

Lixus (Eulixus) nettadorchinae sp. n. (Coleoptera: Curculionidae), a new striped gall-inducing weevil species from the Negev Desert, Israel

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ABSTRACT

Lixus nettadorchinae sp. n. causing galls on branches of *Deverra triradiata* (Apiaceae) is described from the Central Negev, Israel. The new species is distinct among its congeners in its peculiar colour pattern comprising longitudinal whitish stripes of white scales on the head, pronotum and elytra. The new species fits into the subgenus *Lixus (Eulixus)* due to its long, projected and sharply-pointed elytral apex, the claws fused at the base, a relatively flat eye, the pronotum with postocular lobes and due to its association with a member of the Apiaceae family. Description of the external morphology and genitalia of both sexes is given and illustrated with photographs and line drawings. Observations on development, gall formation and parasites of the new species are summarized.

KEYWORDS: Coleoptera, Curculionidae, Lixinae, *Lixus*, *Eulixus*, endemic, new species, taxonomy, Apiaceae, *Deverra triradiata*, Israel, Negev.

תקציר

Lixus nettadorchinae, מין חדש של חדקונית שגורמת עפצים על ענפי קוזח תלת-קרני (משפחת הסוככיים) מתואר כאן מהנגב המרכזי, ישראל. המין החדש נבדל מכל בני הסוג בדגם הצבע המיוחד שלו: פסים לבנים ארוכים לאורך הראש, החזה והחפיות. המין החדש שייך לתת-סוג *Eulixus*, וזאת על סמך התכונות הבאות: קצה החפית מאורך ומחודד, הציפורניים מאוחות בבסיסן, העין שטוחה יחסית, בצידי קדמת החזה הקדמי אוגה בולטת מול העין, והן על סמך הקשר התזונתי וההתפתחותי אל משפחת הסוככיים. התיאור של צורת הגוף החיצונית והצורה של אברי ההזדווגות ניתן בלייזר צילומים וציורים. והן מסוכמות כאן התצפיות על מחזור החיים, התפתחות העפצים והטפילים.

מילות מפתח: חדקונית, חדש, קוזח תלת-קרני, סוככיים, עפץ, טקסונומיה, נגב, ישראל.

INTRODUCTION

During field surveys in Israel, particularly aiming at augmenting the knowledge of the local weevil fauna, an unusual undescribed species of *Lixus* Fabricius, 1801 producing galls on an Apiaceae, which occurs in arid areas of the country was discovered.

Lixus is a speciose cosmopolitan genus (Alonso-Zarazaga & Lyal 1999; Alonso-Zarazaga *et al.* 2023) whose species are particularly numerous in the Holarctic, with a few ones indicated from the Oriental, Neotropical and Australian regions (Csiki 1934; O'Brien & Wibmer 1982; Wibmer & O'Brien 1986; Pullen *et al.* 2014). The fauna of *Lixus* in Israel comprises some 30 species in nine or ten subgenera; the known host plants of these species belong to the families Amaranthaceae, Apiaceae,

Asteraceae, Brassicaceae, Chenopodiaceae, Geraniaceae, Fabaceae and Malvaceae (LF, unpubl. data).

Given that this genus is composed by morphologically quite diverse species, it has been divided in a number of subgenera (Alonso-Zarazaga & Lyal 1999; Alonso-Zarazaga *et al.* 2023), several of which are poorly defined just on morphological features and fading into one another in many cases. Whatever the case is, there are 16 subgenera today, since *Sublarinus* has been elevated to the generic rank by Talamelli (2008).

Given that a phylogenetic revision of all *Lixus* species worldwide is lacking at the moment, we provisionally place the new species in the subgenus *Eulixus* Reitter, 1916 in its currently broad sense. The present composition of *Lixus* (*Eulixus*)—as well as of other subgenera—includes rather morphologically and ecologically diverse species. For example, *Lixus* species associated with Apiaceae are divided between different subgenera (Hoffmann 1955; Ter-Minassian 1967). Our observations have made it evident that all species studied by us and whose association with Apiaceae is known, have a sharply pointed elytral apex, and that their morphological features, although somewhat variable, let them being considered surely related, even if having been spread among *L. (Lixus)*, *L. (Eulixus)* and *L. (Callistolixus)* Reitter, 1916). The colour pattern of members of the last subgenus consists of white scales arranged in bands like in the new species, but their bands are transverse, whereas in the new species the vestiture is arranged as longitudinal stripes.

MATERIALS AND METHODS

Measurements were taken with a Leica DFC295 digital camera mounted on a Leica M205C microscope and using Leica Application Suite 4.2.0. The body length was measured from the base of the rostrum to the elytral apex, i.e. excluding rostrum, as usual for the Curculionoidea. The terminology follows Lyal (2024).

Photographs of the beetles were taken with a Leica DFC295 digital camera mounted on a Leica M205C microscope; image stacks were processed with Leica Application Suite 4.2.0 and Helicon Focus 5.3. Final image editing was done in Adobe Photoshop CS5. Photographs of habitats and plants were taken by the first author, unless stated otherwise. Original hand drawings were scanned and traced in Adobe Illustrator CS5.

Transliterated names of localities in Israel follow the *Israel Touring Map* (Survey of Israel 2009).

Acronyms for type depositories are as follows: ABBM (Atatürk University Biodiversity Science Museum, Erzurum, Turkey), ECRI (Enzo Colonnelli private collection, Rome, Italy), NHM (Natural History Museum, London, UK), NMP (National Museum in Prague, Czech Republic), SMNHTAU (The Steinhardt Museum of Natural History, Tel Aviv University, Israel), ZIN (Zoological Museum, St Petersburg, Russia).

TAXONOMY

Family Curculionidae Latreille, 1802

Subfamily Lixinae Schoenherr, 1823

Genus *Lixus* Fabricius, 1801*Lixus (Eulixus) nettadorchinae* sp. n.

Figs 1–11

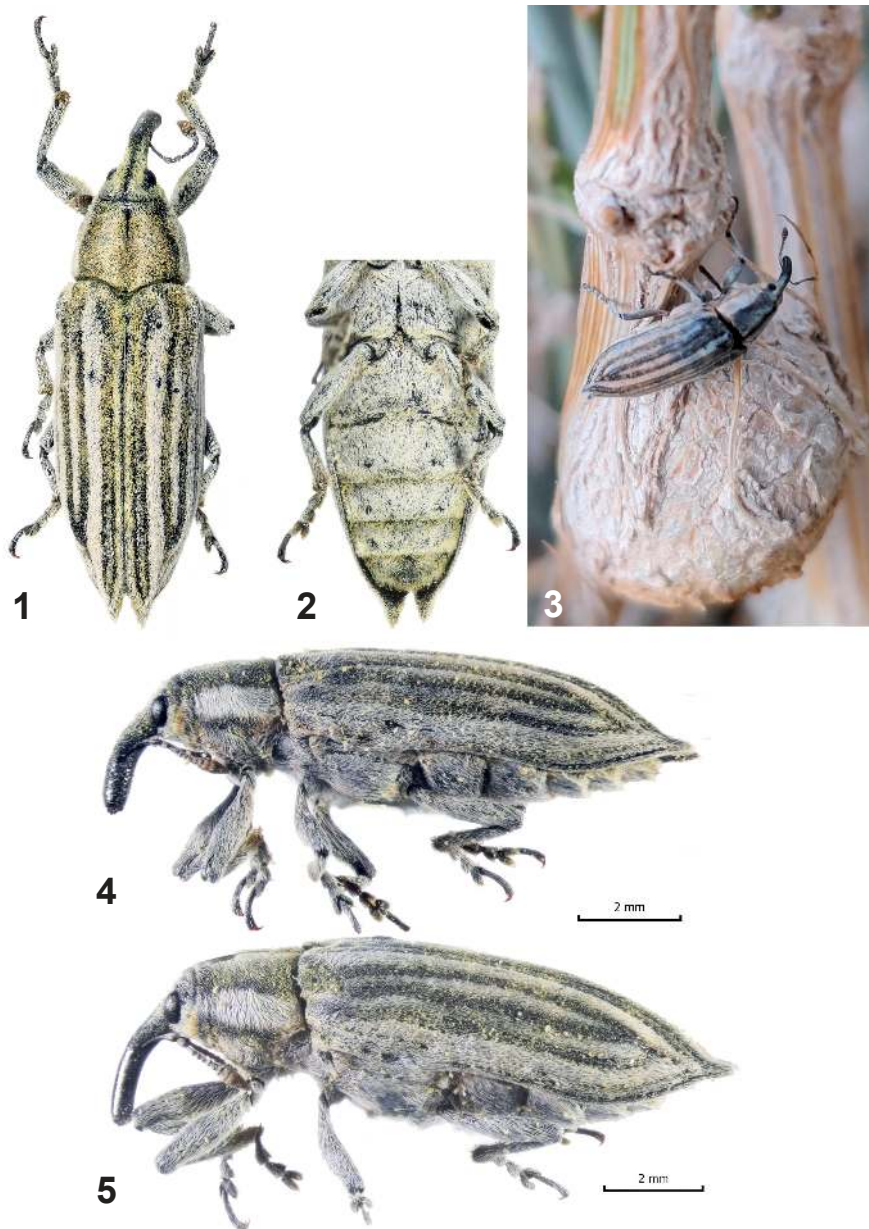
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Etymology: The species is named after Prof. Netta Dorchin, a notable researcher of galls and expert in Cecidomyiidae, chief curator of the entomological collection in SMNHTAU, president of the Entomological Society of Israel, line manager, colleague and friend of the senior author, and with whom much of the material was collected during joint expeditions to the Negev Desert and the Arava Valley. Netta has dedicated her life to the research of insect galls and gall-inducers (gall midges, gall wasps etc.), and among others described cecidomyiids inducing galls on *Deverra triradiata* (Dorchin & Freidberg 2011a, b). Therefore, it is our great pleasure to name this beautiful gall-inducing weevil species after her.

Diagnosis: This species is distinguished from all other *Lixus* species in the peculiar pattern of distinct, solid, longitudinal whitish stripes of white scales on the head, pronotum and elytra in combination with depressed fourth elytral interval and almost complete lack of scales humeri. Many *Lixus* species, in particular in the subgenera *Compsolixus* Reitter, 1916 and *Epimeces* Billberg, 1820, possess a pattern of pale longitudinal stripes, strong or fading, comprising either a single wide longitudinal stripe along the anterior margin of the elytra only, lasting along the lateral side of the pronotum (e.g. *L. (Compsolixus) ascanii* Linnaeus, 1767, *L. (C.) castellanus* Chevrolat, 1866, *L. (C.) juncii* Boheman, 1835, *L. (Epimeces) cardui* Olivier, 1807, *L. (E.) filiformis* Fabricius, 1781 and *L. (E.) scolopax* Boheman, 1835), or several (2–5) longitudinal stripes throughout the elytra, medially stretching throughout the pronotum, head and rostrum (e.g. *L. (C.) anguinus* Linnaeus, 1767 and *L. (C.) nubianus* Capiomont, 1875). Among the striped *Eulixus* species, most have only a lateral stripe and more massive and wide body (e.g. *L. (Eulixus) bidens* Capiomont, 1875, *L. (E.) cannescens* Steven, 1829 and *L. (E.) myagri* Olivier, 1807), and those that have a more delicate and slender body and are striped along the middle part of elytra, pronotum and head – the stripes are weak and fading, often nearly indistinct in older specimens (e.g. *L. (E.) iridis* Olivier, 1807).

Description: Body oblong, ~3× as long as wide. Body length: males 7.5–10.6 mm, females 8.4–11.8 mm. Maximum elytral width: males 2.5–3.5 mm, females 2.8–3.9 mm.

Integument pitch black, at most antenna, tarsi and claws brown, moderately shining and punctured. Dorsal vestiture consisting of recumbent hair-like pointed white scales of variable density, organized in longitudinal bands of thicker and longer scales (Figs 1–5). Ventral vestiture longer and denser than the dorsal one,



Figs 1–5. *Lixis nettadorchinae* sp. n.: (1) male, general habitus, dorsal view; (2) male, metasternum and abdomen, ventral view; (3) living male on a gall, probably after emerging, Nahal Marzeva, 30.714°N 35.053°E, February 2022 (photo Yoav Romach); (4) male, lateral view; (5) female, lateral view.

mesosternum, metasternum and ventrites I–II clothed by a mixture of single-pointed and two-three-pointed scales, partly split nearly to base. Pronotum with distinct postocular tuft of yellowish scales and with two longitudinal submedian bands of white scales, its lateral third nearly completely white. Elytra with longitudinal white bands of scales along odd interstriae. Vestiture on legs thick, composed of mainly recumbent short whitish scales plus a few longer semi-erect whitish ones particularly on tibia, trochanter, coxa and base of femur; tibial apical comb yellowish. Teneral specimens bear yellowish ochre easily-removed wax pruinosity.

Rostrum subcylindrical, moderately curved, more or less distinctly bent basally up to antennal insertion, in male shorter and thicker, $3.3\text{--}3.8\times$ as wide as long, $1.0\text{--}1.2\times$ as long as pronotum, in female slenderer and oblong, $4.8\text{--}5.0\times$ as wide as long, $1.1\text{--}1.2\times$ as long as pronotum, moderately shiny, finely punctate. In male, antenna inserted around middle of rostrum, apical half of rostrum slightly swollen, inconspicuously thicker than basal half and distinctly less pubescent. In female, antenna inserted at basal third of rostrum, apical $\frac{2}{3}$ from completely bare to slightly pubescent.

Antennal scape long, thin, $7\times$ as long as wide, moderately curved, clubbed apically; antennomeres 1 and 2 distinctly oblong, cylindrical; first $1.5\times$ as long as wide; second $2.3\times$ as long as wide and $1.2\times$ as long as first; 3–6 subequal, about as long as wide, all around $0.2\times$ as long as second; 7 transverse and covered by dense long white scales. Club fusiform, $2.4\times$ as long as wide, $0.6\times$ as long as all antennomeres combined, covered by dense short yellowish setae.

Forehead $5\times$ as wide as eye width in dorsal view, concave and medially between eyes with deep fovea, laterally covered by dense white scales, medially completely bare from base of rostrum to anterior base of pronotum.

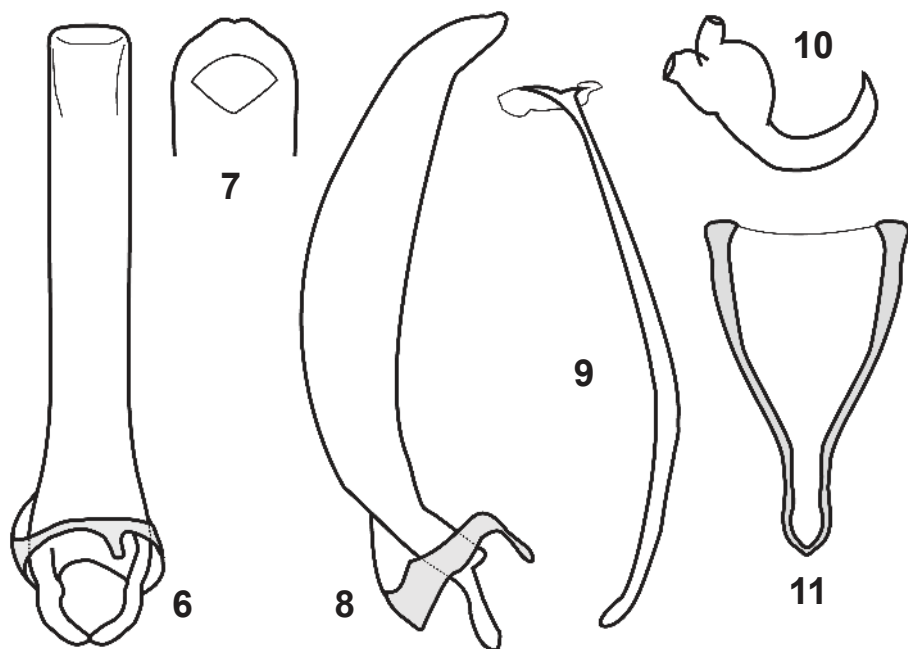
Eyes large, oval, lateral, $1.6\text{--}2.3\times$ as long as wide and barely protruding in dorsal view.

Pronotum campaniform, $0.7\times$ as long as wide, maximal width at base, slightly rounded at median third; apical margin nearly straight, medially slightly protruding, base bisinuate; medially devoid of scales or with only fine pubescence, pronotal anterior third slightly convex with fine but distinct sharp crest, posterior half gradually concave. Surface coarsely sculptured, with punctures of different size and form and sometimes with granules. Postocular lobes distinct although weak and bearing tufts of yellowish scales.

Scutellum indistinct.

Elytra oblong, $2.3\text{--}2.4\times$ as long as wide, maximal width at humeri, laterally subparallel to apical fourth, then gradually roundly narrowed towards apex, apex with short but distinct pointed tail. Striae deep and coarse, formed by rows of separated punctures, interstriae flat to slightly concave, particularly the fourth at base.

Femora moderately swollen medially. All tibiae straight, gradually widening towards apex, mucronate in both sexes, mucro small, slightly curved, pointed. Tarsi densely setose ventrally. Onychium nearly as long or slightly shorter than three



Figs 6–11. Genitalia of *L. nettadorchinae* sp. n.: (6) aedeagus, dorsal view; (7) apex of penis, dorsal view; (8) aedeagus, lateral view; (9) spiculum gastrale; (10) spermatheca; (11) sternite VIII.

basal tarsal segments, tarsomeres 1–2 trapezoidal, 3 strongly roundly bilobed. Claws connate basally, of equal length, curved, pointed and slightly diverging at apex.

Abdominal sternites straight at bases, posterior base of sternites II–IV projects over anterior base of succeeding sternite.

Genitalia (Figs 6–11). Male: Penis (Figs 6–8) well sclerotized, cylindrical, slightly wider at base, apex rounded; in lateral view moderately curved, subbasally and subapically slightly bent, apex slightly drawn backwards; aedeagal apodemes short. Tegmen in form of complete ring (Fig 8). Spiculum gastrale (Fig. 9) narrow, curved, nearly as long as aedeagal tube. Female: Apodeme of sternite VIII as in Fig. 10. Spermatheca C-shaped, ramus moderately incrassate, longer than collum, apex of cornu pointed (Fig. 11).

Comparative notes: *Lixus nettadorchinae* sp. n. keys to the subgenus *Eulixus* in the arrangement by Reitter (1916), Ter-Minassian (1967) and Lohse (1983), having its claws fused at the base, elytra with strongly projected apical mucros, relatively flat eyes and pronotum with postocular lobes. The kind of clothing, united to depressed fourth elytral interval and humeri almost devoid of scales make the new species unmistakable. In addition, this is the only gall-forming species of *L. (Eulixus)* to the best of our knowledge (Korotyaev *et al.* 2005), since Volovnik (2010) demonstrated

that the alleged gall-forming behaviour of *L. (Eulixus) iridis* was incorrect. The new species association with a member of the Apiaceae, similar to those of the “long-tailed” species of the same subgenus, also somewhat support its attribution to *Eulixus*, although some of the species’ peculiar features and its biology readily set the new species apart, as to envision a future description of another subgenus.

Holotype: Israel: ♂ HaMeshar, Rt. 40/ 30°27'20"N 34°56'08"E/ 390 m, 25.i.2023/ L. Friedman/ ex *Deverra triradiata* stem gall (SMNHTAU).

Paratypes: Israel: 6♂ 14♀, same as holotype (SMNHTAU, NHM, NMP); 1♀, Mishor Yamin [31.0047°N 35.1157°E], 9.ix.1997, A. Freidberg, ex *Pituranthos triradiatus* (SMNHTAU); 3♂ 3♀, Nahal Yamin, Rt. 227, 30°57.5'N 35°04.1'E, 300 m, 8.iii.2010, L. Friedman, on *Deverra triradiata* (SMNHTAU); 2♂ 1♀, same locality and date, A. Freidberg (SMNHTAU); 1♀, HaMakhtesh haGadol, Colored Sands [30.9522°N 35.0253°E], 1.iv.2014, L. Friedman, on *Deverra triradiata* (SMNHTAU); 2♀, same locality and date, E. Colonnelli (ECRI); 2♂ 'En 'Avedat National Park [30.8432°N 34.7788°E], 30.vi.2025, M. Nikelshparg, ex *Deverra triradiata* stem gall; 1♂ same data, 1.viii.2025; 1♀, Nahal Zin, Rt. 40, S Nafha Prison, 8 km S 'Avedat [30.7093°N 34.7851°E], 19.iii.2018, L. Friedman (SMNHTAU); 1♂ 1♀, Nahal Horesha [30.5435°N 34.5436°E], 7.iv.2018, I. Renan (SMNHTAU); 1♀, Mizpe Ramon [30.6125°N 34.8066°E], ii.1989, A. Shkolnik, on *Pituranthos triradiatus* (SMNHTAU); 1♂ 1♀, Nahal Ramon, Rt 40, 30°36'46.3"N 34°51'31.0"E, 485 m, ex *Deverra triradiata* stem galls (SMNHTAU); 3♂ 3♀, Nahal Neqarot, 11 km SE of Mizpe Ramon [30.5664°N 34.9046°E], 17.iv.1994, M.G. Volkovitsh, “*Lixus volkovitshi* sp. nov. Gültekin det.” (ABBM, ZIN); 2♀, HaMeshar, 15.ii.2022, 30°27'21"N 34°56'07"E, 390 m, L. Friedman, ex *Deverra triradiata* stem galls (SMNHTAU); 2♂ 4♀, HaMeshar, Rt 40, S Nahal Terashim, 30.4839°N 34.9373°E, 390 m, 15.i.2025, L. Friedman, ex *Deverra triradiata* stem galls (SMNHTAU); 3♂ 1♀, Nahal Zihor [30.2712°N 34.9863°E], 24.xii.1992, J. Halperin, 25.i.1993, ex *Pituranthos triradiatus* (SMNHTAU).

Distribution: We conditionally treat this new species as endemic to southern Israel, although its host plant is widely distributed throughout across North Africa and South-West Asia.

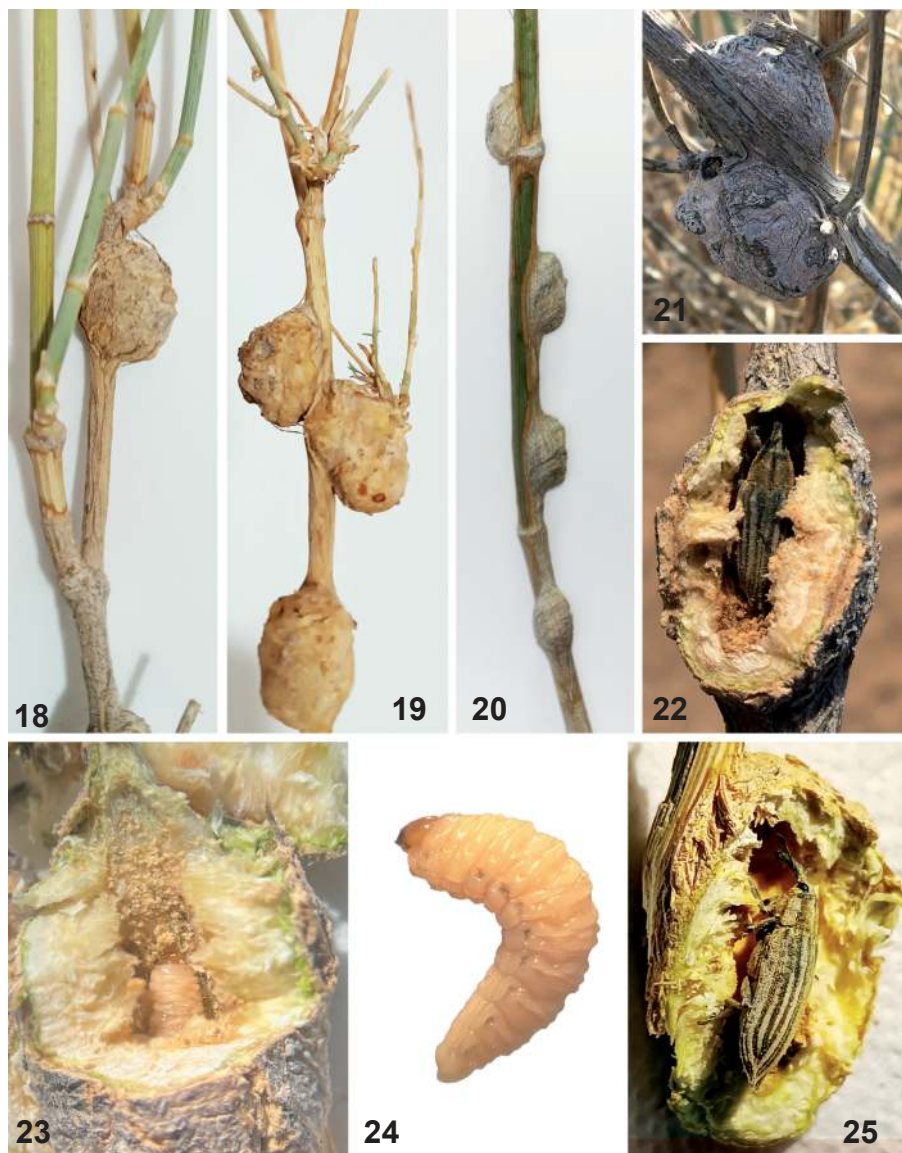
Ecology and notes on biology: All specimens were found on or reared from the stem galls of *Deverra triradiata* Hochst. ex Boiss. (Apiaceae), previously known as *Pituranthos triradiatus* (Boiss.) Asch. & Schweinf. (Danin & Fragman-Sapir 2025), a shrub or subshrub distributed in the deserts and arid shrub-steppes of North Africa (Western Sahara, Algeria, Tunisia, Egypt) and South-West Asia (Syria, Israel, Jordan, Iraq, Kuwait and Saudi Arabia) (Chrtek *et al.* 1984). The nominative subspecies occurs in Egypt, Syria, Israel, Jordan, Iraq and Kuwait, whereas *D. triradiata intermedia* (L. Chevall.) Pfisterer & Podlech is to be found in Western Sahara and Algeria, and *D. triradiata musilii* (Chrtek, Osb.-Kos. & Šurková) Pfisterer & Podlech is indicated from Saudi Arabia (IPNI 2025). In Israel, *Deverra triradiata triradiata* is a common shrub in the Northwest, Central and Southern Negev and the Arava Valley, becoming rare in the southernmost part of the Coastal Plain, occurring at elevations from 100 to 900 m, in various arid biotopes: sands, loess and hamada plains, dry riverbeds, and roadsides (Figs 12–17). Flowering occurs from August to November (Danin & Fragman-Sapir 2025). This plant is used in phytotherapy (Amin *et al.* 2024).

The oviposition of *L. nettadorchinae* sp. n. was not observed, but we assume it occurs in February to March, close to the time of emergence of adults and mating, with the egg probably laid at the base of the youngest shoots. The emergence from

galls and mating was observed from January to March. Galls develop from February to December. Adults are active in the coolest and moist season, which in the desert can be extremely short, between January to March, probably spanning some 2–3 weeks. Galls (Figs 3, 18–25) are more or less elliptic, olive-shaped and olive-



Figs 12–17. Typical landscapes in the Central and Southern Negev, where *L. nettadorchinae* sp. n. and its host plant occur: (12) the type locality, HaMeshar, 25.i.2023, the senior author stands in the thicket of *Deverra triradiata* (photo N. Dorchin); (13) HaMeshar, 25.i.2023, a bush of *D. triradiata*; (14) HaMeshar, 25.i.2023, a gall of *L. nettadorchinae* sp. n. on *D. triradiata*; (15) HaMakhtesh haGadol (= the Larger Crater), 25.i.2023, bushes of *Deverra t.* along the road; (16) Prof. N. Dorchin searching for galls on the bluff above the dry riverbed of Nahal Ramon in Makhtesh Ramon (=Ramon Crater), *D. triradiata* are seen; (17) bushes of *D. triradiata* along the dry riverbed of Nahal Ramon.



Figs 18–25. (18) Typically looking stem gall of *Lixus nettadorchinae* sp. n. on *Deverra triradiata* and their inhabitants, HaMeshar, 15.i.2025; (19) a rare bunch of three galls, Mishor Yamin, 8.iii.2010 (photo S. Zonstein); (20) four sequential galls: Mishor Yamin, 8.iii.2010 (photo S. Zonstein); (21) old galls, probably from the previous year, the emergency hole is seen on the apex of the left gall, HaMeshar, 25.i.2023 (photo N. Dorchin); (22) a male of *L. nettadorchinae* sp. n. ready to emerge, HaMeshar, 25.i.2023 (photo N. Dorchin); (23) a larva of *L. nettadorchinae* sp. n. gnawing inside the gall, 'En 'Avedat National Park, 25.v.2025 (photo M. & I. Nikelshparg); (24) last instar larva of *L. nettadorchinae* sp. n.; (25) a female of *L. nettadorchinae* sp. n., forcibly taken out of its gall, HaMeshar, 15.i.2025.

sized, 1.5–3.0 cm long, 1.2–2.0 cm wide, attached to the lower or mid parts of the branches, with a single larva developing in each gall. The larvae gnaw in vertical direction. The emergence holes of the adults are situated always in the upper tip of the gall. Twenty-three specimens were taken out of galls before the emergence on 25.i.2023, and eight more specimens on 15.i.2025. All adults inside galls are with their heads directed upwards, as to let them to gnaw their emergence holes (Figs 22, 23, 25). The collecting was intentionally made from the large galls, where around one third of them were still inhabited by larvae on 15.i.2025. Indeed, 7 adults, 4 weevil larvae, 4 parasitoid larvae plus 2 empty galls with remains of dead larvae were obtained from 17 galls. Up to one third of the galls contained parasitoid larvae (Figs 26, 27), often with the remains of the weevil larvae. The emergence holes of the parasitoids are on the sides of the galls. Only one parasitoid larva was found in each infested gall. Rearing of both weevils and parasitoid wasps is difficult, as the galls are drying and hardening soon after collecting, so that the insect is unable to penetrate their thick and dry walls. On the other hand, if the galls are open the larvae and pupae of weevils and wasps often dry out and die.

Several adults of the parasitoid wasp *Eurytoma dentata* Mayr, 1878 (Hymenoptera, Eurytomidae) (identified by Z. Yefremova) were reared from the larvae of *Lixus nettadorchinae* (all in SMNHTAU):

3♂ 5♀ Oron, Rt 206, ?2007, A. Freidberg, ex stem galls on *Pituranthos triradiatus*; 2♀ 'En 'Avedat National Park, 30.vi.2024, M. & I. Nikelshparg, ex stem galls of *Deverra triradiata*; 1♀ 'En 'Avedat National Park, 29.iv.2025, pupation 15.v.2025, adult emerging 25.v.2025, M. & I. Nikelshparg (Fig. 28).

Eurytoma Illiger, 1807 is a species-rich cosmopolitan genus, whose members are either plant-feeders or parasitoids of insects from various orders (e.g. Coleoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera). A notable part of the *Eurytoma* spp. hosts are gall-inducers (Lotfalizadeh *et al.* 2007; Gates & Delvare 2008; Fursov *et al.* 2019; UCD 2023; Bruun *et al.* 2024). *Eurytoma dentata* is widely distributed throughout the Palearctic and Oriental regions, parasitizing gall-inducing gall



Figs 26–28. (26) parasitoid larva, most probably *Eurytoma dentata*, inside the *L. nettadorchinae* sp. n. gall, Nahal Yamin, 8.iii.2010 (photo S. Zonstein); (27) the same, enlarged (photo S. Zonstein); (28) *Eurytoma dentata*, female, 'En 'Avedat National Park, 25.v.2025 (photo M. & I. Nikelshparg).

midges of the genus *Asphondylia* spp., on wide range of plants, e.g. Adoxaceae (*Viburnum* spp.), Chenopodiaceae (*Atriplex* spp.), Fabaceae (*Coronilla* spp., *Cytisus* spp., *Genista* spp., *Lotus* spp., *Medicago* spp.), Pedaliaceae (*Sesamum indicum* L.) and Scrophulariaceae (*Verbascum* spp.) (Tiwari 1974; Lotfalizadeh *et al.* 2007; Dorchin *et al.* 2014; UCD 2023; Brunn *et al.* 2024). It is remarkable that all known hosts of *E. dentata* are gall midges, and this is the first record of this species from a beetle, although the ecology (gall-inducing) rather than systematics is the common denominator in this case.

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