



Description of Two New Species of Oriental Genus *Halys* Fabricius (Pentatomoidae, Pentominae, Halyini) from Sindh, Pakistan with a Key of its Nine Asian Species

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ABSTRACT

Till to date nine species of the genus *Halys* are described from Asia. Of the nine species, five are described from Pakistan, including present two new species from Sindh province. These two new species are described, illustrated and compared with the allied species. Illustrations include dorsal view, scent gland apparatus, external and internal male and female genitalia. A key of nine species is also given.

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Authors' Contributions

All authors designed the study. NM and RP identified the species. NM analyzed the data and wrote the article.

Key words

Halyini, *Halys*, New species, Sindh.

INTRODUCTION

The variable genus *Halys* was first described by Fabricius (1803) to accommodate the type species *Cimex dentatus* Fabricius (1775). The status of genus *Halys* and most of its species always has been controversial and either changed, synonymized, or transferred by previous and present researchers like Spinola (1850), Westwood (1837), Distant (1902), Bergroth (1905), Kirkaldy (1909), China and Miller (1950), Ahmed and Khanum (1968), Chopra (1974), Abbasi and Ahmed (1976), Ahmad and Parveen (1982), Ghauri (1988), Ahamd and McPherson (1998), Memon *et al.* (2002) and Manan *et al.* (2011). Because of this in two hundred years only four species have been added in this oriental genus *Halys* from Asia. Although the distributional range of *Halys* species is quite vast and were recorded from different areas of India, Iran, Afghanistan and Bangladesh but not from Pakistan, the most part of which is oriental (Punjab and Sindh province). Memon *et al.* (2006) and (2011) described their new species and recorded *Halys sulcatus* from different areas of Sindh, which was the first published record of *Halys* species from Pakistan, before it was recorded by Ahmed *et al.* (1974) from Bangladesh (former East Pakistan).

Till to date five species have been described from the oriental region (Sindh and Punjab province) of Pakistan. Among these five, four species including present

two have been described from Hyderabad, Miani forest, Tando jam, and Shahdaddkot and Noakot, of Sindh province and only one species *H. mulberriences* Memon *et al.* (2016) is described from Punjab province of Pakistan.

Halys Fabricius 1803

(*Halys* Fabricius, 1803: 180; Chopra, 1974: 473; Abbasi and Ahmad, 1976: 31; Ahmad *et al.*, 1974: 56; Ahmad, 1979: 56; Ghauri, 1988: 77.

This genus *Halys* strikingly resembles *Neohalys* and *Salixocoris* in colour and general appearance like paratype tapering upward and apically acute, but it is a little closer to *Neohalys* because in both genera basal antennal segment distinctly shorter than apex of head (which is a tribal character and present in most of the Asian genera of tribe halyini), while in *Salixocoris* basal antennal segment is almost equal to head apex. Other than these characters, genus *Halys* is totally different from *Neohalys* in having comparatively short labium, striking difference is in the shape of paramere, both stem and blade and most peculiar is the apex of paramere blade and to some extent shape of pygophore too; the male genitalia of *Salixocoris* is also very different from genus *Halys*, particularly the venteroposterior margin of pygophore, and shape of conjunctival appendages.

KEY TO THE SPECIES OF THE GENUS *HALYS* FABRICIUS

1. Anterior part of 4th antennal segment dark brown;

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- apical margin of male paramere almost straight with distinct and quite thick apical spin; spermathecal bulb with four processes of variable shape and size *sindillus* Memon *et al.* (2006)
- Whole 4th antennal segment ochraceous brown; apical margin of male paramere not straight with or without very thin spine; spermathecal bulb with usually three sub equal and finger like processes 2
 - 2. Head narrow, not tapered gradually; paratype with distinct tooth in middle 3
 - Head comparatively broad, tapering gradually; paratype smooth without tooth 7
 - 3. Parameral blade oval with inner and outer margins sinuate, apex subround without inner spine and ridge, penial lobes quadrangular, vesica almost equal to penial lobes *shaista* Ghauri (1988)
 - Paramere broad, with well-developed inner spine and ridge; penial lobes spatulate, vesica shorter than penial lobes 4
 - 4. Apex of paramere broad 5
 - Apex of paramere with distinct spine 6
 - 5. Paratype equal to clypeus; 2nd antennae distinctly longer than 3rd; parameral blade apically bilobed, inner spine of blade of paramere less prominent with indistinct ridge *fabricii* Memon and Ahmad (2002)
 - Paratype distinctly shorter than clypeus; 2nd antennal segment equal or subequal to 3rd; paramere sinuate at apex, forming concave margin, with apices acutely produced, inner spine of blade very prominent a little bent, beak-like, with distinct ridge *serigera* (Westwood, 1837)
 - 6. Ventromedian projection of pygophore narrow but blunt at apex; dorsal conjunctival appendages large tapering gradually upward and thinly narrow at apex spine-like, vesica a little shorter than penial lobes *ulberriensis* Memon *et al.* (2016)
 - Ventromedian projection of pygophore conical at apex; dorsal conjunctival appendages quadrate, throughout of same width with blunt apex, vesica much shorter than penial lobes *sulcatus* (Thunberg 1783)
 - 7. Blade of paramere without apical spine with apex narrowly roundish, inner margin distinctly wavy with prominent depression on upper outer margin; 1st gonocoxae on posterior margin distinctly depressed at anterior angle; spermathecal bulb with two finger-like processes *hyderabadensis* sp.
 - Blade of paramere with small apical spine and with broad apex, inner margin not as above, upper outer margin smooth; posterior margin of 1st gonocoxae not as above; spermathecal bulb with more than two processes 8
 - 8. Blade of paramere with small inwardly bent apical spine, inner margin smooth and a little swollen; dorsal conjunctival appendages large, apical portion thin turned inward like sickle, penial lobes broad, spatulate; 1st gonocoxae with posterior margin straight; 2nd gonocoxae posteriorly convex; spermathecal bulb with 3 sub equal processes *naokotiensis* sp. n.
 - Blade of paramere with small acute apical spine, inner apical margin slightly tapered downward with inner margin wavy; dorsal conjunctival appendages relatively small, apical portion a little narrow, slightly tapered upward; penial lobes thin, a little curved inside; 1st gonocoxae with posterior margin sinuate; 2nd gonocoxae posteriorly concave; spermathecal bulb with four processes *spinosus* Manan *et al.* (2011)

Etymology

Named for known distribution in Hyderabad, Sindh, Pakistan.

Halys hyderabadensis Memon *et al.* (2002), new species (Fig. 1)

Material examined

Holotype ♂, Pakistan: Hyderabad, Sindh, on Temeric, 10.6.1999, (N. Memon), Allotype ♀, same locality, Paratypes 02 ♂ and 04 ♀. The holotype and paratype were deposited in Natural History Museum, Karachi, Sindh Pakistan (NHMUK) and remaining material is kept in Memon's collection.

Size

Holotype: ♂ 19.0 mm; Allotype ♀ 19.9
Paratype: ♂, (19-19.3), ♀ (19.9-20.0)

Colour

Head pronotum, scutellum, is dull ochraceous, thickly and densely punctured with dark brown tinge; eyes dark brown with outer border dull ochraceous; ocelli pale ochraceous; antennae brown; pronotum and scutellum streaked with dark and light stripes; apex of scutellum light brown, with few dark brown puncture; each segment of abdomen dark brown with middle portion light brown; membrane of hemelytra bright brown with dark veins; labium ochraceous except a little basal portion of 3rd and entire 4th segment are brown; legs ochraceous brown with dark patches.

Head

Head distinctly longer than broad, tapering upward; Paratype almost equal to clypeus, lateral margins almost smooth and without tooth; anteocular region of head twice

more than remainder of head, antennae five segmented, 1st antennal segment not reaching apex of head, anteocular distance 3.4 mm, remainder of head 1.4 mm long, width of head 3.3 mm, interocular distance 1.1 mm; interocular distance 1.9 mm, length of head 3.0 mm, antenniferous tubercles partially visible, length of antennal segments: I 0.9 mm, II 2.0 mm, III 1.5 mm, 4th and 5th mutilated in holotype ♂ and paratype ♀, among three segments, 2nd is longest and 3rd is smallest segment; labium extending to fourth abdominal sternite, length of labial segments: I 2.1 mm, II 4.0 mm, III 3.4 mm, IV 2.8 mm (Fig 1A).

Thorax

Pronotum twice as broad as long, and distinctly shorter in length than head length, lateral margins of pronotum anteriorly dentate, posteriorly a little sinuate, humeral angles quite subacute; length of pronotum 3.9 mm, width 8.0 mm; scutellum distinctly longer than broad at base, reaching to three-fourth of abdomen, apical lobe U-shape, length of scutellum 6.8 mm, width 4.9 mm, metathoracic scent gland complex (Fig. 1B) with small ovate aperture, peritreme well-developed, sword-shaped with apex subacute and facing upward, evaporatoria large and very well-defined; membrane of hemelytra equal to abdomen.

Abdomen

Connexiva well exposed, joints sub-acute.

Male genitalia

Pygophore quadrate, dorsoposterior margin (Fig. 1C) with deep cavity, to some extent V-shaped, laterally sinuate and medially excavated, ventroposterior margin (Fig. 1D) with shallow cavity, laterally smooth and with apically bifid median projection, lateral lobes broad; paramere (Fig. 1E) with small stem, blade broad, oval-shaped, inner margin distinctly wavy, apex without spine and sub-round, outer upper margin near apex depressed distinctly, inner triangular spine present; inflated aedeagus (Fig. 1F) with pair of long and apically lobed dorsal membranous conjunctival appendages, pair of ventrolateral membranous conjunctival appendages, pair of highly sclerotized comparatively thin apically sub-round penial lobes, tube-like vesica very much shorter than penial lobes.

Female genitalia

First gonocoxae (Fig. 1G) somewhat quadrate, inner margin concave, posterior margin concave near inner angle, inner angle distinctly produced; second gonocoxae on posterior margin a little concave; eighth paratergite triangular with posterior margin convex; ninth paratergite

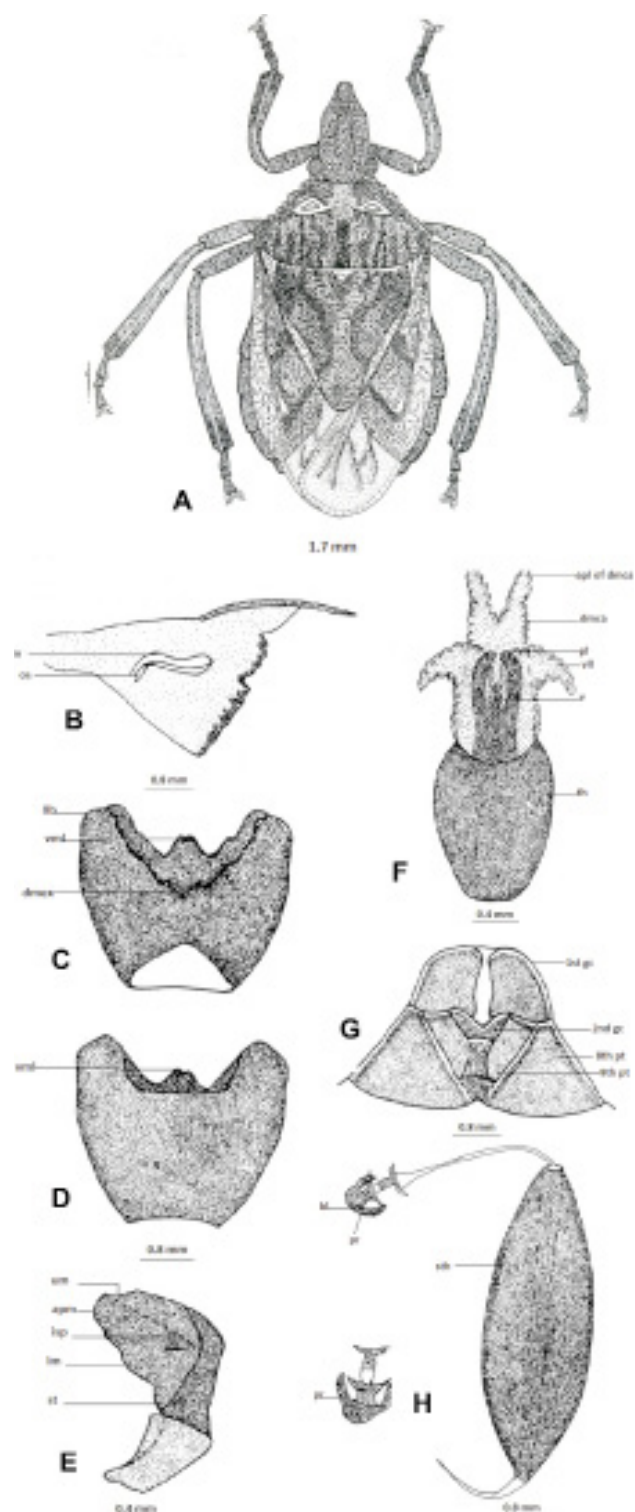


Fig. 1. *Halys hyderabadensis*, new species; A, dorsal view; B, scent gland apparatus; C, pygophore (dorsal view); D, pygophore (ventral view); E, paramere; F, aedeagus; G, female terminalia; H, spermathecal bulb.

very short than eighth paratergite with apex sub-round; triangulin fully visible; spermathecal bulb (Fig. 1H) quite round with two almost equal finger-like processes.

Remarks

This new species *H. hyderabadensis* is closely related to two species *H. shaista* Ghauri and *H. naokotensis* sp. n. in having paraclypei without tooth and, shape of blade which is broad, ventral margin of pygophore with broad and medially a little notched median lobe, but it is very much different in having 2nd antennal segment distinctly longer than 3rd, blade with round apex and without apical spine, inner spine much prominent, outer margin at apex depressed, inner margin very much sinuated, first gonocoxae with outer margin concave and with distinctly produced inner angle, spermathecal bulb with two finger-like processes while in *naokotensis* 2nd antennal segment sub equal or a little longer than 3rd, parameral blade with bent spine, inner spine less prominent, inner margin swollen, first gonocoxae posteriorly quite straight and spermathecal bulb with three processes.

Halys naokoatensis new species (Fig. 2A-I)

Etymology

Named for the known distribution in Naokot, Thar, Sindh, Pakistan.

Material examined

Holotype, ♂ Pakistan: Sindh, Naokot, on *Ziziphus jujube* Mill. 15-4-1971 (Azhar Khan), Allotype, ♀, same locality. Additional material: three ♂, two ♀, Pakistan, Sindh, Hyderabad, on *Temeric* (Imili) 5.6.1998 (Nasreen Memon).

The Holotype, Allotype, Paratype have been deposited in Natural History Museum, Karachi, Pakistan and Paratype in Memon's collection.

Size

Holotype, ♂ 18.8 mm, Allotype, ♀, 19.0 mm
Paratype: ♂ (18.4- 18.9 mm), ♀ (19- 19.5 mm)

Colour

Head, antennal segments, labial segments excluding fourth, entire pronotum, scutellum, corium and clavus, connexiva, venter of abdomen, legs except claws are dull ochraceous, with thick brown punctures; eyes brown, ocelli yellow with reddish tinge; 4th labial segment dark; claws ochraceous brown; membrane of hemelytra brown with dark veins.

Head

Lateral margins of head slightly sinuate; paraclypei

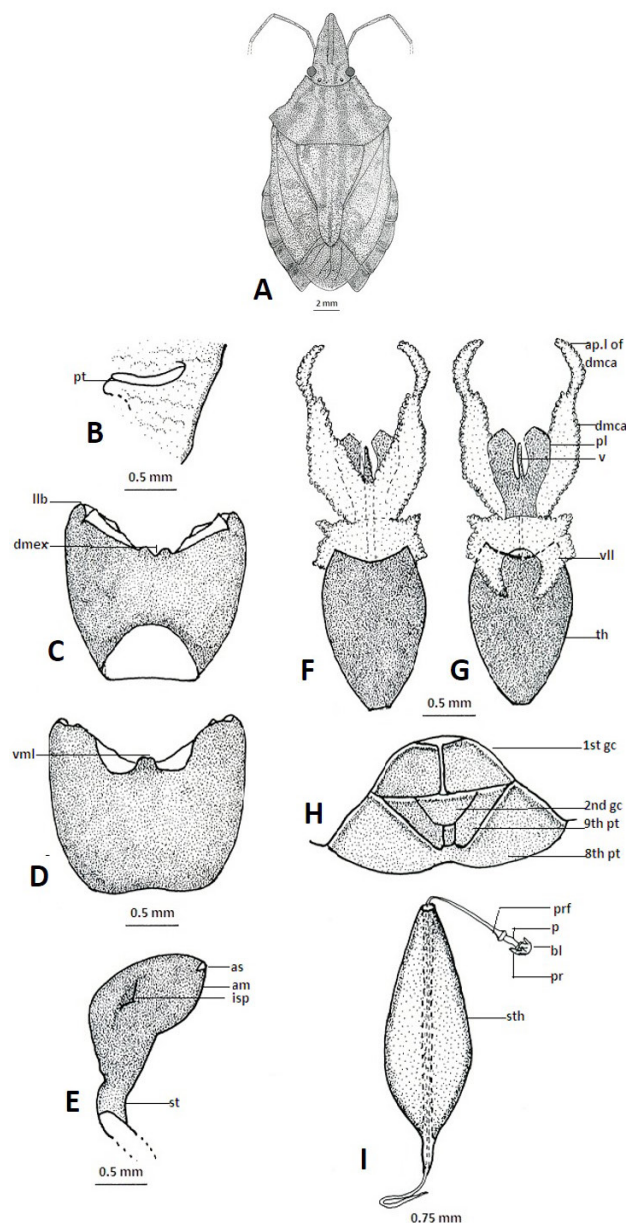


Fig. 2. *Halys naokotensis* new species; A, dorsal view; B, scent gland apparatus; C, pygophore (dorsal view); D, pygophore (ventral view); E, paramere; F, aedeagus (dorsal view); G, aedeagus (ventral view); H, female terminalia; I, spermathecal bulb.

a little shorter than clypeus, tapering towards apex with apices quite acute, antennae five segmented, 1st segment not reaching apex of head, length of antennal segments, I 1.0 mm, II 2.4 mm, III 2.6 mm, 4th and 5th mutilated in type; labium reaching to middle of 6th abdominal segment, length of labial segments, I 2.0 mm, II 4.0 mm, III 3.4 mm, IV 3.0 mm, labial formula I < IV < III < II; buccu-

lae distinctly shorter than basal labial segment (Fig. 2A).

Thorax

Pronotum more than twice as broad as long, lateral margins anteriorly dentate and posteriorly sinuate, anterior angles acute, humeral angles subacute; length of pronotum 4.0 mm, width of pronotum 8.2 mm; scutellum distinctly longer than broad at base, reaching up to 6th abdominal sternum with apex u-shaped; length of scutellum 7.4 mm, width 6.0 mm at base, metathoracic scent gland apparatus (Fig. 2B) ovate with distinct well-developed, sword-shaped peritreme, a little concave on anterior margin with apex sub-acute, evaporatoria very well defined with raised outer margin; membrane of hemelytra about equal to length of abdomen.

Male genitalia

Pygophore with dorsoposterior margin (Fig. 2C) with shallow cavity, medial excavation and two rounded lobes on the sides of excavation, dorsolateral lobes with subround apex, ventral margin of pygophore (Fig. 2D) with deep cup-shaped cavity and median projection with broad apex, a little notched in center; paramere (Fig. 2E) L-shaped, stem without inner spine, blade broad, leaf-shaped, with inner spine comparatively less prominent, apical spine small and inwardly bent, inner margin of blade smooth and distinctly smooth; inflated aedeagus (Fig. 2F, G) with pair of very long dorsal membranous conjunctival appendages gradually tapering in width, specially apical portion very thin, somewhat sickle-shaped, posterior portion acuminate, pair of ventrolateral conjunctival appendages placed moderately apart, like shoe-horn-shaped and U-shaped; pair of spatulate sclerotized penial lobes, a little longer than vesica.

Female genitalia

First gonocoxae (Fig. 2H) with posterior margin almost straight; 2nd gonocoxae with convex posterior margin, fused 8th paratergite triangular with posterior margin convex but distinctly concave in middle; ninth pratergites distinctly shorter than 8th, with apices subrounded, spermathecal bulb, (Fig. 2I) semi sclerotized, ovate, with three finger-like processes, two small and one comparatively large.

Remarks

This new species *H. naokotiensis* closely related to *H. hyderabadiensis* sp.n. in general appearance, same colouration, paratype without tooth, presence of inner spine of paramere, but it differs from *hyderabadiensis* in having distinct bent apical spine, inner margin of paramere blade smooth and swollen, outer upper margin smoothly

roundish, spermathecal bulb with three processes while in *hyderabadiensis* apex of paramere without spine, subrounded, upper outer margin with distinct depression, inner margin of paramere blade distinctly wavy, spermathecal bulb with two almost equal processes.

Statement of conflict of interest

Authors have declared no conflict of interest.

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