fig. 1); width across humeral angles 6.9 mm, length at middle 3.4 mm. Pronotum with eight to ten black spots, these sometimes coalesced resulting in fewer spots. **Scutellum** (Fig. 1) covers entire abdomen, length 7.1 mm, width 6.9 mm at base; eight spots, four basal, two at middle, and two elongate-linear posterior to middle, spots sometimes coalesced into fewer spots. **Metapleuron** (Fig. 5) peritreme comma-shaped.



Figs 8, 9: Eggs of *Deroplax silphoides*: (8) egg mass, 8 days (*in vitro*); (9) egg mass on a fruit capsule at time of hatching.

Abdomen (Figs 3, 4) 7.1 mm long and 6.9 mm wide; stridulatory patches on either side. **Male genitalia** (Fig. 6) quite unlike the genitalia of *Scutellerini*, and were described and illustrated by Leston (1953) and Carapezza (2009). Carapezza (2009) described the **female genitalia** (Fig. 7).

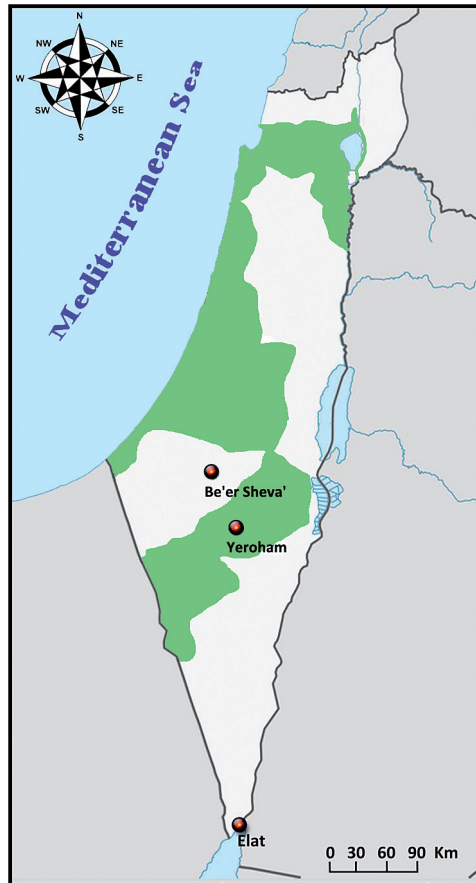
Egg (Figs 8, 9). Surface smooth. Oval-shaped, 1.34 mm long, 1.09 mm wide. Laid in masses of 13 eggs, arranged in three regular lines, one with three eggs, one with six and one with four eggs. Yellow-green when laid, turning yellow in approx. 3 days, eight days later eyes appear as red spots, and egg burster as black triangle (Fig. 8).

Nymphs (Fig. 10). Third to fifth instars resemble adults in their overall shape and color.

Material examined: ISRAEL: *Northern Negev*: Be'er Sheva', 250 m, 19.v.2014 (1♂), 28.v.2014 (2♀), Y. Bar; Be'er Sheva', 9.vi.2010, N. Dahan (1♂, 1♀); Kemehin, 25.x.2013, Z. Sigal & I. Renan (1♂); *Central Negev*: Yeroham, 11.v.2014, Y. Zvik, on *Dodonaea viscosa*, (30♂, 26♀); Yeroham [Yeroham], 25.x.2010, Y. Zvik (1♀); 5.vi.2013, Y. Zvik, on *Dodonaea viscosa*, (5 first instars, 3 second instars, 6♂, 17♀); 16.vi.2013, Y. Zvik, on *Dodonaea viscosa* (6 third instars, 5 fourth instars, 38 fifth instars, 15♂, 6♀); *Southern Negev*: Elat, 17.vi.2002, Y. Shlezinger (1♀); 19.vi.2007, Y. Blumenfeld (2♀).



Figs 10, 11: *Deroplax silphoides*, nymphs (10) and adult (11) on *Dodonaea viscosa*.



Figs 12: Collection localities of *Deroplax silphoides* plotted over distribution of major *Dodonaea viscosa* plantations (green) in Israel. (Modified from <http://www.wildflowers.co.il>)

Distribution: Oriental Region (Ahmad *et al.* 1988; Scott 1990); Palearctic Region (Ahmad *et al.* 1988; Iranipour *et al.* 2010; Göllner-Scheiding 2006; Carapezza 2009); Afrotropical Region (Schouteden 1903; Kirkaldy 1909, Göllner-Scheiding 2006; Carapezza 2009). In Israel, the species occurs in the Northern Negev (Be'er Sheva'), Central Negev (Yeroham), and Southern Negev (Elat) (Fig. 12).

Host plant in Israel: *Dodonaea viscosa* Jacquin (Sapindaceae) (Figs 10, 11).

Biology: In Israel, *Deroplax silphoides* has been observed feeding exclusively on *Dodonaea viscosa*. The species has been found in October and May–June, being more abundant in June, thus suggesting two generations per year. Newly hatched nymphs stay around the egg mass, apparently without feeding, until they molt into the second instar. Third to fifth instars aggregate around immature and ripe

seeds (Figs 10, 11). Adults and second to fifth instars feed on seeds and move among branches and leaves. When disturbed, they usually stay firmly attached to the plant.

ACKNOWLEDGEMENTS

The authors thank our TAUI colleagues Dr. Netta Dorchin for constructive criticism on an early draft of the manuscript, Ariel-Leib-Leonid (Laibale) Friedman for his assistance with the locality names and Tirza Stern for technical help. We thank two anonymous reviewers for thorough reading and commenting, which greatly improved the quality of the manuscript.

REFERENCES

- AHMAD, I., MOIZUDDIN, M., AND MUSHTAQ, S. 1988. A revision of the genus *Deroplax* (Hemiptera: Scutelleridae) from Oriental Region with description of two new species from Pakistan and Bangladesh. *Oriental Insects* **22**: 259–266.
- AVIDOV, Z. AND HARPAZ, I. 1969. *Plant pests of Israel*. Israel University Press, Jerusalem, 549 pp.
- BODENHEIMER, F.S. 1937. Prodrum Faunae Palaestinae. *Memoires de l'Institut d'Egypte* **33**: 1–286.
- CARAPEZZA, A. 2009 [2008]. On some Old World Scutelleridae (Heteroptera). *Nouvelle Revue d'Entomologie (N. S.) Paris* **25**: 197–212.
- CASSIS, G. AND VANAGS, L. 2006. Jewel bugs of Australia (Insecta, Heteroptera, Scutelleridae). In: Rabitsch, W. (ed.), *Hug the bug – for love of true bugs. Festschrift zum 70. Geburtstag von Ernst Heiss. Denisia* **19**: 275–398.
- EL-HAWAGRY, M.S., KHALIL, M.W., SHARAF, M.R., FADL, H.H., AND ALDAWOOD, S.A. 2013. A preliminary study on the insect fauna of Al-Baha Province, Saudi Arabia, with descriptions of two new species. *ZooKeys* **274**: 1–88.
- GÖLLNER-SCHIEDING, U. 2006. Family Scutelleridae Leach, 1815 – shield bugs. In: Aukema, B. and Rieger, C. (eds), *Catalogue of the Heteroptera of the Palearctic Region*. 5, Pentatomomorpha II. The Netherlands Entomological Society, Wageningen, pp. 190–227.
- HENRY, T.J. 2009. Biodiversity of the Heteroptera. In: Foottit, R.G. and Adler, P.H. (eds.), *Insect biodiversity: Science and society*. Wiley-Blackwell, Oxford, pp. 223–263.
- HOBERLANDT, L. 1951. Hemiptera-Heteroptera collected by Mr. J. Houska in Israel. *Acta Entomologica Musei Nationalis Pragae* **27**: 5–34.
- IRANIPOUR, S., PAKDEL, A.K., AND RADJABI, G. 2010. Life history parameters of the Sunn pest, *Eurygaster integriceps*, held at four constant temperatures. *Journal of Insect Science* **10** (106): 1–9. (<http://dx.doi.org/10.1673/031.010.10601>)
- KIRKALDY, G.W. 1909. *Catalogue of the Hemiptera (Heteroptera) with biological and anatomical references, lists of foodplants and parasites, etc.* Prefaced by a discussion on nomenclature and an analytical table of families. Vol. I. Cimicidae. Berlin, xl+392 pp.
- KOSTYUKOVSKY, M., TROSTANETSKY, A., MENASHEROV, M., YASINOV, G., NAFTALYAHY, U., ZOHAR, D., KITAIN, S., AND MELAMED, Y. 2010. Management of Sunn pest *Eurygaster integriceps* Put. for better wheat quality and stable profitability for improvement wheat quality in Israel. *Israel Agriculture*. The International Catalogue for Advanced Agricultural Technology. P. 20.
- KOSTYUKOVSKY, M. AND ZOHAR, D. 2004. Sunn pest *Eurygaster integriceps* Put. and wheat quality in Israel. In: *International Quality Grains Conference*. Purdue University, Indianapolis, IN, USA, July 19–22, 2004, Proceedings, pp. 1–7.
- LESTON, D. 1953. Notes on the Ethiopian Pentatomoidea X. Some specimens from southern Africa in the South African Museum, with a note on the remarkable pygophore of *Elvisura irrorata* Spinola and description of a new species of *Piezodorus* Fieber. *Annals of the South African Museum* **41**: 48–60.
- LINNAVUORI, R. 1960. Hemiptera of Israel. I. *Annales Zoologici Societatis Zoologicae Botanicae Fennicae "Vanamo"* **22** (1): 1–71 pp.
- 1961. Hemiptera of Israel, II. *Annales Zoologici Societatis Zoologicae-Botanicae Fennicae "Vanamo"* **22** (7): 1–51.

- 1973. Studies on the hemipterous fauna of Israel and Sinai. *Israel Journal of Entomology* **8**: 35–46.
- MCDONALD, F.J.D. 1966. The genitalia of North American Pentatomoidea (Hemiptera: Heteroptera). *Quaestiones Entomologicae* **2**: 7–150.
- MINISTRY OF LABOR. 2009. *Israel Touring Map (1:250,000) and "List of Settlements"*. Israel Survey, Tel Aviv.
- PENDERGRAST, J.G. 1957. Studies on the reproductive organs of the Heteroptera with a consideration of their bearing on classification. *Transaction of the Royal Entomological Society of London* **109**: 1–63.
- SCHOUTEDEN, H. 1903. Faune entomologique de l'Afrique tropicale. Rhynchota aethiopica. I. Scutellerinae et Graphosomatinae. *Annales du Musée du Congo* **3**, **1** (1): 1–131.
- SCOTT, J.K. 1990. *Tribulus terrestris* L. (Zygophyllaceae) in southern Africa: an outline of biology and potential biological control agents for Australia. *Plant Protection Quarterly* **5** (3): 103–106.
- SCUDDER, G.G.E. 1959. The female genitalia of the Heteroptera: Morphology and bearing on classification. *Transaction of the Royal Entomological Society of London* **111**: 405–467.