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HISHIMONUS HAMATUS KUOH (HEMIPTERA: CICADELLIDAE): A NEW ALIEN LEAFHOPPER IN EUROPE

Gabrijel SELJAK

Agriculture and Forestry Institute Nova Gorica,
Pri hrastu 18, 5000 Nova Gorica, Slovenia.
E-mail: gabrijel.seljak@go.kgzs.si

Abstract - The first occurrence of the East-Palaearctic leafhopper *Hishimonus hamatus* Kuoh 1976 in Nova Gorica and its surroundings in western Slovenia has been recorded. This is also the first record of this species in Europe. Adults and nymphs were found on several ornamental trees: *Ligustrum lucidum, L. japonicum*, *Lagerstroemia indica*, *Euonymus japonicus, Chamaecyparis lawsoniana* and *Cupressus sempervirens*. Its phytoplasma transmission potential is highlighted.

KEY WORDS: *Hishimonus hamatus*, Cicadellidae, alien species, host plants, Slovenia, Europe

Izvleček - *HISHIMONUS HAMATUS* KUOH (HEMIPTERA: CICADELLIDAE): NOV TUJERODNI ŠKRŽATEK V EVROPI

Zabeležen je prvi pojav škržatka *Hishimonus hamatus* Kuoh (Hemiptera: Cicadellidae) v Novi Gorici in okolici. To je tudi prva najdba te vrste v Evropi. Odrasli škržatki in nimfe so bili nabrani na različnih okrasnih rastlinah: *Ligustrum lucidum, L. japonicum*, *Lagerstroemia indica*, *Euonymus japonicus, Chamaecyparis lawsoniana* in *Cupressus sempervirens*. Izpostavljena je njegova morebitna zmožnost prenašanja fitoplazem.

KLJUČNE BESEDE: *Hishimonus hamatus*, Cicadellidae, tujerodna vrsta, gostitelji, Slovenija, Evropa

Introduction

Hishimonus Ishihara is mostly an Oriental genus of leafhoppers with a remarkable distributional extension into the eastern Palaearctic region (Dai *et al.*, 2013). Only five

species out of 51 currently known in this genus radiate into Afrotropical and Australian zoogeographical region (Knight, 1970; Dai *et al.*, 2013; Zahniser, 2013). Thirteen of them are only recorded from China (Kuoh, 1976; Li, 1988; Cai & Kuoh 1995; Li & Wang, 2004; Zahniser, 2013). Findings of the representatives of this genus in the Western Palaearctic and Nearctic region have to be considered as the result of secondary introduction, like *H. phycitis* Distant in USA (Metcalf, 1967) or *H. sellatus* (Uhler) in Southern Russia (Gnezdilov, 2008). The most recent findings of *Hishimonus hamatus* Kuoh 1976 in western Slovenia in 2012 and 2013 undoubtedly demonstrate the rising introduction trend of alien species from the East-Palearctic region, and from China in particular. As it is well known, China belongs to the salient biodiversity hotspots of the Earth, and it is not surprising that a number of new aliens come from that particular region.

Material and methods

First specimens of *H. hamatus* were trapped accidentally with an insect light trap in September 2012. As light proved to be very attractive for the species, especially for males, it was applied several times on three different localities in the surroundings of Nova Gorica. At the same time potential host plants were periodically swept with an entomological net in order to obtain additional material and to find out the food plants of this species. All the specimens were prepared dry and are deposited in the author's private collection. Most photographs were taken with a Canon 60 D Camera. For the photographs of the aedeagus the following procedure was used: The male genital segment was macerated in 10% KOH solution for 10 minutes at about 90 ºC. The extracted aedeagus was transferred into distilled water for about 5 minutes and then in a drop of glycerol on an excavated slide. Excavated slide enabled repositioning of the aedeagus and taking photographs in different views. Photographs were taken under a compound microscope Nikon Eclipse Ni-E equipped with a DS-U Digital Camera.

Results

Taxonomy

Valid name: *Hishimonus hamatus* Kuoh 1976

Synonym: *H. araii* Okada 1978

Taxonomic position: Hemiptera, Cicadellidae, Deltocephalinae, Opsiini

Material examined: Nova Gorica (45º57'27''N/13 º39'13''E), 28.9.2012 – 1 ♂, 3.7.2013 – 2 ♂ and 4.7.2013 – 1 ♀ and 2 ♂; Kromberk, 14.7.2013 – 8 ♂ and 11.8.2013 – 7 ♂ - all trapped on UV light; Nova Gorica, 18.9.2013 – 1 ♀ and 1 ♂, 20.9.2013 – 22 ♀, 19 ♂ and 15 nymphs, all swept from *Ligustrum lucidum* trees; Kromberk (45º57'48''N/13º40'45''E), 21.9.2013 – 1 ♀, 1 ♂ and 3 nymphs swept from *L. lucidum* trees; Nova Gorica, 21.9.2013 – 2 ♀ and 1 ♂ swept from a *L. japonicum* tree; Šempeter pri Gorici (45º55'50''N/13º39'33''E), 22.9.2013 – 3 ♀, 5 ♂ and 10 nymphs; adults and nymphs swept from *Lagerstroemia indica*, *Euonymus japonicus, Chamae-*

cyparis lawsoniana, Cupressus sempervirens, and a single adult from *Thuja occidentalis* as well.

DESCRIPTION

Originally, the species was independently described twice, first by Kuoh in Chinese on the basis of the material collected in southern China (Kuoh, 1976), and two years later by Okada in Japan under the name of *H. araii* (Okada, 1978). This name was later recognised as a junior synonym of *H. hamatus* (Zahniser, 2013). In addition to a detailed description in English, and excellent drawings, Okada compared the new species with the allied *H. sellatus* (Uhler 1896) and *H. lindbergi* Knight 1970. A concise description presented hereafter was made on the basis of specimens collected in Slovenia, but textually based on Okada (1978).

Body (Figs. 1 and 2): Length: male 3.8 - 4.2 mm; female 4.1 - 4.3 mm. Vertex and frons greenish yellow (Fig. 5); pronotum greenish yellow on anterior half, yellowish brown on posterior half; scutellum yellowish brown with a pair of triangular brown markings anteriorly, black transversal line in the middle, posterior margins and apex whitish interrupted by a short brown strip on both sides. Forewings greyish white with brown veins and transversal reticulation and with a typical large semi-circular brown spot occupying the whole posterior half of clavus, the middle part of the cubital and median cell; legs brown yellowish, with dark brown to black mottling. Abdominal tergites brown medially, greenish yellow laterally; sternites yellow to brownish yellow, sometimes red mottled.

Male genitalia (Figs. 3, 6, 7, 8): subgenital plates broad with strongly convex outer margins, attenuated apically into long finger-like processes; setae white, marginal ones long and hair-like, submarginal ones stout and blunt, uniseriate laterally, becoming multiseriate basally; styles slender, attenuated apically, insides fine papillate (Fig. 8); connective Y-shaped in dorsal view with stem elongate, twice longer than wide; aedeagus V-shaped with two shafts; shafts tubular with lateral margin concave, in distal half lamellated laterad, at the tip acutely hooked (lat.: hamatus!) visible in lateral view; gonopore subapical on posterior surface.

Female genitalia (Fig. 4): caudal margin of 7th sternite concave medially with an emarginated black process.

Fig. 1: *H. hamatus* - lateral view

Fig. 2: *H. hamatus* - dorsal view

Fig. 3: *H. hamatus* – male genital segment

Fig. 4: *H. hamatus* – female genital segment

Fig. 5: *H. hamatus* – head (frontal view)

Fig. 6: *H. hamatus* – aedeagus (dorsal view)

5th instar nymphs (Figs. 9, 10)**:** Body 3.5 – 3.8 mm, very variable in coloration, light to dark brown, white yellowish marbled and with continuous light median strip; vertex brown, white marbled with two whitish apical markings and three transversal occipital ivory-white strips; metanotum with two submedian dark brown to black suffused spots posteriorly; legs yellowish to dark brown, often distinctly red mottled; body dorsally apparent bare, but covered with sparsely scattered minute hairs; setae on tergites III - VIII in numbers 4/4/4/4/4/6, strong, white and sticking out; posterior margins or posterior half of tergites often reddish, sternites yellowish, mostly red to brownish mottled.

Similar species

Kuoh (1976) pointed out in his concise remark in English to the original description: "Allied to *H. callisto* Linnavuori, separated by the medial spot on the tegmina not extending to posterior apex of scutellum, the relatively slender stem of connective and relatively wider shaft of the aedeagus". In addition, aedeagus shafts of *H. hamatus* are

Fig. 7: *H. hamatus* – aedeagus (lateral view)

slightly lamella-shaped enlarged in distal half and with lateral margins concave below this enlargement. *H. callisto* is only known from tropical Africa (Republic of Congo) (Zahniser, 2013). *H. sellatus* is clearly distinguishable by the non-hooked aedeagus shafts, while in *H. lindbergi* the shafts of aedeagus are hooked, but much slenderer and with outer margins convex. The latter is only known from the Cape Verde Islands.

Host plants

So far, adults and nymphs (3rd to 5th instar) collected by the sweeping method have mostly been obtained from *Ligustrum lucidum* Aiton. They have also been swept from the following trees: *L. japonicum* Thunberg (Oleaceae), *Lagerstroemia indica* (L.) Pers. (Lythraceae), *Euonymus japonicus* Thunberg (Celastraceae), *Chamaecyparis*

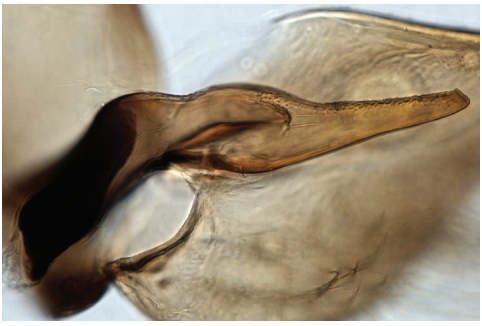

Fig. 8: *H. hamatus* – left stylus

Fig. 9: *H. hamatus* – 5th instar nymph

Fig. 10: *H. hamatus* – 5th instar nymph feeding on cypress leaves

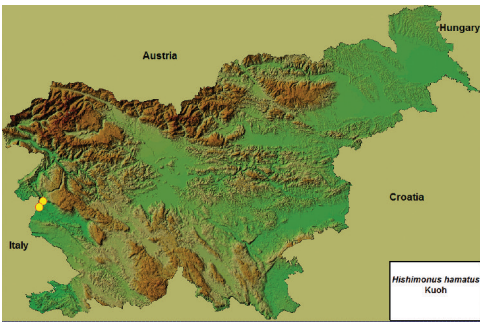

Fig. 11: *H. hamatus* – currently known distribution in Slovenia

lawsoniana (A. Murray) Parl., *Cupressus sempervirens* L. and *Thuja occidentalis* L. (all Cupressaceae). The numerous presence of nymphs of the 3rd, 4th and 5th instar on all the sampled trees, except on *Th. occidentalis,* unequivocally ascertains that these trees are used as host plants. Okada (1978; citing Arai, 1977) recorded several evergreen trees as host plants, from which specimens were swept in Japan, e.g. *E. japonicus*, *Sambucus javanica* Blume (Caprifoliaceae), *Ilex crenata* Thunberg (Aquifoliaceae) and *Serissa japonica* Thunberg (Rubiaceae). Further investigations should give the answer on the real host range of *H. hamatus*. As *L. lucidum* and many other confirmed and putative host plants are distributed worldwide as ornamentals in the temperate zone, further spread of *H. hamatus* outside its native distributional area is very likely.

Origin and distribution

The original distribution range of *H. hamatus* is the East Palaearctic region, from China throughout the Korean peninsula and in Japan (Zahniser, 2013; Okada, 1978). Its occurrence in and around Nova Gorica in western Slovenia is the first place outside its native range (Fig. 11). However, this region is not necessarily the area of its primary introduction. Further investigations, especially in the adjacent regions of northern Italy, may shed light on the path of its introduction.

Comments

Impacts of *H. hamatus* on the European plant health situation are still unknown and unpredictable. A more comprehensive list of plants serving as its food sources in Europe may deliver more usable data, which will ensure a more accurate assessment of the risk of this introduction. Certain representatives of the genus *Hishimonus*, such as *H. phycitis* and *H. sellatus* are well known as vectors of several harmful phytoplasmas (Thomas & Krishnaswami, 1939; Bindra & Singh, 1969; Mitra, 1988; Salehi *et al*., 2007; Bagheri *et al.*, 2009; Weintraub & Beanland, 2006). For instance, *H. phycitis* effectively transmits the 'Lime witches' broom phytoplasma' on *Citrus aurantiifolia* mostly on the Arabian Peninsula (CABI & EPPO, 2013), while *H. sellatus* transmits

jujube witches' broom, mulberry dwarf phytoplasma, Rhus yellows and some others (Okada, 1978, Han & Cha, 2002; Tanaka *et al.,* 2000). During the recent two decades the phytoplasmas-induced plant diseases have become a huge plant health problem in Europe as well as worldwide. Any newly introduced insect species with a phytoplasma transmission potential may constitute a grounded reason of concern. The leafhopper *Scaphoideus titanus* Ball and certain other species are good examples of how entirely trivial insect species in their native habitat may cause unpredictable or even devastating effects under different environmental and plant production conditions. In order to avoid any such unwelcome developments, *H. hamatus* deserves a necessary scientific attention henceforth.

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